The Wireless World AND RADIO REVIEW

(15th Year of Publication)

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WHAT ARE WE TO THINK ?

THERE is something surprisingly inconsistent in the attitude of certain experts on the subject of short-wave transmission and its application to Empire broadcasting.

Recently Mr. Kellaway, managing director of the Marconi Company, in a letter to *The Times*, backed the discouraging attitude of the B.B.C. towards Empire broadcasting which we had previously criticised as being a policy of "waiting for perfection." In that letter Mr. Kellaway said, "With full knowledge of the present position as influenced by not only our own experiments but others abroad, we are convinced that the cause of Empire broadcasting would have been gravely prejudiced had the B.B.C. yielded to the easy course of taking premature and ill-considered action." About a week later, in a statement made to the Press on behalf of his company, Mr. Kellaway said: "There is every prospect that before the end of next year it will be possible for telephone subscribers in England to call up subscribers in any of the Dominions by means of the beam system."

If the state of development is such that a promise of a telephony service of this nature can be made, is it consistent that Mr. Kellaway should view with so much scepticism the possibilities of the inauguration of the much simpler problem of a broadcasting service?

Now we turn to comment on some recent views expressed by Captain Eckersley. We find that his main quarrel with our policy of wishing to push on with an Empire broadcasting station is that he is not technically ready to guarantee a satisfactory service, and that until that time comes he is not prepared to embark on the project and will not agree to experimenting. Now why, we ask, should his policy in respect of British broadcasting at home be different? In a recent article in the official organ of the B.B.C., Captain Eckersley, referring to the inauguration of 5GB, says: "I would add the word of warning that the service is experimental and we cannot guarantee the same freedom from breakdown as in the case of our other transmitters." And again: "It was felt that it would be a pity to deny listeners an alternative service just because it might be less regular than normally." This is precisely our own argument in favour of starting an Empire transmitter at once even if only certain parts of the Empire receive it at first and then perhaps somewhat imperfectly. We venture to think there must be more behind this attitude than has been disclosed, for as it stands the argument of the B.B.C. against starting a short-wave programme is utterly inconsistent with their practical policy in respect of 5GB.

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THE WIRELESS SHOW.

IT is now less than a month to the date of the opening of the annual Wireless Show at Olympia, which is fast coming to be recognised as the event of the year in wireless just as the Motor Show is looked forward to by the motoring public from year to year.

We have become accustomed to expect a good deal in the way of novelty at the Wireless Show, but it would seem that this year, far from being an exception, all previous Shows will be eclipsed as regards the proportion of new things to be shown. Information which is now reaching us indicates that the past year has been utilised, by most of those responsible for production, in the development of apparatus which can be grouped under three heads: That which is outstanding on account of its novelty, such, for example, as new valves and other apparatus distinct from anything which has previously been shown. Secondly, apparatus designed to reduce the complexity of wireless and providing the simplest arrangements for current supply to valves; in this class may be included the sets which operate direct from the mains and valves deriving their filament current from the mains, the filament being indirectly heated. Thirdly, sets and components where reduction in price has been a prime consideration.

EBONITE MANUFACTURE

Materials and Processes in the Manufacture of High-grade Ebonite.

THERE is no doubt that the success or failure of a wireless receiving or transmitting set is dependent to a great extent upon the efficiency of the insulating materials employed. In spite of the wide range of substances now on the market, ebonite still retains first place as the ideal insulator for the purpose. This statement will probably be received with some misgivings by amateurs who have experienced trouble with materials purchased under this name; we propose to deal not with this class of ebonite, but with the genuine material made from new rubber and sulphur only, and free from any reclaimed rubber adulterants, fillers, colouring matter, and so forth.

In the first place, selection of the rubber is of the highest importance; this must be of the best quality, tested to check the moisture content and to ensure that it is free from dirt and grit accumulated during transport from the plantation. The sulphur must be the purest obtainable, and so fine that it will pass a sieve of at least 120 mesh. It is chemically tested to be sure that no deleterious substances are present, and is dried and carefully sifted before use.

Mastication.

The rubber is removed from the case in a block due to the baling pressure used in packing, and the sheets of which the block is composed are either pulled apart or the block is sliced in a guillotine and placed in a warming room ready for mastication. The rubbers used, either pale crêpe or smoked sheet, are fairly well known owing to their use as soles for shoes. Mastication is the kneading or breaking down of the rubber to a plastic and uniform condition; this is accomplished by continually passing the rubber between a pair of heavy cast-iron rolls driven by an electric motor. The rolls are hollow and capable of being heated by admitting steam or cooled by letting in cold water. When mastication commences, the rolls are heated, but as the process is continued and the rubber is sufficiently hot to be plastic, the steam is cut off and friction keeps the temperature up to the proper point; any adjustment to avoid the rubber being overheated is carried out by the inlet of water to the rolls. The latter do not run at like or even speeds, the back roll being run faster than the front so that the rubber is warmed up, pressed and kneaded by continuous passage between the rolls. As the rubber becomes tacky, it joins up and runs completely round the front or slower roll; sulphur is then worked into the rubber a little at a time until it has become evenly distributed throughout the mass.

An ebonite mix contains on an average 30 per cent. of sulphur and 70 per cent. of rubber, but with such a large percentage of rubber it would be very difficult material to control or handle, and it is therefore usual to add a percentage of pre-vulcanised ebonite. This is done by vulcanising a quantity of the rubber and sulphur mix as it comes from the rolls, grinding it to a fine powder and sifting it through a 120 mesh sieve in a similar manner to the sulphur. This ebonite powder is added to the rubber with the sulphur and the resulting stock provides

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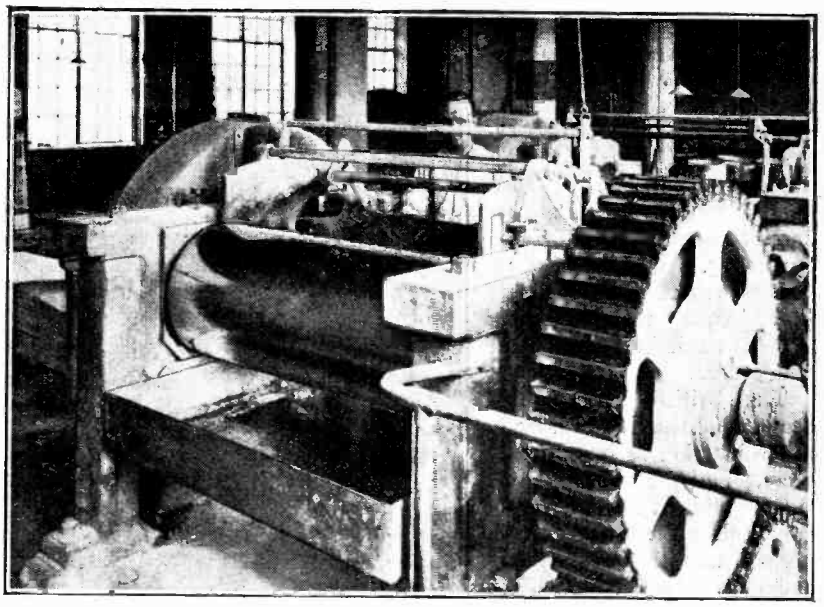
the shops with what may be described as their raw material. It is dark brown in colour, firm and sufficiently free from tackiness that it may be readily worked. When the mixing roll operator is satisfied that the batch is properly mixed, he makes a rapid slice with a knife into the mass of ebonite dough which is on the roll, cuts out a slab and takes it to the calender.

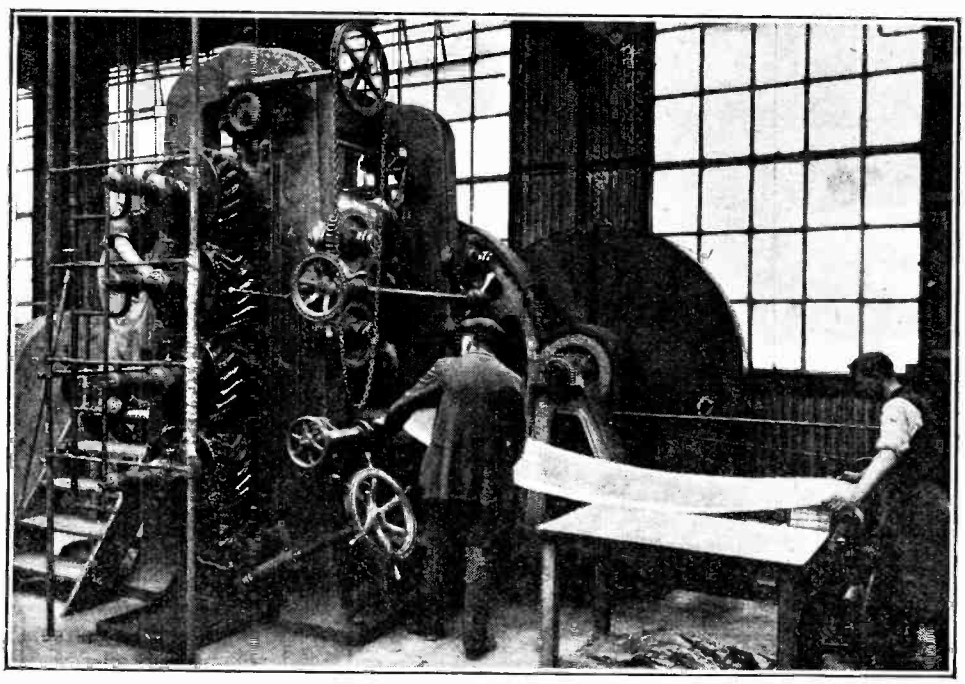


Breaking down rubber and mixing-in sulphur and ebonite powder. The fast-moving roll is in the foreground and the slow-moving roll to which the mixture adheres at the back.

Calendering.

A calender consists of either two or three polished iron rolls similar to the mixing rolls, but whereas the latter are arranged horizontally, those on the calender are vertical. It is possible by means of the adjusting gear on the calender to move the rolls in relation to one another so that the slab of ebonite dough may be rolled out into a sheet of controlled thickness. The rolls can be warmed or cooled as desired, and the dough is introduced between the top and middle rolls so that it travels round the latter, passes between middle and bottom rolls, round the bottom roll, and is taken up on a mandrel with calico to prevent adhesion of the layers.

In the manufacture of ebonite sheet the calendered dough is plied up until the required thickness is produced and then cut to a standard size, usually 36in. × 18in. Preparatory to vulcanisation, a sheet of practically pure tin is rolled down on each side of the ebonite. This is a simple operation and yet calls for considerable skill, since not only must the tin be rolled down without trapping the slightest air bubble, but the product must be very exact in thickness as the maximum tolerance guaranteed, for instance, on a $\frac{1}{4}$in. sheet is as low as six-thousandths of an inch over or under the nominal thickness. The sheets are now ready for vulcanising; this is carried out in a water bath, the sheets being stacked in an iron tank which is filled with water and run into a horizontal vulcaniser. The vulcaniser is then closed securely by a number of swing bolts; steam is turned on and the temperature allowed to rise very slowly (a rapid rise will ruin the sheets), the steam valve being opened a little at a time over a period of two or three hours until the temperature to be maintained is reached; after about 24 hours the vulcaniser is "blown down" and allowed to cool, the water is drawn off the tank and the tinfoil-covered sheets of ebonite taken out and the tin sheets stripped off. The reason for the use of tinfoil is to ensure a smooth even surface on the ebonite and retain the sheet to correct dimensions during vulcanisation. There is a possibility of particles of tin being left on the ebonite, but these of themselves do not appreciably impair the resistivity. The surface of the ebonite in intimate contact with the foil undergoes some kind of change, and this "skin" is at times of low resistivity although its ap-



Four-bowl calender for rolling ebonite dough to required thickness.

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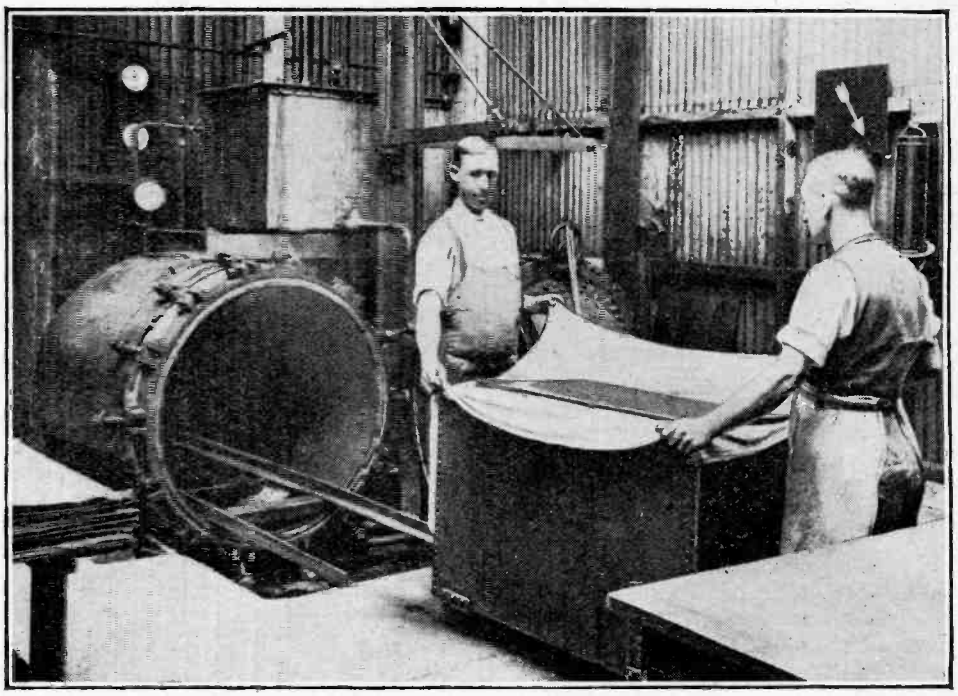
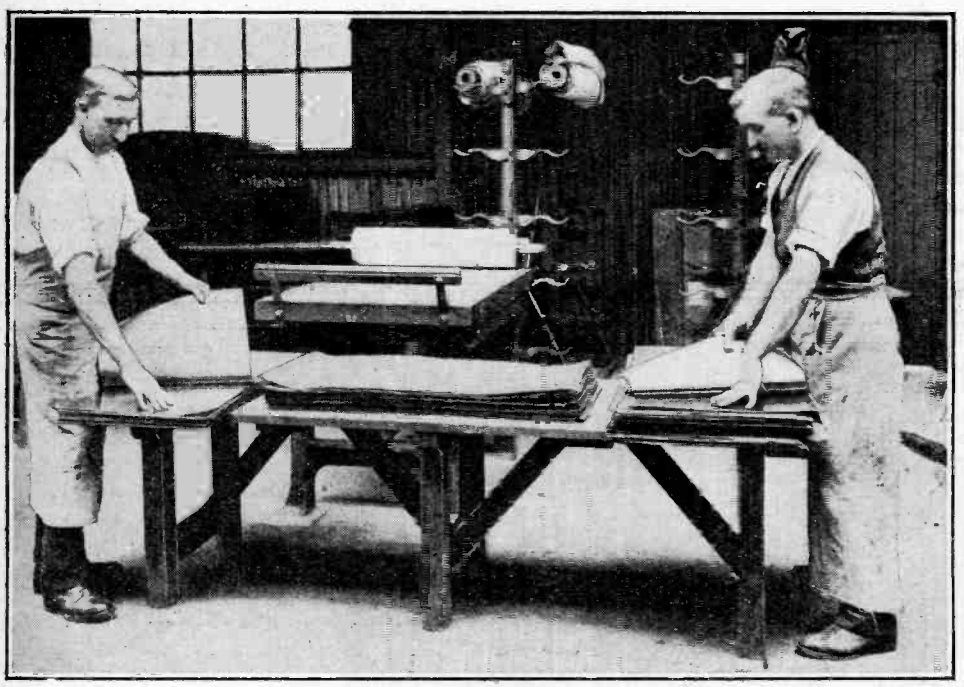
pearance is quite good, and the only safe course is to use ebonite sheet with "matted" or "scrubbed" surfaces from which the original "skin" has been removed. If either polished or foil surface sheet is used it should be tested for surface resistivity. With electrodes ¼in. apart and a potential of 1,000 volts, the resistance should be infinity over the whole area.

The British Engineering Standards Association issued a specification in November, 1925, under the title of "Ebonite for Panels for Radio Reception Purposes," and this publication embodies the tests which should be carried out on sheet to be used for this purpose. Some manufacturers have adopted this specification as standard for wireless ebonite, and brand their product under licence from the Association with the mark BESA/234-25; such material can be used with every confidence, as the mark carries a definite guarantee that the ebonite conforms to the specification both as regards its ingredients and compliance with the tests laid down.



Loading ebonite sheets into tank for vulcanising.

Rod and tube are produced by a machine in which the ebonite dough already described is fed into a hopper and carried forward through a die by the action of a worm screw; both the hopper and die (the latter determining the size of rod or tube) are heated, and considerable experience and skill are necessary to produce rods and tubes homogeneous and accurate as regards diameters; both rods and tubes are packed in French chalk on trays for vulcanising, the tubes first being slipped on mandrels.



Stripping tin-foil from ebonite sheets after vulcanising. The sheets are subsequently rubbed down to remove conducting films from the surface.

Ebonite Mouldings.

Mouldings are produced by fixing the shape of the piece by a rapid preliminary vulcanisation in the mould; the piece is then taken from the mould and packed in French chalk on trays for complete vulcanisation. The moulds themselves are either hot-pressed or turned from a yellow metal, and after inserting the piece of ebonite dough the mould is closed under a hydraulic press.

Ebonite manufactured in the manner described has very high electric strength and volume and surface resistivity. It also shows a remarkably low power factor

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or power loss; that is, the power absorbed by the dielectric and dissipated as heat. This is an extremely important consideration in the case of high frequencies at high voltages.

There are many ways in which a black substance having the appearance of ebonite can be produced. For example, instead of using all new rubber, the aid of a proportion of reclaimed rubber or rubber substitute (or both) may be invoked. Reclaimed rubber is obtained by the treatment of old motor tyres, etc., and rubber substitute is vulcanised or oxidised oil. Such a stock can be readily loaded with a variety of minerals, e.g., French chalk, zinc oxide, clay, powdered slate, etc., and the extent to which this is practised by some manufacturers may be gauged by the preparation of special blacks for ebonite. If any adulterant is used, some colouring matter must be added; but a pure rubber and sulphur mix will vulcanise to a rich jet black without the addition of any colouring substance.

A simple test of ebonite is to drill a hole in it with a twist drill. If the ebonite is pure, the shavings will be long, springy, and of a clear brown colour; these rubbed in the hand will break up, but remain as shavings, whereas adulterated ebonite drilled in the same way will give shavings which are short, dusty, and a dirty grey colour, and will be reduced to dust when crumbled. A saw-cut should give a light brown dust; if the dust is greyish in colour the ebonite is impure.

[*We are indebted to Messrs. Siemens Bros. and Co., Ltd., Woolwich, for facilities afforded in connection with the photographs illustrating this article and the information contained therein.*]

RECENT INVENTIONS.

The following abstracts are prepared, with the permission of the Comptroller of H.M. Stationery Office, from Specifications obtainable at the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

Preventing Fading.

(No. 263,876.)

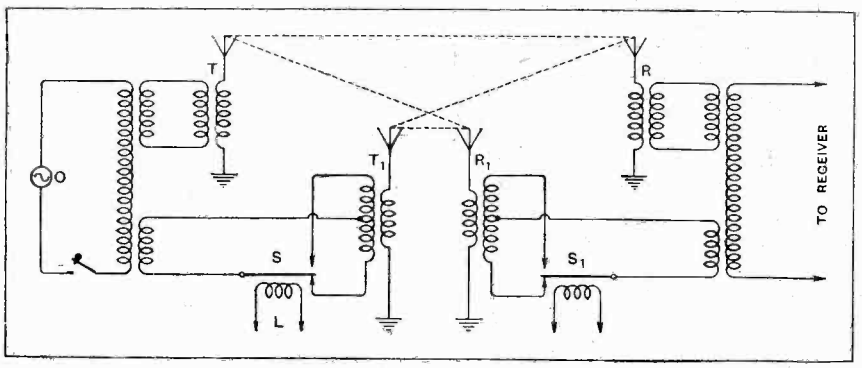
Convention date (U.S.A.): January 2nd, 1926.

Whilst no thoroughly comprehensive theory of the origin and causes of fading has so far been established, it has been proved by experiment that, in certain cases, short-wave signals fade differently at points separated by as little as 500 feet. In such instances the phase-relation of the waves between these points has been found to reverse several times in a minute. Whilst this is perhaps an extreme case at the distance stated, it is quite a common occurrence between points separated by several miles.

These observations indicate the possibility of avoiding fading effects by combining the signals received from two or more separated aerials in such a way as to be independent of the signal phase in space. For instance, if the phase-relationship is maintained, although each of the two aerials may at any given moment be producing strong signal voltages, the result of combining them in a common receiver may be zero, owing to the phase shift mentioned above. On the other hand, if the two voltages are combined independently of phase, signals would be heard at the common point as long as any signal voltage existed in either of the aerials.

As shown, two short-wave transmitting aerials T, T_1 are fed from a common high-frequency source O, the first through an ordinary coupling circuit, and the second through a tapped transformer comprising a switch S, which alternately connects the upper and lower coil sections in circuit. The switch S is operated through a relay coil L carrying a 60-cycle current, thus ensuring a periodic phase-reversal at that frequency.

A similar switch S_1 is inserted in one of the leads from the two distant aerials R, R_1 to the common receiving device. In this way fading effects due either to the environment of the transmitting aerials or to the atmospheric or Heaviside layer conditions encountered by the waves in their passage to the receiving point are eliminated or minimised. Patent issued to the Marconi Co.



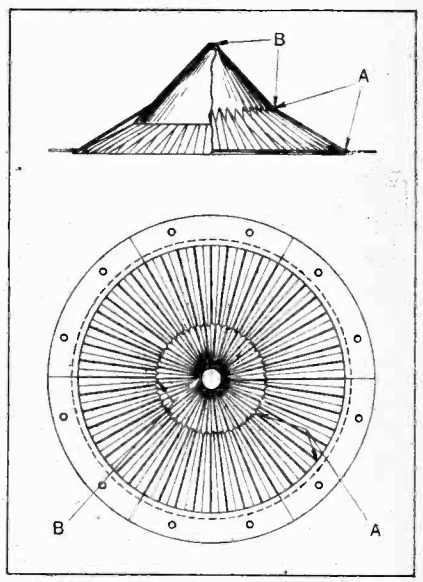
Short-wave system designed to overcome fading. (No. 263,876.)

Pleated Diaphragms.

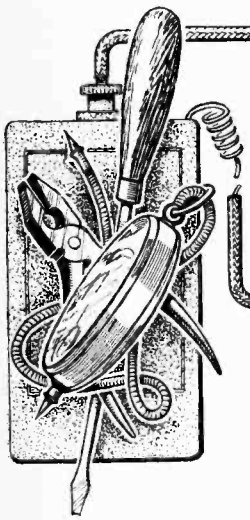
(No. 268,723.)

Convention date (U.S.A.): March 31st, 1926.

In order to secure a greater degree of stiffness whilst retaining the other desirable properties of a pleated diaphragm, the latter is made in two sections A, B. The first or outer portion, A, is of frustro-conical shape, made of paper or parchment and pleated in the ordinary way. The second or base portion, B, may be either pleated or plain, and is attached to the first by gluing. The result is that the diaphragm is stiffened as a whole, and vibrates with more of the characteristics of a plunger or piston than usual. Patent issued to the Gramophone Co.



Pleated conical diaphragms. (No. 268,723.)



PRACTICAL HINTS AND TIPS

A Section Mainly for the New Reader.

H.F. TRANSFORMER CONSTRUCTION.

IT is difficult to generalise on the subject of high-frequency transformers, but it is possible to offer a few suggestions which will hold good with almost any modern design.

In the first place, it is now generally accepted that the magnetic coupling between primary and secondary should be as close as possible, but at the same time no effort should be spared to reduce the capacity between these windings. Now, air has a lower capacity, or, more correctly, a lower dielectric constant, than any other insulator, and thus it is customary to use as little solid material as possible between the coils. In practice, they are generally spaced by strips which, if suitably arranged, make the fulfilment of this requirement a fairly easy matter. The inter-winding capacity is further reduced by choosing a very fine-gauge wire for the primary; resistance is not a serious matter in this case, as the winding is in series with the valve resistance, which is always very much greater.

Although the resistance of the primary is a matter of small importance, a large self-capacity in this coil is undesirable, and accordingly adjacent turns of the windings are usually spaced. It is, however, not always an easy matter to separate the turns of a long-wave coil, and in these cases it is convenient to use double cotton-covered wire (still of a fine gauge) in which the thickness of the covering may well be greater than that of the metal, giving the effect of a spaced winding.

The invariable rule is that the primary winding should be coupled to the low-potential end of the secondary (the end which is connected to the filament of the succeeding valve) and never to the high-potential end, which is joined to the grid. Insulation between primary and secondary should be of a high order; apart from the question of H.F. leakage, it must be remembered that the voltage of the H.T. battery is applied between the windings, and a breakdown will result in a short-circuit.

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SAFETY FIRST.

SHOULD further argument in favour of the adoption of the standard *Wireless World* method of interconnecting H.T. and L.T. batteries be necessary, it may be pointed out that, unless H.T. negative is joined to L.T. negative, there is a very considerable risk of burning out valves should a short-circuit be introduced between primary and secondary of the H.F. transformer windings.

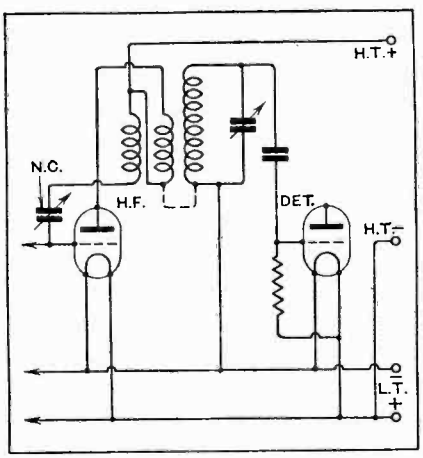

Fig. 1.—Showing possibility of burning out valves when L.T. + is connected to H.T.—

The reason for this will be evident if Fig. 1 is carefully studied. In this diagram a short-circuit is shown by dotted lines, and it will be seen that the circuit of the H.T. battery is completed through the valve filaments.

Admittedly, in this particular case the possibility of trouble could be avoided by returning the low-potential end of the tuned circuit to L.T. positive instead of L.T. negative, but this would hardly be practicable if the second valve were acting as a bottom bend detector or an H.F. amplifier instead of as a grid rectifier.

The only advantage accruing from the connection of H.T. negative to L.T. positive is that the voltage of the L.T. battery is added to that of the H.T. battery. There can be little doubt, however, that this comparatively small addition of at most six "free" volts is obtained only at the loss of additional complication and risk of accident.

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CRYSTAL DETECTORS WITH H.F. VALVES.

IT seems doubtful if the use of a crystal rectifier in conjunction with H.F. amplifying valves will ever attain any great degree of popularity, but it cannot be denied that the combination is one which appeals to a certain type of experimenter, and for which, moreover, it is an easy matter to make out a very excellent case. The subject is one which is too complex for adequate treatment in these notes, but we can consider one or two special cases in which crystal rectification offers a satisfactory solution of a particular problem.

From considerations of expense, a number of constructors limit themselves to a total of four valves; in-

deed, such a receiver is rightly regarded as sufficiently ambitious for the average amateur. Now it will be obvious that if two L.F. amplifiers—also rightly considered as essential for long-distance loud-speaker reception—are to be retained, together with valve detection, only one valve will be available for the function of high-frequency amplification, and it will not be possible to take advantage of the gain in selectivity obtainable from the filtering effect of a second H.F. stage.

By substituting a crystal detector, it will at once be obvious that two stages of amplification, both at high and low frequency, may be included without exceeding our arbitrary limit of four valves. At the same time, there is no reason why overall selectivity should not be comparable with that obtainable with valve detection, provided always that the valve-crystal coupling is suitably designed. From the point of view of selectivity and general flexibility, it is probable that H.F. voltages amplified by the valve (or valves) are best applied to the crystal through a transformer (which may be interchangeable) wound on the lines of those described from time to time in this journal in connection with all-wave receivers, with one important modification.

As an average crystal exerts a greater damping effect on the circuit across which it is connected than does a valve, it is essential that it should not be shunted across the whole of the transformer secondary winding; by joining it to a suitably chosen point, both signal strength and selectivity will actually be improved, and by still further reducing the number of turns in shunt selectivity will be still better, but this gain is at the expense of volume. No definite figures can be given, as the resistance of individual crystals varies considerably. The matter is one for experiment—indeed, it is particularly to the experimentally-minded that valve-crystal combinations most particularly appeal—but as a guide it may be stated that low-resistance rectifiers of the "ite" type should be connected across one-quarter of the total turns, and high-resistance crystals across one-half.

In spite of taking this precaution regarding the reduction of damping, it is doubtful if it is worth while using a transformer secondary of extremely low resistance; Litz wire is generally considered as being unnecessary, and the coil may be wound with a solid double-cotton-covered conductor. If crystal damping is sufficiently low it is essential to provide a neutralised high-frequency coupling, as indicated in Fig. 2, which shows the general circuit arrangement. It will be noticed that the rectified output from the crystal is applied to the first L.F. valve through a transformer; in the light of experience there seems to be no doubt that this is the most satisfactory plan, as the methods in which the rectifier is joined direct to the grid are generally lacking in stability.

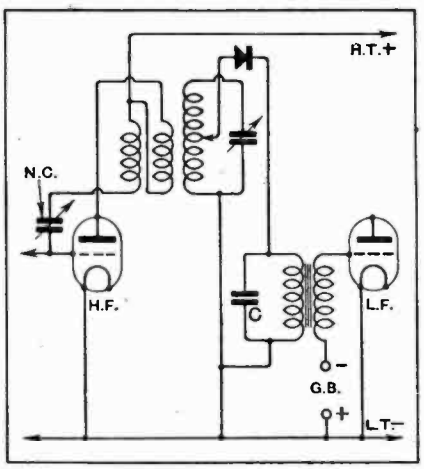

Fig. 2.—Using a crystal rectifier with high-efficiency H.F. amplification.

A second important advantage of the crystal rectifier is observed when a receiver is supplied with H.T. from the mains, and more particularly when filament current is derived from the same source. It is now widely recognised that a great many of the troubles encountered under these conditions have their origin in the detector valve, and it will be clear that if this is replaced by a rectifier which requires no direct connection with the mains, the source of trouble will disappear. The plan is strongly recommended to those who have been unable to obtain complete satisfaction from "mains" receivers.

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SELECTIVITY—TRUE AND FALSE.

THE user of a valve receiver must not be led into thinking, because the adjustment of his condenser is extremely critical when tuning-in a weak transmission with reaction adjusted to the verge of oscillation, that selectivity is of a high order. Even the crudest circuit arrangement will generally give apparent selectivity of this kind, but it may well be found that signals from a powerful transmitter at a distance of some five or ten miles may be heard over the whole tuning scale. The matter is due to the fact that the resonance curve of a circuit in which heavy losses are compensated by reaction has a sharp peak.

At first sight a modern set using low-resistance coils and a stage of H.F. amplification may appear to be inferior in selectivity, as the adjustment of individual condenser dials is not particularly critical. In such a receiver the overall resonance curve has a comparatively flat top, particularly when it is operated in a completely neutralised condition, and this accounts for a slight apparent flatness in tuning. Actually, the useful selectivity is greater than in a set using inefficient coils, as a powerful near-by transmitter may be eliminated at a shorter distance, and in the rare cases where mutual interference exists between two distant transmitters with a small wavelength difference, signals may be separated by a judicious use of that form of reaction obtainable by partial de-neutralisation.

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LEADING-IN WIRES RUN CLOSE TO WALLS.

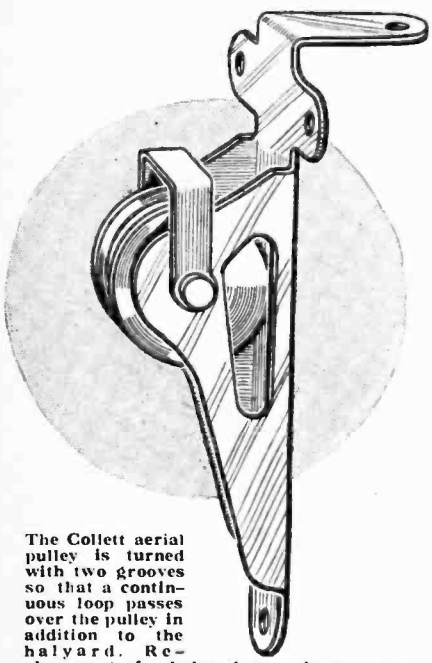
IT is bad practice to run a leading-in wire from an aerial along a wall for a long distance. Most walls are made of brick or plaster, which are poor dielectrics, and are liable to introduce serious losses in any wire bearing H.F. potentials which are brought close to them. When a long leading-in wire is unavoidable it should, if possible, be set at least a foot or two away from any wall it may pass. High-frequency currents cannot be efficiently conveyed by indefinite lengths of wire tacked round walls, ceilings and floors in the same way as bell-ringing or lighting currents, and a job which may be neatly executed from the ordinary wireman's point of view may be hopeless for radio-frequency purposes.

A Review of the Latest Products of the Manufacturers.

A USEFUL AERIAL PULLEY.

There is no recognised method of securing an aerial pulley to its mast, and it is customary to procure a galvanised iron pulley and bind it to the mast by means of several strands of aerial or galvanised iron wire. The aerial is usually elevated by a rope passing over the pulley, in which case should the halyard break it will be necessary in order to restore it to lower the mast.

A special aerial pulley is among the products of the S. H. Collett Manufacturing Co., 60, Pentonville Road, London, N.1. It consists of a pressed metal frame supporting an aluminium pulley fitted with a bridging piece to prevent the halyard riding out of the groove. The pulley is of novel design and is turned with two grooves so that a light cord can be run as a continuous loop through the pulley and used for raising the halyard so that when once the aerial is pulled taut the auxiliary continuous cord is not subjected to strain. The possibility of having to lower the mast to renew a broken halyard is thus avoided.



The Collett aerial pulley is turned with two grooves so that a continuous loop passes over the pulley in addition to the halyard. Replacement of a halyard thus becomes a simple matter and the necessity for lowering the mast is avoided.

The pulley is made of non-rusting material and is supplied complete with a 30ft. endless halyard.

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GLASS-BORING OUTFIT.

The attractive appearance produced by the use of a glass panel is generally appreciated, yet difficulty arises in regard to the making of the holes for securing the components. It is often inconvenient to prepare an exact drawing of the panel showing the precise requirements as to the size and location of the holes in order to pass the panel to a specialist in glass drilling. An article recently appeared in the pages of this journal giving practical details of a process for drilling glass, and readers will be interested to learn that a glass-boring outfit is available from Ernest H. Hill, Ltd., Broomhall Street, Sheffield. The outfit comprises five spear-pointed drills, three wheel-ended drills, and one dozen spare wheels and spindles, a small punch, a lubricating can, and a piece of camphor.

The glass panel is placed on a flat surface and the hole commenced with a wheel-ended cutter rotated by means of a brace and lubricated with a boring fluid consisting of a solution of camphor in turpentine. When the hole is about $\frac{3}{32}$in. through a spear-pointed drill is used to complete the hole, which is then enlarged from the reverse side. The process is not difficult, but care and patience are essential. It is stated that a $\frac{1}{4}$in. hole can be made in $\frac{1}{4}$in. plate glass in two to three minutes. For drilling ordinary sheet glass (thin window glass) the process is very much easier, and the outfit will be found useful for making a hole in a glass pane for fixing leading-in wires.

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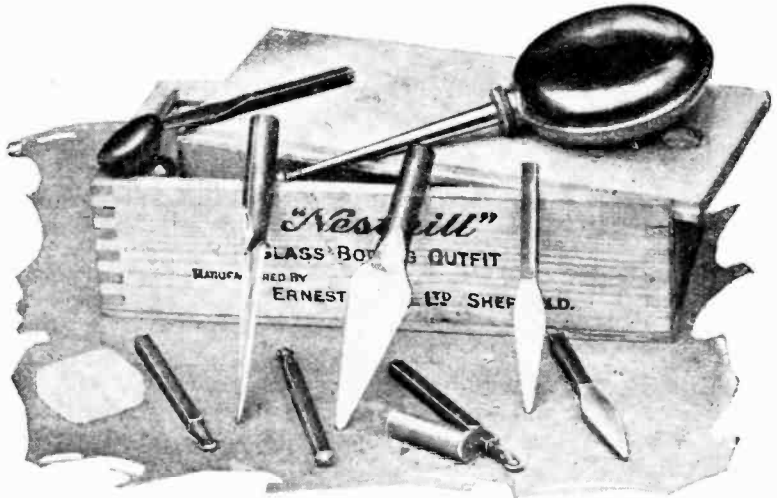
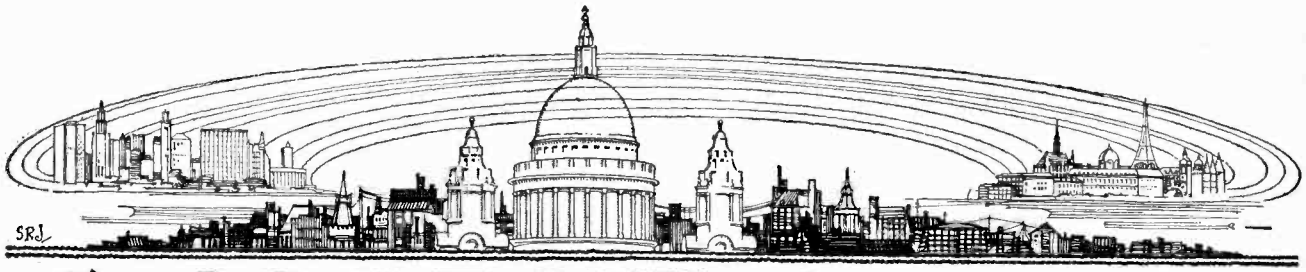
PORCELAIN PANELS.

Both aluminium and glass have to some extent replaced ebonite for the construction of instrument panels.

Recently the B. and J. Wireless Co., 2, Athelstane Mews, Stroud Green Road, London, N.4, introduced a new form of panel which will undoubtedly prove of great interest to the set builder. The material used resembles white tiling and is probably a form of glass very similar to the opal variety. The face is, of course, highly polished like glass, and is perfectly white. Instrument dials either of polished ebonite or dull black finished material give an exceedingly good appearance when mounted on this white glazed material, the dials standing out clearly, and the instrument has a clean appearance. Unlike ebonite, the smooth surface will not hold dust, and is, of course, easily cleaned. Holes are drilled in the same manner as is employed for drilling glass, and when a template or drawing shows the requirements in regard to holes it can be supplied ready drilled. The thickness of the panel is about $\frac{5}{16}$in.



The Nesthill glass-boring outfit.



CURRENT TOPICS

Events of the Week in Brief Review.

LICENCE FIGURES GROW.

Broadcasting licences in force at the end of July amounted to 2,306,285, marking an advance of over 7,000 on the previous month's total.

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HAMBURG-BUENOS AIRES TELEPHONY.

A permanent wireless telephony service will shortly be established between Hamburg and Buenos Aires. Successful tests have already been conducted between the two cities.

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SCAPEGOAT WIRELESS.

A feature of the widely reported "wireless death" at Newport last week, when a schoolboy wireless enthusiast was electrocuted through contact with the lighting mains, was the fact that the wireless set was in no way responsible for the tragedy.

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FIRE BRIGADE WIRELESS.

A wireless telephony system is being experimented with by the Berlin fire brigade. At present transmitters and receivers are installed at Berlin and Spandau, the object of the service being to enable headquarters to keep in close touch with outlying stations. A secret wavelength is employed to avoid interruption by experimenters and broadcasting stations.

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BROADCASTING AND NEWS COPYRIGHT.

A sign of the times in connection with the League of Nations Press Conference at Geneva last week was the introduction of broadcasting as a factor in the dissemination of copyright news. The conference was of the opinion that no information destined for publication by the Press or through broadcasting should be legally received by unauthorised persons for publication or use in any way for the purpose of distribution through the Press, through broadcasting, or in any similar manner.

It was held that the question of protecting news already published in the Press or through broadcasting was one for consideration in the respective countries concerned.

THEY ALSO SUFFER IN BELFAST.

"When it stops suddenly, the silence hits one like a pile-driver." A Belfast listener's description of the effect produced by a neighbour's loud-speaker.

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NORWEGIAN DEVELOPMENTS.

The Tyholt heights, near Trondhjem, Norway, will soon boast a broadcasting station. The same site has been chosen for a wireless telegraph station for communication with Great Britain.

ARMOURED CAR WIRELESS. The 23rd (London) Armoured Car Tank Corps demonstrated last week that wireless communication could be maintained between headquarters and a car such as the above.

MUSIC AND BACCHUS.

Whether wireless reception should be employed to beguile the time between drinks is the question which will be faced by the Midland licensing authorities at a meeting to be held at Birmingham in October. At present many applications to instal wireless receivers in public bars are refused.

A FOUR YEAR'S PENALTY.

A fine of £5 and costs, £2 2s., was imposed on a Leytonstone listener last week who admitted that he had operated a broadcast receiver without a licence for four years.

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NEW DANISH STATION.

A 7-kilowatt broadcasting station was opened last week at Kallundborg, in the north-west of Zeeland, by the Minister of Public Works and M. Chambellan Lerche, president of the Wireless Council. Kallundborg broadcasts daily on 1,153 metres.

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LATEST FORD JOKE ?

Pieces of classical music, selections by old-time fiddlers and a revival of American songs of a century ago, are to be transmitted by the American National Broadcasting Company under the auspices of the Ford Motor Company to advertise the new Ford car.

According to our New York correspondent this announcement has created a stir among radio dealers in view of Mr. Henry Ford's former objection to broadcasting as an advertisement medium.

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HIGH POWER BROADCASTING IN U.S.

The new 50kW. broadcasting station at Belmore, Long Island, which has been erected by the National Broadcasting Company, has just received an experimental licence issued by the Federal Radio Commission. We learn that tests are being conducted regularly on a frequency of 610 kilocycles, the call sign being 2XZ. The new transmitter will shortly replace the well-known WEAF 5kW. transmitter in New York City.

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RECIPROCAL EMPIRE BROADCASTING.

Amateur broadcasting to the Empire was inaugurated on Thursday last by Mr. Gerald Marcuse (2NM), of Caterham, who transmitted a programme of musical items on a wavelength of 32.5 metres. Mr. Marcuse informed *The Wireless World* that the delay in the hour of starting was due to the excellence of reception from Australia, the broadcasting station 2FC at Sydney sending out an excellent programme on 29.8 metres. Rather than upset reception 2NM delayed transmission.

PATENTS IN SOUTHERN IRELAND.

A new situation will be created by the passing of the Patents and Trade Marks Act in the Irish Free State. Previously British Patents and Trade Mark Registrations have covered the whole of Ireland, but when the new Patent Act is in force, they will automatically cease to function in Staorstal Eireann. It is necessary, therefore, for all holders of British Patents and Trade Marks desiring to retain protection in Southern Ireland to take out fresh Patents or Trade Marks there.

British Patents, however, granted before December 6th, 1921, will be continued upon the Irish register if a copy of the Patent is lodged in Ireland and renewal fees are paid as in England.

Messrs. Rayner and Co., 5, Chancery Lane, W.C.2, advise us that they will be glad to supply full information to enquiries free of charge.

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FIRST BRITISH WIRELESS BEACON.

New installations for the assistance of navigation, known as wireless beacons, are now under construction by Trinity House at various points around the English coast.

The first wireless beacon to be put into regular commission by Trinity House is situated at Round Island in the Scilly Islands. This set has a power of 500 watts and is operated on a wavelength of 1,000 metres, which is the specified wavelength for wireless beacon stations. Each beacon station is to have a special call sign, and that at Round Island is the letters GGG in morse code.

The beacon transmitter has been designed by the Marconi Company to the specifications of Trinity House, and the whole equipment is automatically controlled by a master clock for transmitting groups of I.C.W. signals at predetermined intervals.

The range of the station, assuming a normal ship's D/F receiver, is capable of giving accurate bearings up to a range of 70 to 100 miles. Under favourable conditions of atmospherics and jamming, this range will of course be increased.

ON THE MOVE. Inside the armoured car showing the operator in telephonic communication with headquarters.

TRADE NOTES.

Clix London Agency.

The Central London representation of "Clix" specialities has been entrusted to Mr. P. C. Curtis, late manager of Radio Components, Ltd. Communications should be addressed to Lectro Linx, Ltd., 254, Vauxhall Bridge Road, S.W.1.

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Cossor's "Radio Mail."

The acute problem of aerial congestion in large towns is approached in a drastic fashion in the current number of Cossor's "Radio Mail," in which directions are given for obtaining maximum results with an indoor aerial. In an article on accumulator charging service the dealer who contemplates opening an accumulator charging business is given useful advice: "Do the thing properly or not at all"—a sentiment with which the long-suffering public will heartily concur!

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A.T.M. Club House.

Broad Green Hall, a fine old Elizabethan mansion near Liverpool, has recently been opened as a club house and social centre for the sports and social organisation of the Automatic Telephone Manufacturing Co., Ltd. Among the amenities provided is the opportunity for broadcast reception, a fine four-valve set having been installed, serving Claritone loud-speakers in all the principal rooms. This can be individually controlled according to requirements, and can provide dance music in the music-room as an alternative to piano or orchestra.

NEWS FROM THE CLUBS.

Kite Aerial Experiments.

A 400ft. aerial composed of wire attached to a kite was successfully used for the reception of broadcast programmes from Dublin, Manchester, and Daventry by members of the Wireless Society of Ireland on Saturday, August 20th. A party of optimists had ventured out to Ballycorus lead mine for a picnic, and were well rewarded for their pains, the weather being excellent. After the kite experiments referred to transmission and reception tests on the 45-metre wave were effected on the Society's portable station 13B installed on the hilltop above the lead mine, some 10 miles from Dublin.

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Where the Kite Failed.

Successful two-way communication was established and maintained successively with G6WN (London), Mr. W. Bryan Bates (GW15C) at Ashbourne, County Meath, and Mr. J. P. Campbell (GW14B) at Sutton, County Dublin; aerials were suspended from the old chimney of the mine. The kite aerial was also employed for transmission and reception, but, although effective, it brought in atmospherics rather too strongly.

The Society also carried out tests from 13B on the hill of Howth to the north of Dublin Bay on September 3rd. Reports of signals from 13B will be very welcome.

Hon. secretary, Mr. H. Hodgens, 12, Trinity Street, Dublin.

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A "Schnell" Short-wave Set.

In view of the interest now shown in short-wave broadcasting, it was not surprising that Mr. W. Gartland's lecture and demonstration on an efficient short-wave receiver at the last meeting of the North Middlesex Wireless Club received a full measure of appreciation. The lecturer outlined the circuit, a modified "Schnell." Commercial coils of the plug-in type were used, being held in position by celluloid strips. A four-turn coil was used in the grid circuit and two-turns as reaction coil. The aerial was coupled by a single turn, not earthed, to the grid end of the former, the range with these coils being between 16 and 45 metres. It was found that a valve of about 10,000 ohms A.C. resistance gave the best results.

Mr. Gartland enumerated several traps for the unwary in short-wave work. He deprecated the use of long leads of any kind, as these produced blank spots in the tuning scale owing to their resonant properties. Battery eliminators were quite useless. He emphasised the need for low-loss construction.

Hon. secretary, Mr. H. A. Green, 100, Pellatt Grove, Wood Green, N.22.

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Western Metropolitan Social Gathering.

A Social Meeting of the Western Metropolitan group of radio societies is to take place at Sudbury on Sunday next, September 11th. The Sports Committee of Messrs. Lyons and Co. have kindly lent their ground and ballroom, situated one minute's walk from Sudbury District Railway Station.

The festivities will begin at 2.0 p.m. with an American tennis tournament to be followed at 4.0 p.m. by a thé dansant. A competition will be held for the best home-made portable set.

Admission will be by ticket only, obtainable from Lt.-Col. H. A. Scarlett, D.S.O., 357a, Finchley Road, N.W.3.

The FOUR-ELECTRODE VALVE and better Selectivity

An Experimental Arrangement Using Very Low H.T.

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

IT is probable that many readers who delight in trying out new circuits and ideas have wanted to experiment with four-electrode valves, which are just beginning to receive quite a lot of attention, but perhaps they have not wanted to plunge straight away into the construction of a two- or three-valve set until they have mastered the essential differences between four and the ordinary three-electrode valves.

Putting it quite briefly, one of the chief advantages of the four-electrode valve is that it can be made, by suitable design, to function at least as efficiently as a three-electrode on very much lower H.T. voltage than is necessary for the latter. Another advantage of the four-electrode valve is that it can be made to have a very high amplification factor with a comparatively low internal A.C. resistance—much lower than a three-electrode valve of corresponding amplification factor would have, so that, for a given H.T. supply, much larger amplification is obtainable with a suitable four-electrode valve.

In this article the writer does not propose to go into the theory of the four-electrode valve, but simply intends to describe the construction of a single valve set which is equally suitable for short or long wavelengths (provided the tuning coil is changed, of course), and in which sufficient space has been left on the baseboard for the addition of one or even two stages of L.F. amplification if it is desired later to operate a loud-speaker.

The arrangement of components is quite elastic, and as the set is intended for experimental work, more controls are arranged for than are absolutely necessary. The circuit makes use of centre-tapped coils for tuning purposes, so that only one coil per range is necessary—*i.e.*, two coils will cover the 300-500 and Daventry wavebands. It is not at all essential in this circuit for the tapping point to be exactly at the electrical centre of the coil, so that home-made coils tapped at the centre turn will do equally well.

The Circuit.

There are one or two interesting points about the complete circuit (shown in Fig. 1). It may here be said that if the outer grid of the valve and the connection to the terminal marked +G were left out, the circuit would then be completely suitable for a three-electrode valve, although, of course, much higher H.T. values would have to be used.

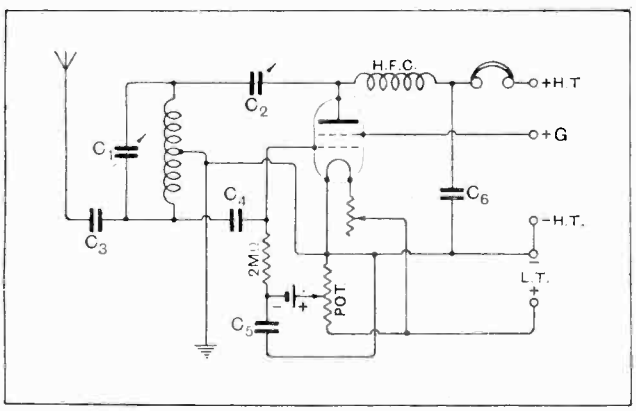


Fig. 1.—The circuit diagram. The values of the various condensers are given in the text. The coils used in the set are the Gambrell centre-tapped ones.

The next point of interest is the use of both a potentiometer and a 1½-volt cell in order to control the mean grid potential. With this arrangement it is possible to change over from the anode bend to leaky grid rectification simply by rotating the potentiometer knob. The explanation of how this

The Four-Electrode Valve.

works is really quite simple. When the potentiometer slider is over on to the side of the potentiometer connected to negative L.T., the grid of the valve is kept 1½ volts more negative, due to the grid bias cell. Thus, for signals up to about 1 volt (which is quite a strong signal) the grid never gets positive, so that grid current does not flow, and therefore any rectification that takes place is due to the curvature of the plate current—grid volts characteristic, *i.e.*, the valve is behaving as an anode bend rectifier.

On the other hand, when the potentiometer slider is over on the positive side, which corresponds to +2, +4, or +6 volts, according to the filament voltage of the valve, and in any case is more than +1½ volt, the grid, or rather the end of the grid leak, will always be positive, so that most of the rectification will be of the leaky grid variety.

In this way, by using intermediate points on the potentiometer, the most sensitive conditions for a given signal may be found. A filament resistance is also provided for, as critical adjustment of filament temperature is quite often found helpful.

Going round the circuit in detail, C_1 is the main tuning condenser, about 0.0003 to 0.0005 mfd. maximum; C_2 is the reaction condenser, about 0.0003 mfd. maximum; C_3 is the aerial coupling condenser, which is used to reduce the damping effect of the aerial on the tuning, and for 300-2,000 metres may be about 0.0003 mfd. mica dielectric, but for short wave work (*circa* 45 metres) it is advisable to use a tiny variable condenser, such as a Gambrell Neutrovernia, in this position, which may be varied to get over aerial harmonic absorption troubles (*i.e.*, dead spots where the valve will not oscillate). With this alteration, the set works well on the short waves over the whole range of the tuning condenser.

C_4 is a grid condenser of about 0.0003 mfd.; C_5 is not absolutely necessary, but is useful where an old grid cell is employed, and it may have any value from about 0.002 mfd. upwards, and C_6 is a small condenser of about 0.0001 to 0.0002 mfd., which is rather desirable when phones are being used, so as to tie down definitely the H.F. potential of the end of the choke connected to the phones and so prevent the trailing leads of the latter from upsetting the tuning. It is almost essential that C_1 should have a slow motion arrangement, and desirable, though not essential, that C_2 should have a similar arrangement. In the set described in this article, both C_1 and C_2 are Ormond condensers with Ormond slow-motion dials, but, of course, any other well-made condensers will do equally well.

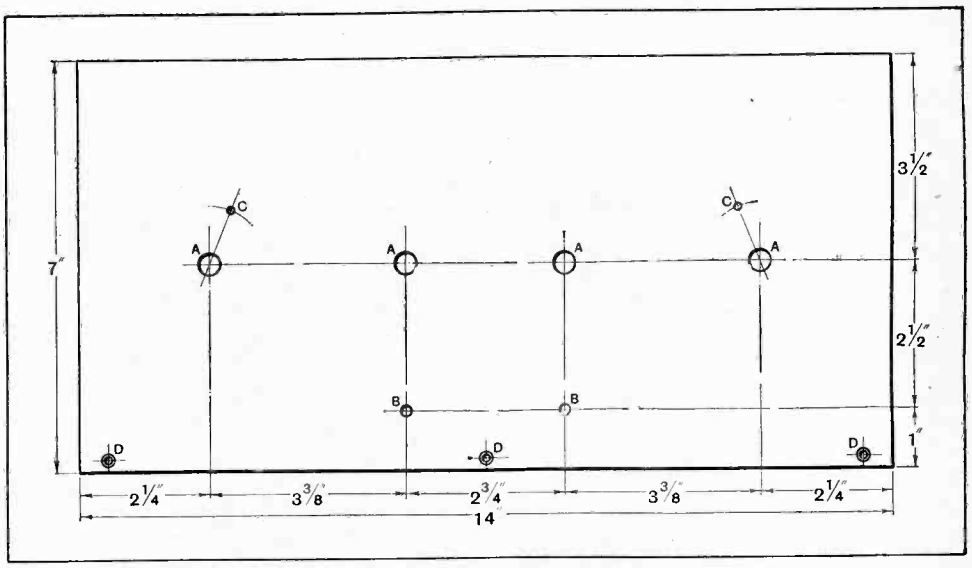


Fig. 2.—Panel dimensions. A = 3/8in. dia. holes; B = 3/16in. dia. holes; C = 1/8in. dia. holes; D = 1/8in. dia. holes, countersunk for No. 4 wood screws. The "C" holes are for securing the Ormond dials, and should be drilled at 22½° to vertical axis at 1in. radius.

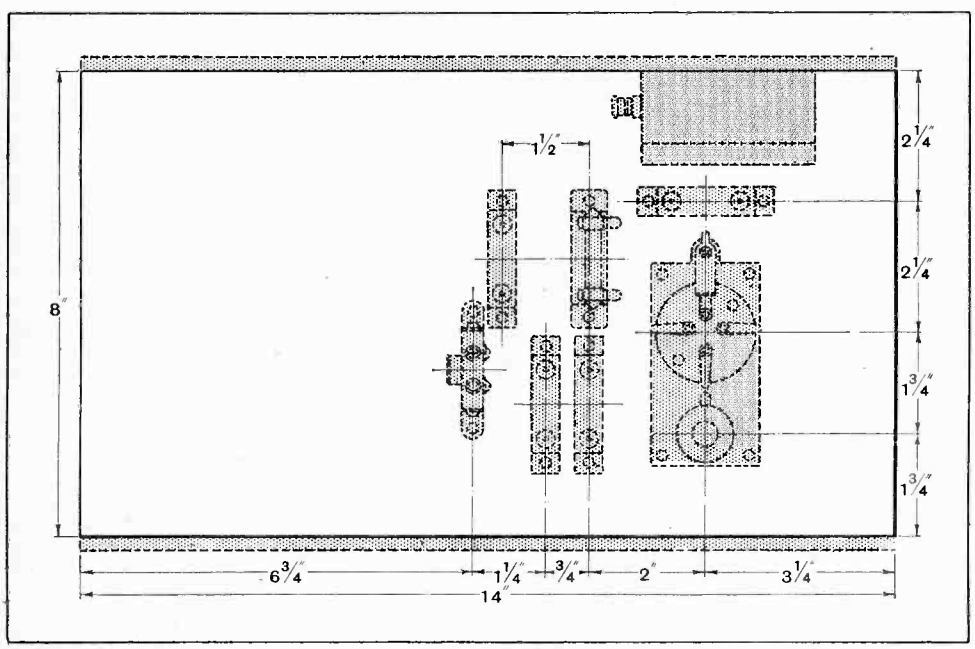


Fig. 3.—Showing the layout of the components on the baseboard. Note that room has been left for the later addition of one or two stages of L.F. amplification.

The Four-Electrode Valve.

LIST OF PARTS.

1 Ebonite panel, 14in. × 7in.
1 Baseboard, 14in. × 8in.
1 Centre-tapped coil holder (Gambrell Bros.).
Centre-tapped coils, a/2, B1 and E1 (Gambrell Bros.).
1 Variable condenser, low loss straight line, 0·0003 mfd. (Ormond).
1 Variable condenser, low loss straight line, 0·0005 mfd. (Ormond).
2 Slow-motion dual indicating dials (Ormond).
1 "MH" filament resistance, 30 ohms (McMichael, Ltd.).
1 "MH" 400 ohm Potentiometer (McMichael, Ltd.).
1 H.F. choke (R.I and Varley, Ltd.).
1 "Magnum" valve holder (Burne-Jones & Co.).
1 "Dumetohm" grid leak, 2 meg. (Dubilier).
1 "Dumetohm" holder (Dubilier).
2 Fixed condensers, No. 620 type, 0·0003 mfd. (Dubilier).
1 Fixed condenser, No. 620 type, 0·0002 mfd. (Dubilier).
1 Fixed condenser, No. 620 type, 0·005 mfd. (Dubilier).
1 "T" square type 1½ v. cell (Siemens).
9 "Eelex" terminals (J. J. Eastick & Sons, Ltd.).
Wire, screws, etc., etc.

Approximate cost - £5 0 0

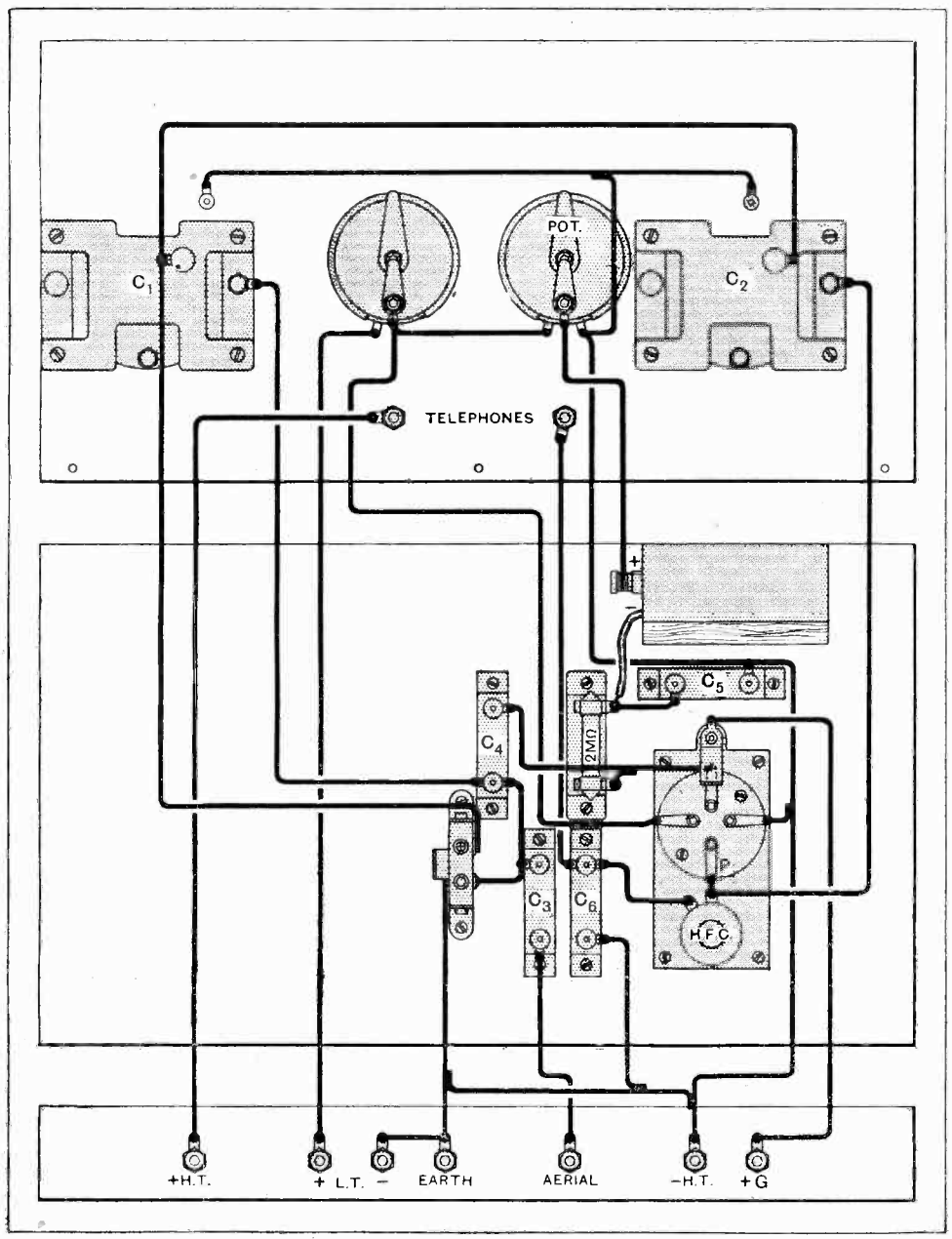


Fig. 4.—The wiring diagram. Components are lettered to correspond to those in Fig. 1.

The Valve Holder.

The four-electrode valve, having one more electrode than the ordinary valve, has, therefore, to have some scheme for making connection to this extra electrode. What is usually done is to bring this lead out to a terminal on the side of the valve cap, and in the valves recommended for the set—the Aneloy A.P. valves—this terminal is placed in the cap above the ordinary grid leg. To connect to this terminal a piece of flexible wire may be used, but a better arrangement is to use a piece of springy brass or phosphor bronze with a U-shaped slot cut in it and mounted on a little ebonite pillar of the right height. The photographs of the set show this arrangement, which is extremely useful because it enables the valve to be plugged-in in the usual way, thus enabling a rapid change of valve to be made for experimental work.

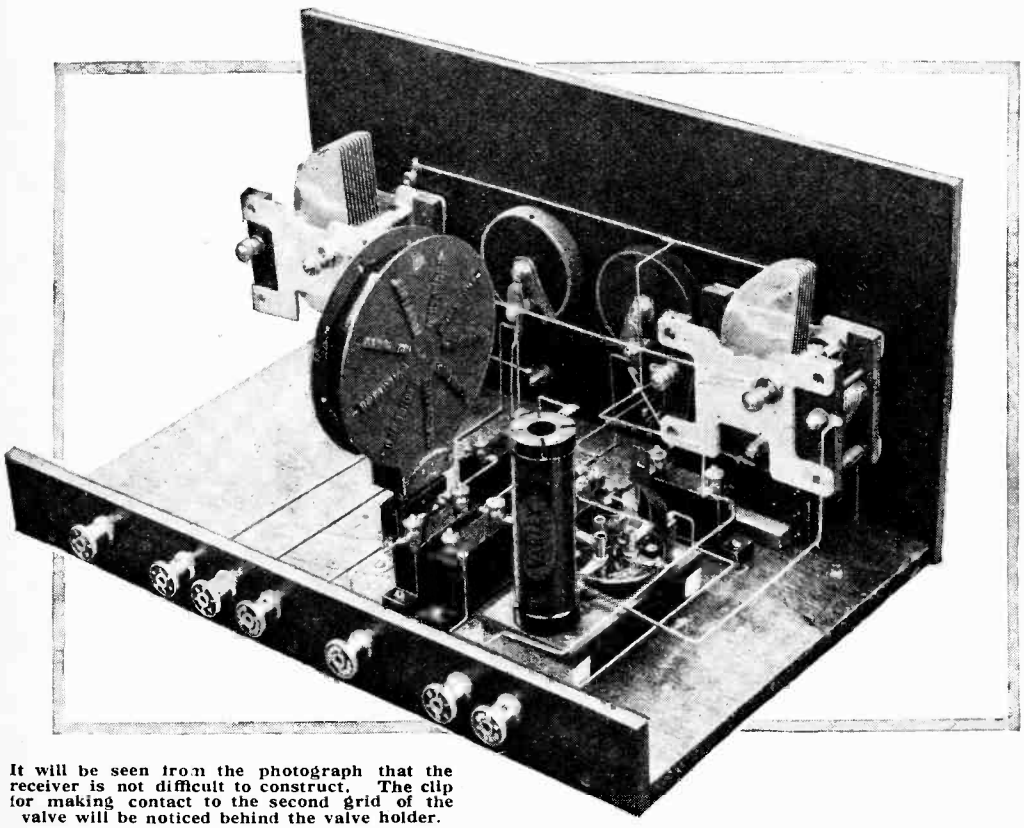
The Panel.

The chief dimensions and the positions of the requisite holes in the panel are shown in Fig. 2. The Ormond dials used are made of aluminium, and serve very nicely as screens to eliminate hand capacity effects, provided they are suitably earthed. Both sides of

The Four-Electrode Valve.

the condenser are "live," so that the provision of some sort of screen is essential. If the condensers are arranged as shown in the photograph, the dial fixing screws will be found to be quite clear of the condensers, and in quite get-at-able positions for wiring.

The Ormond dials are tilted at 22½° in the set illustrated —this is quite a minor point, and need not be done if not desired, although if they are used in a normal vertical position it would be advisable to use a longer panel.



It will be seen from the photograph that the receiver is not difficult to construct. The clip for making contact to the second grid of the valve will be noticed behind the valve holder.

The construction of the rest of the set should not be difficult, with the aid of the baseboard layout and wiring diagram and the photographs.

The Valve.

Almost any four-electrode valve will work in this circuit, though, of course, some will give much better results than others. If the reader has not a suitable valve, he is strongly advised to obtain one of the Aneloy A.P. valves —if only for the facts that the filament consumption is so low (only 0.1 amp. at 4 volts) and that these are the only makers supplying a complete range of four-electrode valves, from H.F. to R.C. and L.F. types, which makes the addition of one or more stages of amplification a comparatively simple matter. The most suitable valve for this set as described is the A.P. 412 H.F., in which the *outer* grid is connected to the terminal, and which has an amplification factor of about 28. This valve works very well indeed on a nine-volt grid bias battery—+9 on plate and about +6 to the outer grid (+G terminal on set). If a large aerial is being used it may be found desirable to increase these values somewhat.

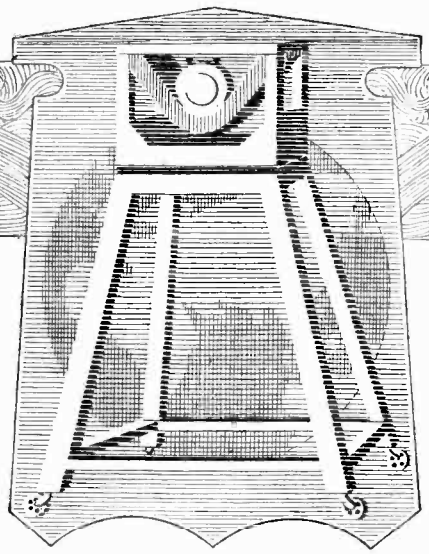
The A.P. 412 R.C. valve is also suitable—it has an amplification factor of about 36 to 38, and will want rather higher voltages for its most efficient functioning—about 10-15 volts on +G and either about +4 to +6 on plate or +20-30 volts. It is very interesting to experiment with +H.T. and +G voltages on both weak and strong signals and to find their effect on ease of oscillation.

One thing that should be noticed with this circuit is the beautifully smooth reaction control that is obtained —there is no "banging" into oscillation and out again, and it is even difficult to tell when the set is oscillating unless a station is being received—to tell, that is, without touching the aerial terminal to obtain the familiar double click. The tuning should be found to be extremely sharp, and any distant station *must* be exactly tuned when reaction is used near its limit, or distortion will result. This tuning is quite easy with the slow-motion dials.

The set described in this article was tested at 30 miles from 2LO on an average aerial about 20ft. high, and over a dozen stations at quite reasonable telephone strength were tuned in after dusk in the course of an evening, using an A.P. 412 H.F. valve and a 9-volt grid bias battery as H.T., and the set as a whole was found very nice indeed to handle.

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.

BROADCAST BREVITIES



NEWS FROM ALL QUARTERS.

By Our Special Correspondent.

St. Leger Broadcast.—B.B.C. at the Show.—Capturing the "Casual."—Birmingham and 5GB.—A New Disease.

Broadcasting the St. Leger.

To-day's running commentary on the St. Leger will be relayed from Doncaster to 2LO and 5XX. The commentators will be Mr. Geoffrey Gilbey and Mr. Q. Gilbey. The former will be remembered by listeners for his commentary on the Derby last June.

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B.B.C. at the Exhibition.

Last year's display of the B.B.C. at the National Radio Exhibition was generally voted a success. Separated from the mysteries of broadcasting by a mere pane of glass, we saw uncles, aunts, and other artists in the very act of disporting themselves before the microphone. The sight was inspiring, and we returned to our receivers filled with new confidence. The same can hardly be said of the Corporation's show at the Ideal Home Exhibition last March. Here the show-case element predominated without the showmanship, and the general public failed to "bite."

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Changed Tactics.

This time something more exciting is promised. Mr. J. C. Clarke, who is organising the B.B.C. exhibit at the National Radio Exhibition, tells me that the big effort this year is to capture the casual visitor, and to this end several novelties will be staged. It is felt, however, that even the tyro in broadcasting matters has a fair notion of what goes on in the studio, and for this reason it is considered unnecessary to install a full-size studio in use.

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Transmitters on View.

To *Wireless World* readers the most interesting exhibits will be the two transmitters. One is a "Q" type telephony set designed and constructed by the Marconi Company. It is rated as a 6kW. transmitter with a Geneva rating (*i.e.*, power in the aerial) of 1kW The instrument itself consists of four panels, viz., the rectifier, drive, oscillator, and modulator. A motor alternator, which is driven from the mains, supplies the main step-up transformer with a single-phase power at 500 volts and a frequency of 300 cycles. This voltage is stepped up by the transformers to about 10,000 and passed on to the rectifier panel, where full wave rectification takes place. Ordinary choke control modulation is employed.

Low Power Modulation.

The other transmitter which will be on view is a Standard Telephone and Cables instrument with a Geneva rating of 5kW. The circuit is different from that in the Marconi set. H.F. magnification is adopted, *i.e.*, modulation is carried out at low power (as at 5GB), and the modulated carrier wave is then amplified by successive power stages. The transmitter comprises six units, viz., A.C. power unit, D.C. power unit, oscillator-modulator, rectifier, power amplifier, and the tuner.

The power supply is obtained direct from a 1,600-volt generator, while the 10,000-volt supply for the power amplifier is provided by a three-phase half rectifier.

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Some Side-shows.

Besides the transmitters, we shall have an opportunity of inspecting a large-size model of the London control room complete with its amplifiers, "S.B." board, corrector desk, and checking receivers. And last, but not least, there will be the special section designed to titillate the visitor who possesses a thirst for statistics and for information as to the way the staff spends its time at Savoy Hill.

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Novelties.

A number of intriguing devices will acquaint the visitor with, among other things, the growth in the number of licences from 1923 to 1927, the mechanism of the "S.B." network, the sequence of events in a boat race broadcast, and other details well worth a little study.

I understand that the B.B.C. show will occupy the whole of the gallery on the north side of the hall.

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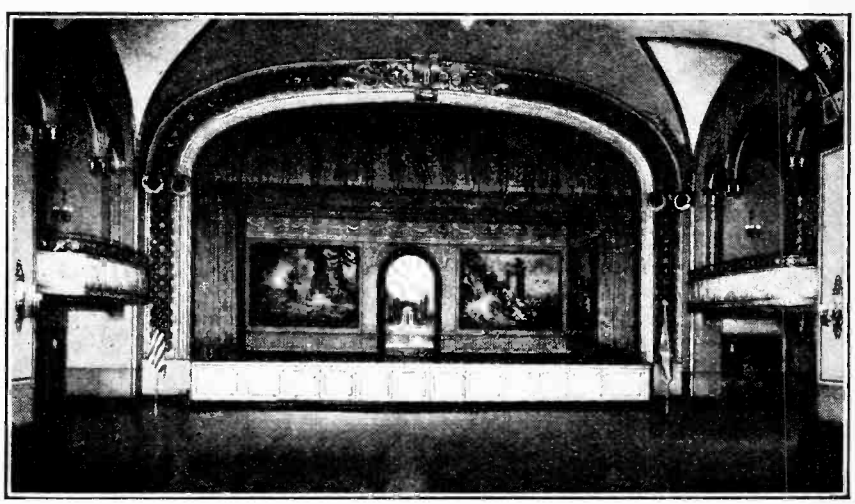
Birmingham and 5GB.

It is still rather early for a conclusive discussion on the merits of 5GB. Praise of the transmissions has come from unexpected quarters, while protests



THE WIRELESS HOTEL. Every room in the Hotel Statler, Boston, U.S.A., is provided with a wireless point so that guests have broadcast programmes "on tap." This picture shows the ballroom stage, which is permanently equipped with valve amplifiers. Note the loud-speakers.

have arrived, not unexpectedly, from Birmingham, which has lost its local station.

On enquiry at Savoy Hill I was informed that the B.B.C. are still conducting tests on the signal strength of 5GB at varying distances, so that all reports received at headquarters are welcomed.

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What Reports Show.

The reports already received indicate that 5GB is not received so strongly in certain directions as in others. Listeners who compare the strength of 5GB with that of 5XX should remember, of course, the different characteristics of the long and medium wavelengths. Generally speaking, in most directions 5GB is slightly stronger than 5XX up to distances of seventy miles from the transmitter. Thereafter, owing to the more rapid attenuation effect on the medium as compared with the long wave, 5XX asserts its superiority.

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Have You Got the Disease?

The newest disease (and there are so many to choose from in this enlightened age) is in need of a name. I suggest Daventritis.

Persons most susceptible to the complaint are those in possession of valve sets. The period of onset is marked by a feverish desire to hear what 5GB is doing, or, if the victim is listening to 5GB, what 2LO is doing. The course of the disease is rapid. In a very short time the victim is unable to concentrate on either station for more than a minute, in case he should be missing something from the other. An awkward complication frequently accompanying the malady is swollen wrist, due to the continual operation of the condenser dial.

A friend of mine spends his evening oscillating between 2LO and 5GB at nearly audio frequency. What will happen to the poor wretch when the other five regional stations begin?

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"Madame Butterfly."

On September 15th Puccini's opera, "Madame Butterfly," will be heard by listeners to 5GB. The Wireless Symphony Orchestra will be conducted by Percy Pitt, while Miriam Licette will play the name part, with Dorothy Helmrich as Zuyuki, Vivienne Chatterton as Kate Pinkerton, Parry Jones as Lieut. B. F. Pinkerton, Dennis Noble as Sharples, Sydney Russell as Goro, Bernard Ross as Prince Yamadon and The Bonze. The Wireless Chorus will be under the direction of Stanford Robinson.

o o o o

Talks for Schools.

The B.B.C. has just issued the Programme and Syllabus of Transmissions to Schools. The Syllabus covers the transmissions from all stations for the Christmas Term, September 23rd to December 16th, 1927, and gives a provisional programme for the coming school year. An effort is being made to adapt the lessons still more to the special needs of the medium, and to effect a closer co-operation between school teachers and their colleagues at the microphone.

Among the well-known names in the Syllabus are those of Sir Walford Davies, Monsieur Stephan, and Professor Noel Baker.

Six concerts, given to audiences of L.C.C. school children in various district halls, will be broadcast, and, alternating with the concerts, six plays by a representative company of Old Vic players.

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At the "Proms."

There is only one opinion, at the moment, regarding the success of the Promenade Concerts. The success is immense. Every night sees eager crowds at Langham Place, whether the programme be Wagner, Beethoven, or a bit of everything. Attendances on "slack" nights are 25 per cent. greater than in the best nights in 1926.

There must be something in this broadcasting which everybody talks about with such enthusiasm!

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"Proms" to Listen For.

Promenade concerts to be broadcast from the Queen's Hall in the near future include: September 2nd: London, Newcastle, Aberdeen, Belfast, Dundee, Edinburgh, Hull, Leeds-Bradford, Liverpool, Nottingham, Plymouth, and Sheffield. September 3rd: Glasgow. September 5th: Manchester. September 6th: Daventry experimental station, Bournemouth, Glasgow, and Leeds-Bradford. September 7th: Sheffield. September 8th: London, Newcastle, Belfast, Dundee, Edinburgh, Hull, Nottingham, Plymouth, and Stoke-on-Trent. September 9th: Daventry experimental station, Bournemouth, Cardiff, Aberdeen, Liverpool, and Swansea.

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Myra Hess.

Myra Hess will give her second pianoforte recital from 2LO on September 12th, when she will play items by Schumann and Chopin.

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Broadcasting the League of Nations.

The proceedings of the Eighth Assembly of the League of Nations at Geneva are being relayed daily by the Ecole Supérieure Station, Paris The transmissions begin at 10 a.m. and 3 p.m. Ecole Supérieure operates on a wavelength of 447.8 metres.

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Harpsichord and Clavichord.

A lecture on old keyboard instruments will be broadcast from 2LO on September 14th by Philip B. James. Miss E. Wilkinson will give illustrations on the harpsichord and clavichord.

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A Henry Arthur Jones Play.

"The Liars," an original comedy in four acts, by Henry Arthur Jones, will be heard by listeners to London on September 21st.

FUTURE FEATURES.

London & Daventry (5XX).

SEPTEMBER 11TH.—Military Band and Vocal Concert.
SEPTEMBER 12TH.—Opening Performance of Pavlova Ballet Season, "Don Quixote."
SEPTEMBER 13TH.—Emilio Colombo's Orchestra.
SEPTEMBER 14TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.
SEPTEMBER 15TH.—"Early Birds," a sketch in one act by Roland Pertwee.
SEPTEMBER 16TH.—"Madame Butterfly," a Japanese tragedy, music by Puccini.
SEPTEMBER 17TH.—Variety Programme.

Daventry (5GB), experimental.

SEPTEMBER 11TH.—Gems of Oratorio.
SEPTEMBER 12TH.—Worcestershire Concert.
SEPTEMBER 13TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.
SEPTEMBER 14TH.—"Ranee," a musical comedy.
SEPTEMBER 15TH.—"Madame Butterfly," a Japanese tragedy, music by Puccini.
SEPTEMBER 16TH.—"Captain Cook and the Widow," a comedy by Stuart Ready.
SEPTEMBER 17TH.—Light Orchestral Concert.

Bournemouth.

SEPTEMBER 12TH.—A Shakespearean Programme.
SEPTEMBER 17TH.—Concert Party.

Cardiff.

SEPTEMBER 15TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.
SEPTEMBER 17TH.—The Blacksmith's Programme, by a Blacksmith.

Manchester.

SEPTEMBER 12TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.
SEPTEMBER 17TH.—"Highways and Byways," a Ramblers' Programme.

Newcastle.

SEPTEMBER 14TH.—"X-Q, a Night of the Trojan War," a play in one act by John Drinkwater.

Glasgow.

SEPTEMBER 13TH.—Band Programme. "A Trip to the Isle of Man."
SEPTEMBER 15TH.—"Heroes and Heroines," a musical programme.

Aberdeen.

SEPTEMBER 15TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.
SEPTEMBER 16TH.—Gaelic Songs sung by Mary Orr.

Belfast.

SEPTEMBER 13TH.—A Musical Crossword.

THE NEW SCREENED VALVE.

Circuit Calculations for Tuned Anode Coupling.

By N. W. McLACHLAN, D.Sc., M.I.E.E.

(*Concluded from page 263 of previous issue.*)

HAVING discovered that the screened valve is no aristocrat, but an ordinary being with a very small capacity, a large magnification factor and high resistance, we proceed to see what happens when it is used in conjunction with our old and familiar friend the tuned anode. The equivalent simple circuit of a tuned anode in which we neglect feed back is shown in Fig. 9. Here we have a fictitious alternator in series with the A.C. internal valve resistance and the tuned anode or inductance-condenser circuit.

In practice we want to get the voltage across the LC circuit as large as possible. Now when the LC circuit is tuned to resonance it can be replaced by a dynamic resistance (where there is an A.C. but not a D.C. voltage drop) whose value is given by

$$\frac{\text{inductance}}{\text{capacity} \times \text{resistance of coil}}.$$

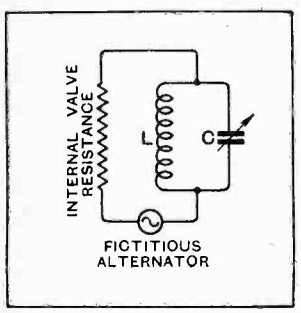

Fig. 9.—Simplified equivalent circuit of tuned anode with screened or three-electrode valve.

Thus if the major part of the alternator voltage is to be expended on the tuned circuit, its dynamic resistance should be large. This means a large coil inductance and a small coil resistance. The reader will immediately say that he wants a "low-loss" coil, and we shall see very soon whether his conclusion is justified.

If we use a low-loss coil having an inductance of 250 microhenries and a resistance of 3 ohms on the wavelength of 2LO we find that its dynamic resistance is about 5.5×10^5 ohms, which is about twice the valve resistance with a grid bias of -0.5 volts. The amplification from the tuned anode with this coil is about 58. For stability at 361 metres this amplification is rather on the high side. If now we use a coil with 9 ohms resistance the amplification is about 42, which is perhaps slightly too high, but more nearly the thing for stability. Although the coil resistance has been increased 200 per cent. the magnification has only been reduced 30 per cent. As a contrast to this we can take a D.E.3 three-electrode valve with an internal resistance of only 22,000 ohms. The possible magnifications for coil resistances of 3 and 9 ohms are given in Table I. Here we have a drop of only 7 per cent. arising from an increase in coil resistance of 200 per cent.

TABLE I.

Coil resistance. R ohms.	Possible magnification. (Per cent.)	Loss in magnification.
3	96	—
9	89	7 per cent.

Inductance = 250 microhenries. Capacity = 150 $\mu\mu$F.
D.E.3 valve. Wavelength = 361 metres.

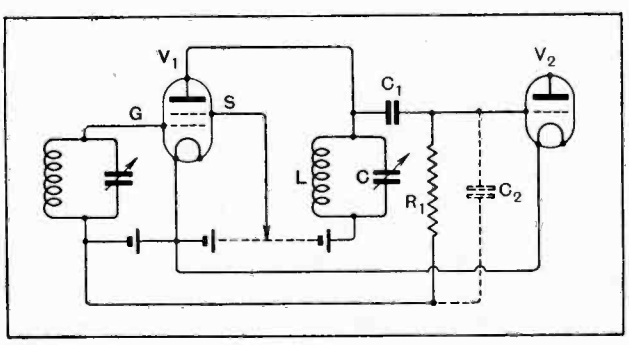

Fig. 10.—Showing connection of tuned anode with screened valve V_1. S is the screen, G the control grid, C_1 the coupling condenser, R_1 grid leak, C_2 grid-filament capacity.

This can be explained by the aid of Fig. 11. The circuit of Fig. 9 can be regarded as equivalent to a tuned LC circuit with a resistance across the condenser equal to the internal resistance of the valve. This may perhaps be clearer if we imagine the alternator in Fig. 9 to stop suddenly. The LC circuit will still oscillate, but the internal valve resistance is connected across it and acts as a leak on condenser C, which causes the oscillation to die away (Figs. 9 and 11). If the valve resistance were zero the condenser would be short-circuited. In practice, where the resistance is not zero the condenser is partially short-circuited, and it must be evident that the larger the valve resistance the less current will pass through it, and the smaller will be the short circuiting or leak action on the condenser. Thus the damping of the tuned circuit gets less as the valve resistance gets bigger. Now a resistance of 22,000 ohms (three-electrode valve) is a far greater drain on the condenser than one of 1.2×10^5 ohms, which we get with a screened valve. Thus the virtue of a low-loss coil is swamped by the vice of the low-resistance three-electrode valve. A screened valve, on the other hand, is not so greedy, and therefore exerts less damping, because it drains away less current from the condenser. Nevertheless, if the valve resistance is less than the dynamic resistance of the tuned circuit the gain in using low-loss coils with a screened valve is hardly worth the extra cost (apart from the possibility of oscillation due to feed back by virtue of low damping).

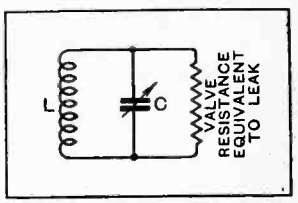

Fig. 11.—Illustrating the damping action of the valve on the tuned circuit.

In an actual receiver we we have to cope with additional damping due to dielectric losses in neighbouring insulators. The damping is increased if the

The New Screened Valve.—

grid leak to the next valve is too low because it is virtually across the coil. In this case the grid leak is in parallel with the valve resistance. Where the following valve is a grid leak detector the damping is still greater, though as an off-set this damping makes for stable operation.

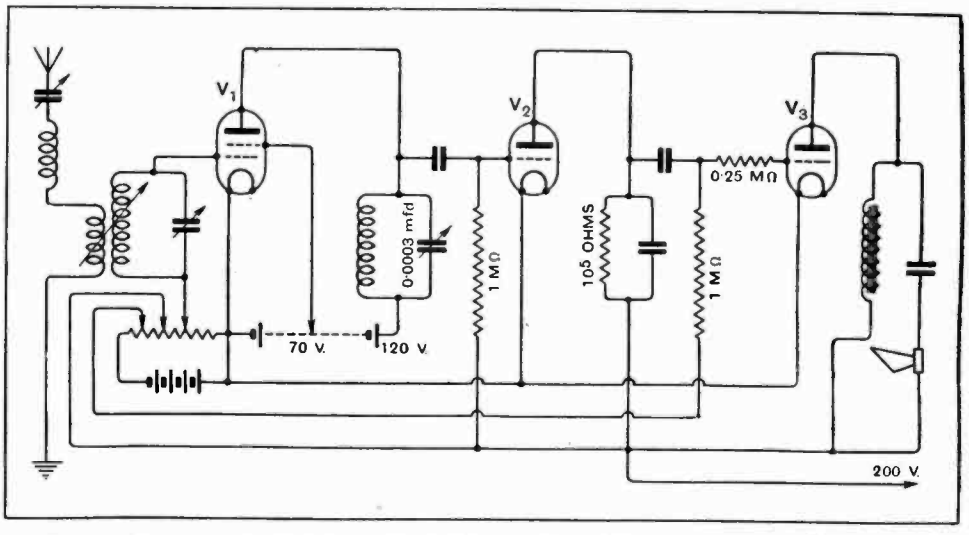

Fig. 13.—Receiving circuit for examining the properties of the screened valve. V_1 = screened valve (amplifier); V_2 = D.E.5B (detector); V_3 = B.11 power valve.

Stability of Operation.

Since the inter-electrode capacity is not zero it is clear that *some* feed back must occur. Thus the amplification obtained consists of two components (1) that obtained from the valve when considered to have zero capacity—no feed back, and (2) the extra amplification due to the feed back. If the magnification for stability at a certain frequency were 30, the actual magnification would be 30 times a factor depending on the feed back. The factor would obviously exceed unity. For stability its value is limited, but depends on the frequency. As this increases (shorter wavelengths) the impedance of the valve capacity decreases, so that the current flowing from the anode to the grid circuit increases. This means augmented feed back. To keep the feed back within limits the valve magnification must be reduced by decreasing the dynamic of the tuned circuit in some manner. Moreover, for stability the valve magnification must decrease as the frequency rises.

Selectivity with Tuned Anode.

This is an important issue which appeals directly to those who live some distance from the main broadcasting stations. If the reader has digested the preceding remarks on the damping introduced into the tuned circuit by the valve he will have no difficulty in seeing the selectivity side of the problem. We saw quite definitely that a low-resistance valve causes heavy damping, and it follows, therefore, that it is accompanied by poor selectivity. To illustrate this point more intimately reference should be made to Fig. 12.[1] Here we have the tuning curve for two neutrodyned three-electrode valves of 22,000 ohms (D.E.3) and 50,000 (D.E.3B) resistance respectively. Although the D.E.3B gives more selectivity than the D.E.3, it is far from that of the coil and condenser alone. The screened valve with which we are now concerned has a much higher internal resistance, and it therefore gives selectivity by virtue of smaller damping. The curve for this valve would be between the D.E.3B and the full-line curve. With an infinite internal resistance the full-line curve would be obtained, for the damping would be due to the LC circuit alone. Thus selectivity is enhanced by increasing the internal resistance, and this can be accomplished in a screened valve by increasing the grid bias. Care must be exercised not to mar the selectivity by the use of low-resistance grid leaks, as already explained.

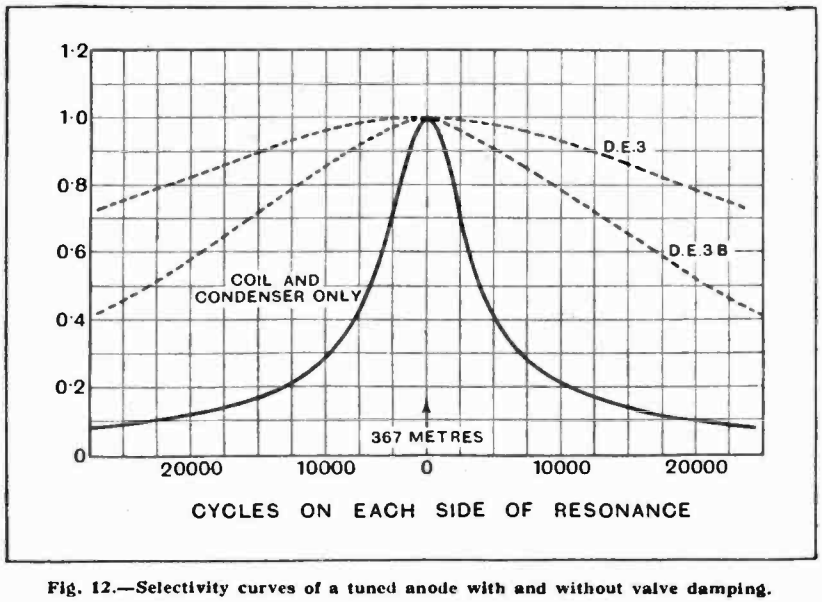

Fig. 12.—Selectivity curves of a tuned anode with and without valve damping.

Tuned Anode Experiment.

Perhaps a simple experiment in reception with a tuned anode and screened valve may be of interest. The circuit is shown in Fig. 13. Here we have an aerial coupled to a tuned circuit connected to the grid and filament of a screened valve V_1. In the anode circuit of the valve we have another tuned circuit, and both grid and anode circuits

[1] Reproduced from Fig. 10b, p. 551, *Experimental Wireless*, September, 1926, "The Amplification and Selectivity of the Neutralised Tuned Anode Circuit."

The New Screened Valve.—

have *low-loss coils*. The valve was operated with a grid bias of −1.0 volts, screen volts of +70, and anode volts 120. There was a good deal of latitude for the screen and anode volts; for example, the screen could be altered 15 or more volts each side of 70, and the anode could be varied from 100 to 150 or more. The anode volts should always exceed the screen volts. The screened valve was resistance-capacity coupled to a D.E.5B anode bend detector with 10^5 ohms in its output and an H.T. voltage of 200 (D.C. mains). This again was resistance-capacity coupled to a B.11 valve with a grid bias of −27 having a loud-speaker output. At a distance of several miles from 2LO the aerial circuit—aerial about 10 feet high—could not be tuned without blasting, *i.e.*, signals were too strong. If the grid and anode circuits were brought to tune simultaneously, self-oscillation occurred. This was prevented by inserting a resistance in one or both of the tuned circuits, and even then the tuning was sensibly sharp. Actually the resistances were only used for trial, because oscillation could be stopped by putting the grid circuit off tune or increasing bias. The tuned anode was then quite selective. The quality on normal loud-speaker signals was good. It should be pointed out that no precautions were taken to reduce the capacity and other couplings to a minimum, and had this been done doubtless the stability margin would have been increased. As a matter of curiosity an unneutrodyned D.E.8 H.F. valve was inserted instead of the screened valve. This was accompanied by the usual squeal indicating instability, and would not be tied down in any way except that of adjusting to a relatively very subdued amplification.

Summary.

In view of the novelty of the subject and of the fact that screened valves are certain to attract widespread attention among wireless amateurs, it is well to crystalise the salient features of this article.

1. Owing to the extremely small electrostatic capacity between the anode and control grid of a screened valve the tendency to self-oscillation due to energy being fed back through the valve circuit is reduced to a relatively small amount.

2. By virtue of this small capacity the stable high-frequency amplification per stage is much greater than that with an unneutrodyned three-electrode valve.

3. Because the amplification is stable does not mean that there is no feed back. In general there will be a small amount of feed back, but if the equivalent resistances of the tuned circuits in the valve circuit are not too low oscillation will not occur. The magnification is that due to the valve *per se*, together with that due to feed back.

4. It is essential to take every precaution not to add capacity to the anode-grid circuit by improper wiring. Also, to carefully screen succeeding tuned circuits to avoid electromagnetic and stray capacity coupling.

5. The internal resistance of a screened valve is greater than that of a three-electrode valve. For example, the valve tested at zero grid volts had a resistance of 120,000 ohms, which is about four times that of a D.E.5B.

6. When a tuned circuit is used, the valve resistance can be considered to be connected across the condenser, *i.e.*, a leak. The smaller the resistance the greater is its short-circuiting action on the condenser and the greater the damping. Thus the tuning would be flatter with a low- than with a high-resistance valve. Moreover, the selectivity with a screened valve of 1.2×10^5 ohms internal resistance will be greater than that with a three-electrode valve (neutrodyned, of course), say a D.E.5B of 3×10^4 ohms resistance. The screened valve obviously scores where selectivity is concerned.

7. Owing to the necessity to preserve stability, and to the damping exercised by the valve, it is not essential to use low-loss coils in the broadcasting band of wavelengths. For example, a coil having an inductance of 250 microhenries and a resistance of 3 ohms at 2LO's wavelength would be unnecessary. The extra resistance put into the coil due to the valve is 16.8 ohms, or more than five times that of the coil.[2]

8. The magnification factor of the screened valve is not infinite. It has a perfectly definite value depending upon the anode and grid voltages. It is much higher than that of the usual three-electrode valves because its internal resistance is higher. For example, the valve tested has an m value of 70 when the grid bias is zero and 120 when the grid bias is −3.5 volts. For tuned anode circuits at frequencies of about 1,000,000 (300 metres), these values cannot be realised owing to the necessity for lower magnification to maintain stability. The maximum step-up per stage depends upon the resistance of the tuned grid circuit and that of the tuned anode. It is in the neighbourhood of 40 at 2LO's wavelength. For longer waves the stable magnification increases, but for shorter waves it decreases.

9. The mutual conductance or change in anode current per volt change on the control grid is of the same order in a screened valve as in a three-electrode valve. The magnification factor of both types of valve is the product of mutual conductance and internal resistance. For instance, at zero grid volts the mutual conductance is 5.8×10^{-4} amperes per volt, whilst the internal resistance is 1.2×10^5 ohms. The product is 5.8×12, and this is 70, the magnification factor.

10. Both internal resistance and mutual conductance vary with the grid and anode voltages. As the grid bias increases so also does the internal resistance, whilst the mutual conductance decreases. The product, however, increases up to a point.

11. If the grid bias were −3.5 and the voltage swing on the grid were from −2.5 to −4.5, distortion would ensue because the magnification on each side of the −3.5 volt bias would be different. This would introduce additional frequencies, but in the case of a tuned anode these would hardly be likely to occur because the grid swing would be much less than 2 volts, and the grid bias would more usually be about −1.5 volts. There is no doubt that distortion would occur in the L.F. part of an amplifier.

12. At a certain point on the characteristic, when the anode voltage is less than that on the screen, the curve slopes downwards. The screened valve may over the downward sloping portion be considered to have a nega-

[2] There is, of course, a gain with low-loss coils, but it is not in proportion to the reduction in resistance (see Table 1).

The New Screened Valve.—

tive resistance (dynamic). If the anode voltage is set about midway on this downward slope and a tuned circuit connected in series, oscillation will occur provided the equivalent dynamic resistance of the tuned circuit at resonance is arithmetically less than the negative resistance.

ANALYTICAL APPENDIX.

There are doubtless a number of readers who desire to know how the various statements made in this article are substantiated by theory, and it is the purpose of this appendix to outline broadly some of the points raised in connection with the valve and tuned anode.

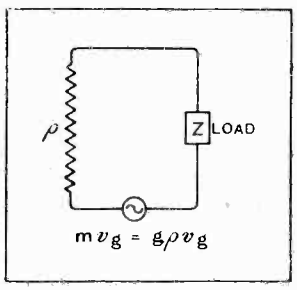

Fig. 14.—Equivalent circuit of screened valve. The D.C. resistance of the load or impedance Z is small, so that there is no appreciable drop in the D.C. volts, *i.e.*, the D.C. voltage on the valve is sensibly that of the H.T. battery.

The equivalent circuit of a three-electrode valve or a screened valve (assuming its internal resistance and mutual conductance to be constant) are identical. The circuit is shown in Fig. 14. The voltage of the alternator is $mv_g = g\rho v_g$. This formula can be deduced as follows: when Z is removed the alternator will be in series with ρ. Thus the anode current

$$i_a = \frac{v_a}{\rho}.$$

Now, by definition the mutual conductance

$$g = \frac{i_a}{v_g}.$$

This gives $i_a = gv_g$, so that $\frac{v_a}{\rho} = gv_g$, or $v_a = \rho g v_g = mv_g$ where $m = g\rho$ = the magnification factor of the valve *per se*. Taking the load as an inductance L, we have its impedance as ωL. Thus the alternator will supply current

$$i_a = \frac{\text{Volts}}{\text{Total impedance}} = \frac{g\rho v_g}{(\rho^2 + \omega^2 L^2)^{\frac{1}{2}}}.$$

Dividing above and below by ρ we get

$$i_a = \frac{gv_g}{\left(1 + \frac{\omega^2 L^2}{\rho^2}\right)^{\frac{1}{2}}}.$$

But the voltage on the inductance $v_z = \omega L i_a$, or

$$v_z = \frac{g\omega L v_g}{\left(1 + \frac{\omega^2 L^2}{\rho^2}\right)^{\frac{1}{2}}}.$$

If ρ is large compared with ωL the fraction $\frac{\omega^2 L^2}{\rho^2}$ is negligible compared with unity. Thus $v_z = g\omega L v_g$
$= gZv_g$
= mutual conductance × anode impedance × grid swing,
or magnification = mutual conductance × impedance.

In practice it will be found in many cases that ρ is smaller than Z, so that the term $\frac{\omega^2 L^2}{\rho^2}$ must be retained. Thus the magnification will be reduced compared with its value when ρ is infinite. It is easy to show that when ρ is finite the maximum possible amplification with an infinite impedance Z has a finite value $g\rho$. It is assumed, of course, that the D.C. ohmic resistance of Z is small enough to cause an inappreciable drop in anode voltage. Then

$$i_a = \frac{g\rho v_g}{[(\rho + r)^2 + P^2]^{\frac{1}{2}}},$$

where r is the resistive and P the reactive components of Z and

$$v_a = i_a Z = \frac{g\rho v_g [r^2 + P^2]^{\frac{1}{2}}}{[(\rho + r)^2 + P^2]^{\frac{1}{2}}}.$$

But if $Z = (r^2 + \rho^2)^{\frac{1}{2}}$ = infinity, ρ in the term $(\rho + r)^2$ can be neglected. Hence we get $\frac{v_a}{v_g} = g\rho$, and this is the maximum possible magnification, and is, therefore, the amplification factor of the valve *per se*.

Coming now to the tuned anode, it is easy to show that at resonance the combination behaves as a dynamic resistance (there is no D.C. drop)

$$\frac{L}{Cr} = \frac{\omega^2 L^2}{r} = R,$$

where L is the coil inductance of A.C. resistance r tuned by a condenser C.

Applying the above analysis, we get anode current $i_a = \frac{\text{alternator volts}}{\text{total resistance}} = \frac{g\rho v_g}{\rho + R}$, and the volts on R (the tuned anode) $= i_a R = \frac{g\rho R v_g}{\rho + R} = m\left(\frac{R}{\rho + R}\right) v_g$, an expression which is identical with that for the magnification obtained with resistance coupling in a three-electrode valve circuit. The actual magnification is

$$m\left(\frac{R}{\rho + R}\right).$$

Now, with $L = 250\mu H$, $r = 3$ ohms, $C = 150\mu\mu F$, the value of $R = 5.5 \times 10^5$. Taking $\rho = 1.2 \times 10^5$ ohms we get $\frac{R}{\rho + R} = \frac{5{\cdot}5}{6{\cdot}7} = 0{\cdot}8$.

From Fig. 8 we find $g = 5.8 \times 10^{-4}$, so that $m = g\rho = 5.8 \times 10^{-4} \times 1.2 \times 10^{-5} = 70$.

Thus the actual magnification is $70 \times 0.8 = 56$. Making the coil resistance 9 ohms gives $R = 1.8 \times 10^5$ ohms and $\frac{R}{\rho + R} = 0.6$. The actual magnification is $0.6 \times 70 = 42$—a value which makes more for stability than that with the low-loss coil.

Danish Amateur Transmitters.

The first society for Danish amateur transmitters came into being on August 15th under the title of 'Eksperimenterende Danske Radio Amatorer." The president is Prof. P. O. Pedersen, the eminent Danish scientist and Director of the Copenhagen Polytechnic. The executive committee consists of the following well-known Danish wireless amateurs:—G. Bramslav (7ZM), H. Rafn (7EW), and A. Christmas Eskildsen (7AX). The last-named is chairman of the Association. We understand that information concerning the activities of the Society will appear in the new Danish wireless journal, "Radio Posten."

TRANSMITTERS' NOTES AND QUERIES.

Reports Wanted.

Mr. J. Hartley (G 6JH), who has recently moved to 13, Springfield Road, Gatley, Cheadle, Cheshire, will shortly resume operations on 8 and 45 metres. He will be glad to receive reports and to collaborate with other experimenters.

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Mr. W. P. Dolphin (G 6DP) will be glad to arrange schedules with any amateur transmitters on 23 and 45 metres. Mr. Dolphin's address is 53, Higham Road, London, N.15.

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New Call-signs and Stations Identified.

2KK	Ralph H. Parker, Radio House, Wilson Rd., Smethwick, Staffs.
2BRI	David D. Marshall, 41, Kelvinside Gdns., Glasgow, N.W.
5HK	H. S. Beckett, 448, Redmines Rd., Lodge Moor, Sheffield. (Corrected address.)
2AUL	J. Skidmore, Chevin Rd., Belper, Derby.
2AXL	S. Buckingham, 53, Beaconsfield Rd., London, N.11.
2JU	E. J. Pearcey, Collingwood, Pinner View, Harrow, Middlesex. (Change of address.)
eb-V9	A. J. Demoor, 2, Champs, 48, Ghent.
EV4DS	F. De Saeddeler, 63, Avenue Lippens, Knocke, Belgium.
EJ7DD	S. Liebermann, Medulićeva 9, Zagreb, Yugo-Slavia.

A Description of the Bombay Station.

By V. A. M. BULOW (*Chief Engineer Indian Broadcasting Co., Ltd.*).

IT is thought that some account of the new broadcasting stations at Bombay and Calcutta may be of interest. The Bombay station was opened by the Viceroy, and the opening ceremony of the Calcutta station by the Governor of Bengal took place on August 26th. The following description refers primarily to Bombay. Calcutta may be taken as being similar, except where differences are pointed out.

When the writer arrived in Bombay on February 25th he found that the site for the Calcutta transmitter had been decided upon on land which is to be a public park, but not that for Bombay. In the latter case two possible sites were in view. Both of these were on open ground; one near the racecourse, the other almost two miles farther out, at Worli. The racecourse site was on rather low-lying ground, and it was abandoned in favour of the latter. The wisdom of this decision, from one point of view, was proved at the beginning of the monsoon, for the racecourse site was flooded, and, had the station been there, engineers would have had to swim to their posts!

The Station Buildings.

Both stations are to have Marconi equipment of the same power as 2LO, viz., 3 kW. to the oscillating valves, but here the comparison ends, for the transmitters are to be housed in special buildings erected for the purpose. The sites are open and on the outskirts of the towns. It may be said, without fear of contradiction, that the B.B.C. has no station to compare with the Indian stations in these respects except Daventry. The building at Bombay is 90ft. long, 30ft. wide, 15ft. high inside, and contains a machine room, workshop, stores, office, and battery room, in addition to a fine room for the wireless gear proper.

Before building operations could be commenced sanctions in connection with the site, plans, etc., had to be obtained from the Government of India, the Government of Bombay, the Municipality, and the Bombay Improvement Trust. Fortunately, the general manager was successful in securing all the necessary permissions in record time.

The site at Worli was pegged out on March 14th. Two months later the roof was on the building, while at the end of ten weeks it was possible to begin the installation of the plant. The building is a really substantial structure having stone foundations, brick walls, and a tiled roof. Such rapid progress makes one doubt the truth of the saying that a tombstone is the reward of him who attempts to hurry the East.

The Aerial-earth System.

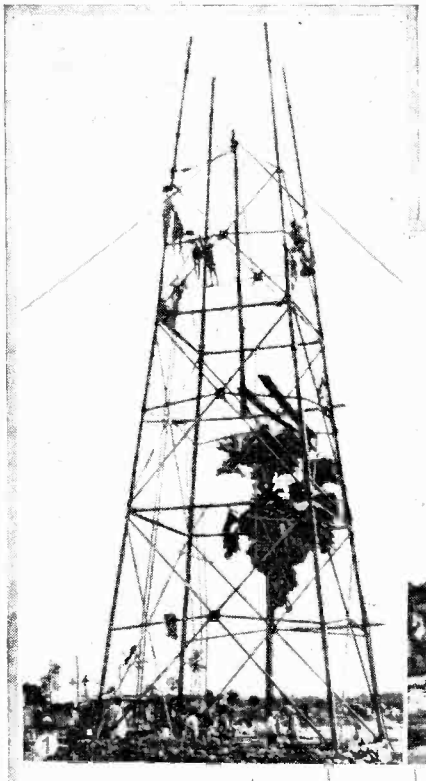
Owing to the open situation and the extensiveness of the ground it has been possible to erect a "pukka" aerial-earth system. The aerial, which is a four-wire cage T, is suspended from two self-supporting lattice steel towers, 150ft. high. The earth system consists of two circles of buried earth plates, each 25ft. in diameter, under the centre of the aerial and in line with it. These are both connected together on their adjacent sides and to the earth terminal of the set. Radiating from the remote sides are numerous copper wires buried just below the surface of the ground. In this way the earth-system is made to cover an area of approximately 80,000 square feet—*i.e.*, a rectangle of 400ft. long by 200ft. wide.

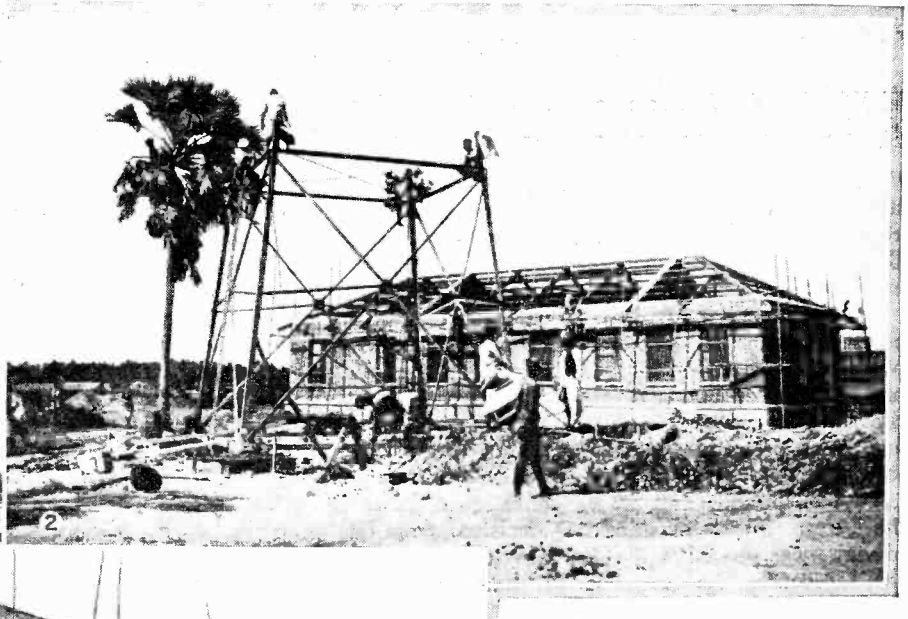
It is interesting to note that although elaborate mast erection equipment had been shipped with the masts the Indian workmen would have none of it, and preferred to rely on their own bamboo poles for the little scaffolding

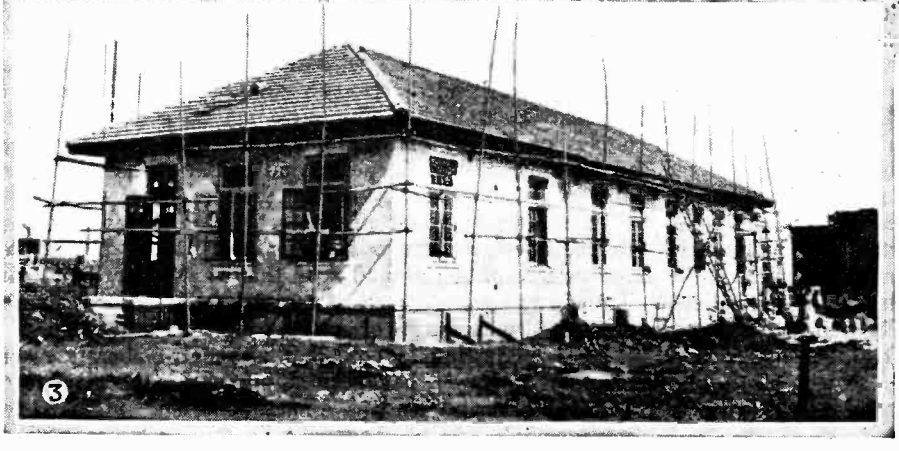
Broadcasting in India.—

that was needed and for forming the shear-legs by means of which the steel members were hoisted as the work proceeded. An iron ladder is fixed to one side of each mast and was put up as the mast grew, but the Indians scorned to use this—they preferred to exercise their skill and agility and scale the lattice work itself. Each tower was completely erected in one week, and I doubt if this could have been beaten by any workmen in England.

Owing to the loose nature of the soil it was thought desirable to increase the size of the foundations above that originally intended in order to reduce the weight per square foot upon it. Incidentally, this also increased the overturning factor of safety. Each tower is supported on four concrete blocks, one at each corner, and the weight of these is 21½ tons each.







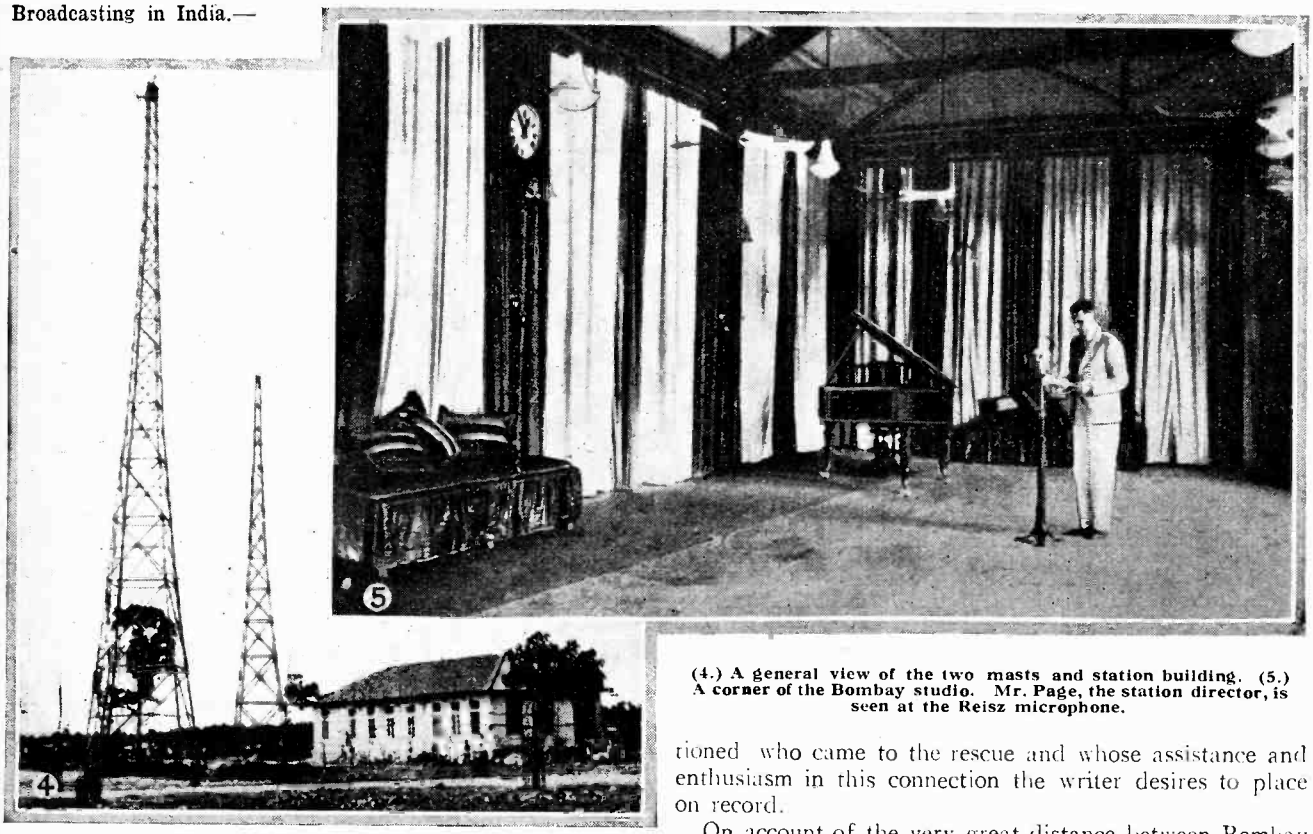
(1.) Native workmen erecting a mast. (2.) An early stage in the erection of masts and buildings. (3.) The transmitter buildings nearly finished.

Turning now to studio premises, we find these quite adequate for a commencement. The Bombay studio is located in Radio House, Apollo Bunder. Each station has two studios. The Bombay dimensions being 54ft. × 27ft. × 14ft. high, with gable roof above that forming the ceiling—a fine lofty room for a main studio. There is a small room, 12ft. × 12ft., which will be used for talks, lectures, news, etc. At Calcutta the two studios are 31ft. × 20ft. 6in. × 12ft. high, and 22ft. 6in. × 19ft. × 12ft. high respectively. At both stations the natural resonance is reduced by means of *light* curtains hung on rods in such a way that it is a simple matter to expose more or less wall and so adjust the echo to any desired amount. No drapery of any sort is used on the ceilings. It is not intended at present to make use of artificial echo, but rather to make the best use of natural resonance by reducing it to the requisite amount in the way mentioned.

Studio Ventilation.

As it will be realised, studio ventilation offers a nice problem in India. It has been decided that no attempt will be made to give a perfectly silent background, and therefore it has been possible to make use of natural ventilation. A number of fanlights have been fitted down the two long walls giving direct access to the open air. These can be left open even during heavy rain, as eaves overhang to the extent of about three feet. Then there are numerous windows down one side of the room, which can be opened to the outside air in fine weather; while in wet weather several pairs of double doors, giving access to a wide verandah, can be utilised for the same purpose. In the hot

Broadcasting in India.—



(4.) A general view of the two masts and station building. (5.) A corner of the Bombay studio. Mr. Page, the station director, is seen at the Reisz microphone.

weather a number of fans or punkhas suspended from the roof set up just that gentle breeze which makes the heat bearable.

Control Room and Land Lines.

In the control room, which is the nerve centre of a broadcasting station, we find two tables with apparatus for operating two studios, but so arranged that equipment No. 2 can be used with studio No. 1 should equipment No. 1 become faulty; and similarly for No. 2 studio. The various switching operations necessary in dealing with the input and the output of the amplifiers are accomplished by means of plug and jack boards as in the B.B.C. stations. An innovation has been introduced in the stations of the I.B.C., however, in that these operations are performed on cordless boards. The latter are not so elastic as boards having a number of double-ended cords, but the tangles sometimes encountered with the latter are avoided, as is also troublesome cord maintenance, which, the writer understands, is particularly bad during the damp monsoon season in Bombay. These cordless boards have been constructed by the Bombay Telephone Company, Ltd., and considerable thought has been given to their design to ensure that they will meet all demands made upon them. It may be of interest to note that originally it had been intended to follow the B.B.C. precedent and use cord switchboards. The order for these had been placed, but it soon became evident that the delivery date could not be adhered to. This created an awkward situation, but, happily, a crisis was avoided, thanks to the telephone company already mentioned who came to the rescue and whose assistance and enthusiasm in this connection the writer desires to place on record.

On account of the very great distance between Bombay and Calcutta, and the unsatisfactory state of what lines there are connecting the two places, anything in the nature of simultaneous broadcasting as understood in the British Isles is out of the question. Wired wireless is an attractive proposition, and the possibilities of using this method of linking up the two stations is being investigated. The problem of the successful transmission of speech and music is not so simple as might appear; it is not such an easy thing as the application of wired wireless to telegraphy. Another possibility would be the utilisation of a very short wavelength of the order of 20-30 metres, for the purpose of a wireless link. One hesitates to adopt such a scheme, however, because one feels that the re-broadcasting might be spoiled by the efforts of those who might seek to pick up the programme direct. It is feared that the oscillation trouble is not confined to the home country!

Short Waves.

Speaking of the short waves reminds one of the very great demand there is for the relaying of the London programme by this means. Many people have been heard to say that broadcasting would be worth while if they could hear London. The use of a short-wave transmitter for the purpose of Empire broadcasting appears to warrant some optimism. Judging by the transmissions from Eindhoven on 30.2 metres, a wavelength in this neighbourhood would seem to offer distinct possibilities as far as India is concerned. The writer heard *something* of the re-broadcasting of the London and Paris programmes on the night of June 23rd-24th, between 12.30 a.m. and

Broadcasting in India.—

1.45 a.m., Indian Standard Time, on the morning of June 24th. This was his first essay in this direction, and he was distinctly struck by the very slight fading and the almost complete absence of atmospheric and other types of interference.

It is good news that the B.B.C. are contemplating making experiments with a very short-wave transmitter. We in India hope they will be an *early* success, so that this great land may be able to listen to the programmes of the Mother Country and perhaps hear the voice of the King-Emperor.

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.

CONTINENTAL RECEPTION OF 5GB.

Sir,—By now I suppose that thousands of letters have been pouring in on you as well as the B.B.C. headquarters regarding the new high-power British station 5GB. Perhaps my humble observations made at a rather more remote "outpost" may not be amiss.

My receiver is of British origin, quite sensitive, and about as selective as most good neutrodynes.

I first picked up the carrier wave of 5GB around 8 p.m. yesterday, August 22nd. By 9 p.m. signals were coming through quite clear, and by about 10 p.m. music was coming through at full L.S. volume, brakes—figuratively speaking—having to be applied to avoid sadly overloading a D.E.5A in the output stage.

The modulation struck me as particularly good, the tone of the transmitter being soft and yet full; fading was conspicuous by its absence.

There seems to me, however, to be one fly in what otherwise promises to be the perfect ointment! And that is the particular wavelength chosen for this station. The Berlin transmitter on 620 k.c. was just edging in the least little bit, and as I gather from the Press here that this particular station is going to double its output in the autumn, I fear that it may spoil to a considerable degree the reception from 5GB.

Might it not be worth while to consider assigning 5GB a frequency of 600 k.c.? The next high-power station is Vienna on 580 k.c., so that 5GB would sandwich nicely between Berlin and Vienna with a safe margin of 20 k.c. either way.

Perhaps mine is a lone voice in the wilderness; on the other hand, there may be many listeners on the Continent whose experience is shared by mine, but who would welcome, for several reasons, the opportunity of "listening in" on this station with the least possible interference.

Danzig. F. LESLIE BERGER.
August 23rd, 1927.

REPRODUCTION OF GRAMOPHONE MUSIC.

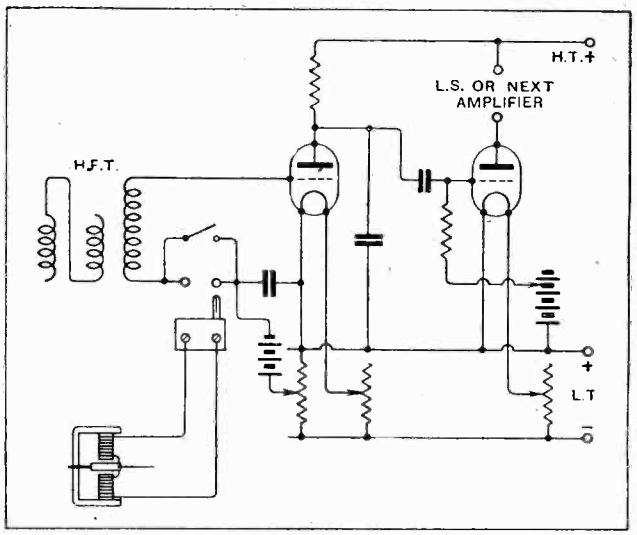
Sir,—Further to your article and circuit diagram published in August 10th issue of *The Wireless World*, I think the following method may be of interest to your readers who are not desirous of making alterations to their "Everyman Four" receivers.

A twin flex lead from the electromagnetic pick-up should be connected to a standard pin and socket coil plug.

The Daventry loading coil is removed from sockets and the coil plug with flexible connection is inserted in its place. When the gramophone is in use the loading switch is open and the pick-up thereby connected in series with existing fixed grid coil.

With an electromagnetic pick-up of 2,000 ohms resistance it is not necessary to use a transformer as it is quite safe to connect this directly between grid and filament as indicated in accompanying diagram.

With a valve of high amplification factor in the detector position resistance-capacity coupled to a suitable power valve, the volume obtainable for a given H.T. voltage is approximately 30 per cent. higher than when the same two valves are used for local station broadcast reception, operating as detector and low-frequency. Scratch frequency filter circuits for all ordinary domestic use can be ignored, as this is considerably reduced by fitting a fibre needle in the pick-up.



Electromagnetic pick-up connections suggested by Mr. Duckworth.

Should the pick-up not be provided with triangular needle socket a suitable adapter is sold by gramophone dealers, fitting in the round needle hole and holding triangular needles quite firmly.

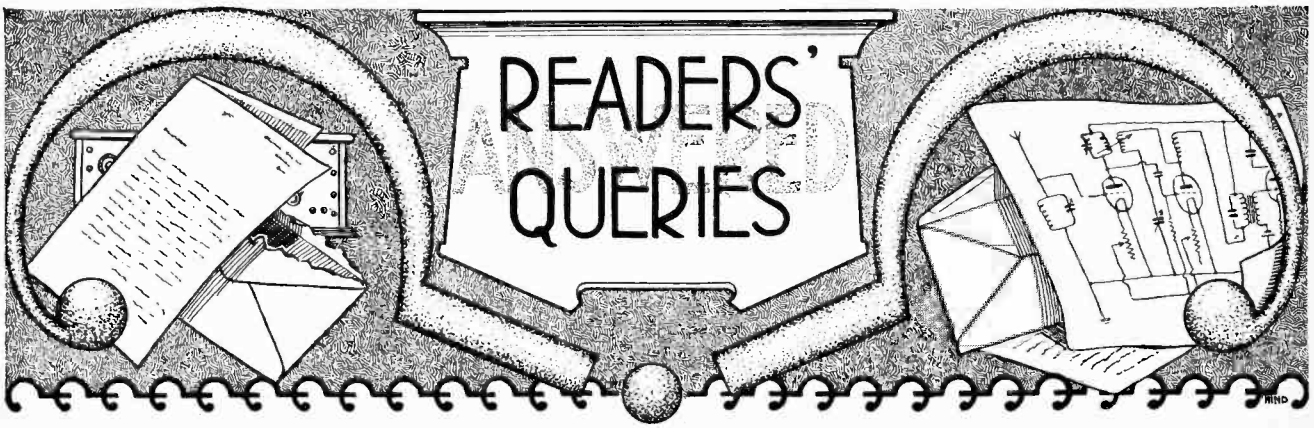
Manchester. WILLIAM DUCKWORTH.
August 23rd, 1927.

B.B.C. ALTERNATIVE PROGRAMME POLICY.

Sir,—Your Editorial in to-day's issue on the subject of the alternative programmes appears to me to express very accurately the state of affairs which has arisen as a result of the introduction of 5GB.

I agree with everything that you have to say regarding the service to broadcasting which the B.B.C. is unintentionally doing by compelling listeners to resort to valve sets for a choice of even two separate programmes, but the B.B.C. has been so insistent in the past on assuring the public that they intended to consider first the crystal user that it will be interesting to see what explanation they will give for the present state of affairs. E. P.

Peterborough.
August 31st, 1927.



"The Wireless World" Information Department Conducts a Free Service of Replies to Readers' Queries.

Questions should be concisely worded, written on one side of the paper, and headed "Information Department." One question only should be sent at a time, and must be accompanied by a stamped, addressed envelope for postal reply. Any diagram accompanying the question should be drawn on a separate sheet. No responsibility will be accepted for questions sent in which do not comply with these rules.

H.T. from Private Lighting Installations.

I have a private house-lighting set consisting of a battery of 30 large-size accumulator cells, this giving me a voltage of sixty, which I use to illuminate my house. For some time past I have been using three of these cells for lighting the valves of my four-valve set, my H.T. supply consisting of large-size dry cells. As these cells will shortly require renewal I am wondering whether it would not be possible to utilise my lighting equipment for H.T. supply also. Needless to say, I have a special arrangement consisting of oil engine and dynamo for charging my batteries, and am fully acquainted with the fact that the three cells used for my L.T. supply become more quickly discharged than the other cells, and I make special charging arrangements for them.

D. B.

Since your supply is only 60 volts, it would be impossible to use this for supplying H.T. in a direct and simple manner to the receiver, as, naturally, 120 volts will be required for the L.F. valves at any rate. Since you are already using three of the cells for L.T. supply, and fully understand the necessity for making special charging arrangements, we think you cannot do better than invest in one of those small machines commonly known as anode converters, since they appear to meet your requirements very aptly. These machines consist of a six-volt motor taking about 1 ampere or so, driving a 120-volt dynamo on the same shaft, the 120-volt dynamo being specially designed for supplying plate current to power valves.

The whole instrument is screened by being mounted in a metal container, and in this container is a complete smoothing unit of chokes and condensers. You will see, therefore, that you can connect the input terminal of this device to the three cells which are already lighting your valves, and thus produce a thoroughly dependable H.T. supply. Most of these instruments are of good make, and can be thoroughly relied upon; they can usually be obtained in various types, some giving 120-volt output, and some a higher voltage. We advise you to write to Messrs. M-L Magneto Syndicate, Ltd., Victoria Works, Coventry, asking for full particulars.

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A Question of Volume Control.

I have built a receiver consisting of an efficient H.F. stage, an anode bend detector, followed by two resistance-coupled stages, and in order to preserve good quality have made no arrangements for switching out valves for headphone work. The receiver is, in fact, a slightly modified form of your "All-Wave Four" receiver. I now find myself in the difficulty of wishing to run a loud speaker and a pair of headphones simultaneously for the benefit of a member of my family who prefers the latter form of reception. What arrangements can I make for using telephones after the detector valve for headphone reception, whilst at the same time the loud-speaker is operating after the fourth valve?

R. P.

You are not advised to put in any switching arrangements, or any arrangements for using your telephones after your detector valve. Your best plan would be to use a choke-filter output circuit, or output transformer, after the final valve of your receiver, and you could then connect your loud-speaker and telephones in series, and at the same time shunt the telephones with a volume control, of which many specimens are upon the market. Most of these volume controls consist of a suitable resistance having a variation between 0 and 40,000 ohms. They are made by various firms, such as Messrs. Automobile Accessories (Bristol), Ltd., 93-95, Victoria Street, Bristol; Messrs. Marconiphone Co., 210-212, Tottenham Court Road, London, W.1; and Messrs. Dubilier Condenser Co., Ducon Works, Victoria Road, North Acton, etc., all of which give satisfaction. Alternatively, you could use a special volume control plug. This matter was, however, gone into fully in an article on page 205 of our August 17th issue.

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Two-volt Valves in the "Everyman Four."

I am intending to build the "Everyman Four" receiver from the description given in your book entitled "Everyman Four." I am, however, going to use two-volt valves throughout, and shall be glad if you will give me the correct values of the fixed resistors R_3 and R_4, and also any other advice concerning valves which you think might be useful to me.

A. W. F.

In the original description of the receiver it was advised that six-volt valves be used in all positions except the detector position, where a two-volt valve was advised, since it was found that a two-volt valve made a better anode bend rectifier than a six-volt valve, all other things being equal; but, naturally, six-volt valves give better results elsewhere, as has been recently pointed out in this journal. Since a six-volt accumulator had to be used, it became necessary to insert a resistance in series with the two-volt filament of the detector valve in order to drop the unwanted four volts, and so safeguard the filament from being overrun. The value of the series filament resistance, which was a fixed one and not a variable one, was determined solely by Ohm's Law, the formula used being $R = \frac{E}{C}$, where R is the resistance in ohms, E the volts to be dropped across the resistance (4 volts in this case), and C is normal value of filament current taken by the valve.

It will be seen, therefore, that the value of this resistance would not be the same for all two-volt valves, but would depend on whether the two-volt valve was

of the 0.1 amp. type, the 0.3 amp. type, etc. Since there was a voltage drop of four across this rheostat, it will be apparent that by returning the detector valve grid return lead to some spot on the resister a negative bias could be given to the grid, and if the fixed resistor had a sliding arm like a potentiometer we should have a continual variable value of grid bias from 0 to 4 volts, which would have been ample for the detector valve, and it would have enabled us to adjust the detector valve grid bias fairly critical. Since a fixed resistor with a sliding arm was not available, two fixed resistors were used, it being necessary, of course, that the sum of the two resistances equalled the total value of resistance required according to Ohm's Law, as we have previously mentioned.

A moment's thought will make it clear that by juggling with the values of these two resistances we could fix the grid potential at any value we wished. Thus, if R_3 and R_4 were equal, the voltage drop across each would be 2 volts, and by joining the grid return lead to the junction between the two resistors a two-volt bias would be applied to the grid. Similarly, we could have used a different value at R_3 compared to that of R_4, so causing a different voltage drop across each, and thus varying the potential on the grid of the valve (whose return lead would still be attached to the junction between the two resistors) according to the relative voltage drop across R_3 and R_4. The effect would be, in fact, the same as if we had had a slider sliding up and down one resistance, such as we have already discussed, but instead of giving us a continually variable arrangement it would be variable in only comparatively rough steps unless we obtained a very large number of fixed resistors of different values with which to experiment. With two-volt valves worked off a two-volt accumulator, we have only 0.2 of a volt to drop across a resistor (most two-volt valves work to 1.8 volts), and naturally 0.2 of a volt is not sufficient bias for the detector. It becomes necessary, therefore, to abandon the taking of grid bias automatically by virtue of the potential drop across the filament resistors, and to use the grid battery which we already have in the set for this purpose, and the circuit needs to be amended slightly. In Fig. 1 (a) we show the original arrangement; in Fig. 1 (b) we show the amended arrangement. It will be seen that there is still a resistor R in series with the detector valve filament, its only office, however, being to safeguard the filament, and its value is ascertained solely by Ohm's Law, following the example we have already given. With the two-volt accumulator used with most two-volt valves, it can be left out altogether.

The condenser C shown in dotted lines is more or less optional, and is intended to prevent the H.F. energy wandering through the set to the grid battery, and thus possibly in some cases causing instability. By using the grid battery in this manner, we can vary the detector valve grid bias in steps of 1½ volts, but owing to the fact that many modern valves specially designed for anode bend rectification have a very sharply defined bottom bend, it has often been found that this arrangement is too coarse, and the arrangement shown in Fig. 1 (c), which was used in the "All-Wave Four" receiver, is much to be preferred, although it necessitates a small extra grid battery for the detector valve grid alone. An arrangement such as is shown in Fig. 1 (c), used with modern valves, often makes all the difference between getting a distant station at good strength and not hearing it at all, owing to the necessity for adjusting the working point of the detector valve accurately on the sharply defined curve. No current is taken from the grid battery (which may consist of two small cells), since the potentiometer winding is across the L.T. battery. The drain on the filament accumulator is only 0.015 ampere, which is, of course, negligible for an L.T. battery.

We would point out that in the case of a set using four-volt valves throughout the same ruling holds good as in the case of your set, using two-volt valves throughout, or indeed even if six-volt valves are used. Whatever combination is used, it is strongly advised that the original method shown in Fig. 1 (a) be abandoned in favour of methods (b) or (c).

With regard to valves, you cannot do better than refer to the reply given to "C. F. T." on page 737 of our June 8th issue, where the matter was gone into very thoroughly.

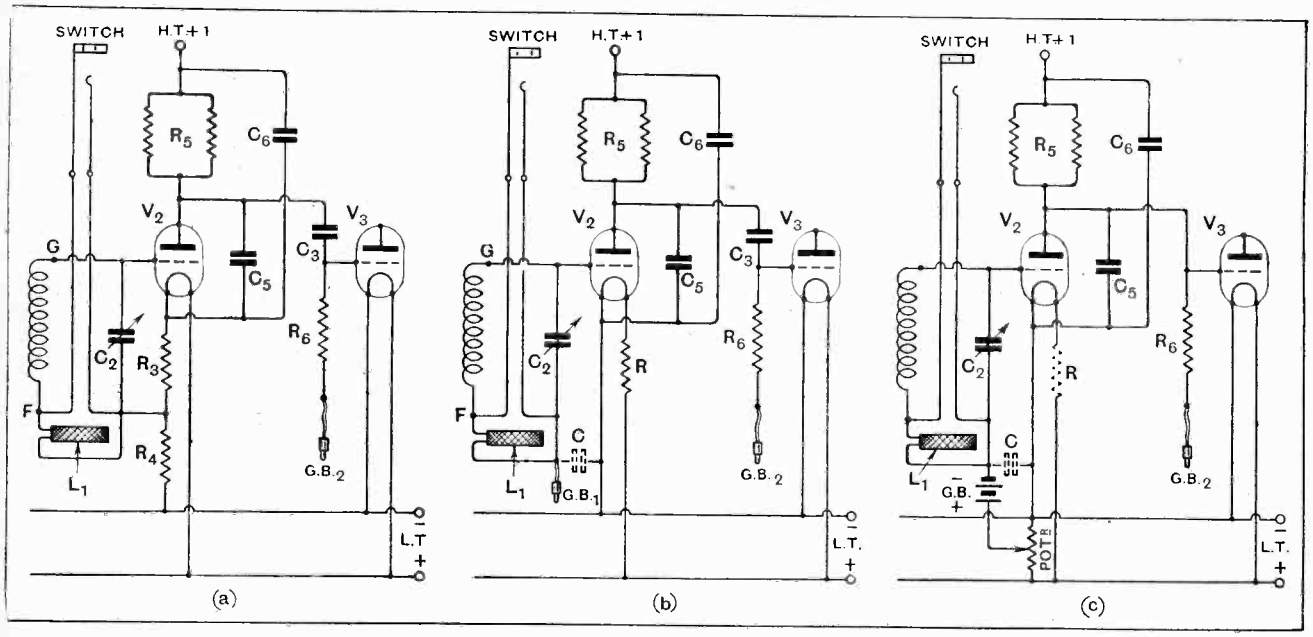

Fig. 1.—Detector circuit modifications in the "Everyman Four" when using two-volt valves.

A Critical Value of Condenser.

One often sees a small blocking condenser connected between the low-potential end of the tuned grid circuit of an H.F. valve and L.T., the actual bottom end of the coil winding going to a G.B. tapping. This value seems to vary greatly in different sets described. Is it critical? T. S. D.

The value is by no means critical, and it is necessary only that the value should be just large enough to by-pass all H.F. energy, thus preventing the H.F. energy straying along to the grid battery, and possibly causing instability, especially if the grid battery is situated at the other end of the set. The average value used is 0.01 mfd., which is ample.

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The Wireless World AND RADIO REVIEW

(15th Year of Publication)

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CONFOUNDING THE PESSIMISTS.

FOR months past we have persistently advocated the erection of a short-wave Empire broadcasting station in this country, and little by little the stubborn resistance of the B.B.C. to the project has been broken down until at last we have obtained the assurance from the B.B.C. that before the end of the year they will have a short-wave station in operation.

We find it very difficult to understand the attitude of the B.B.C. towards this project. They have had before their eyes the evidence of the possibilities which the Dutch and American stations have provided, yet they declined to accept the point of view that the art of short-wave transmission and reception had reached a stage where the erection of a transmitter here would be justified. It seems almost amusing, therefore, that in carrying out the recent rebroadcast of the Australian short-wave station the B.B.C. have themselves proved to the listening public that the establishment of broadcast communication between this country and the Empire is an achievement which need be by no means so remote of fulfilment as the B.B.C. by their pessimistic attitude of the past months would have us believe. Satisfactory reception of the Australian station is achieved direct, even on one valve, in this country, and although the retransmission by the B.B.C. through their station was naturally not so good as could be obtained by direct reception, yet our readers will agree that it was sufficiently successful to render the speeches intelligible and the music more than recognisable, whilst it is reported that the transmissions carried out by Mr. Marcuse have been received in Australia sufficiently well to justify rebroadcasting them.

If this can be done with an amateur station, are we not justified in looking for far superior results from a station erected with all the resources of the B.B.C. behind it and sufficient funds to carry it through? But however successful the B.B.C. may be with the transmissions of their short-wave station when it is ready, as promised, before the end of this year, no amount of success will quite wipe out the feeling of disappointment which is so general that we in this country have failed to respond to the desire existing in the Dominions for broadcast contact with the home country. If only one could instil into those responsible here for conducting Empire broadcasting some of the enthusiasm which was conveyed in the speeches of those who took part in the first programme from Australia we should not be waiting now to return the compliment of that transmission.

Under "Correspondence" in this issue we publish a letter from a reader in Cape Town. The letter is, perhaps, somewhat bitter in its attack on our lack of enterprise in the home country, but we publish it because it is typical of the opinion to which expression is being given throughout the Empire. We realise that we have devoted much space in *The Wireless World* to this topic, and we may have wearied some of our readers with our persistence, but our action was prompted by the conviction that the time had come for some action to be taken, and we believe that the importance of the establishment of Empire broadcast communication will only be recognised at its full value when we can look back on its inauguration as a landmark in history.

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THE LIFE OF 5GB.

SOME doubt has been expressed as to whether 5GB, because it is an experimental station, is going to be permanent or not. In an interview with Capt. Eckersley we were assured that 5GB will continue to transmit at least for twelve months and that other stations of the Regional scheme are not likely to be established for operation before within that period.

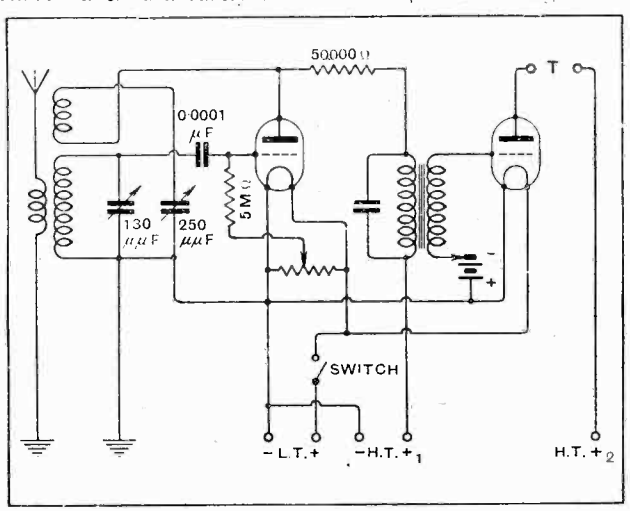
It should also be reassuring to those who contemplate modifying their sets to increase selectivity so as to receive the alternative programme from 5GB that in improving them along these lines their receivers will be equally applicable when the Regional stations are in operation.

Constructional Details of Two Short-Wave Broadcast Receivers.

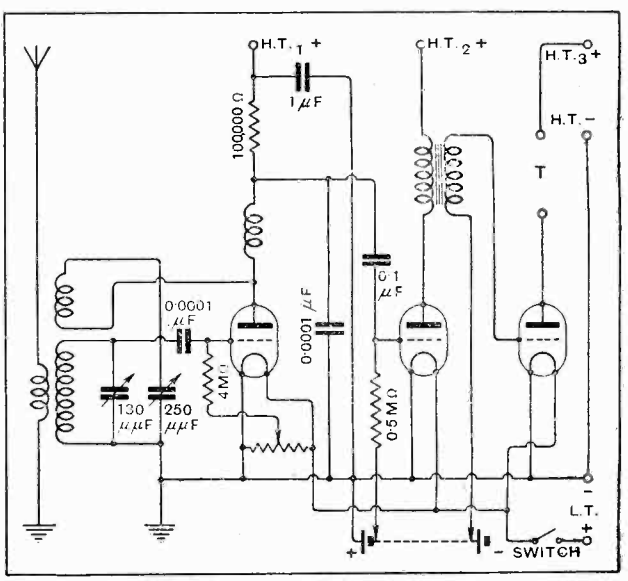
FACTS recently revealed in regard to the use of short waves for world-wide broadcasting indicate immense possibilities. It has long been known that telephony transmissions from stations using ultra-short wavelengths can be heard in remote parts, yet it has taken some while to acquire confidence in the potentialities of a short-wave broadcasting service as a means of covering the face of the globe. Representing the view of its readers, particularly those enthusiastic experimenters resident in our colonies, it has been the policy of this journal to press for the introduction of the short-wave service, and now, during recent weeks, it has been seen that the foundations have been well laid.

World-wide Broadcasting.

The writer would be the first to admit that the quality and nature of reception across thousands of miles using short waves is a vastly different thing from tuning in the local station at ten miles, and it is this difference of effect that has formed the basis of the tardiness of the British Broadcasting Corporation in giving its support to the scheme. Home and Empire broadcasting must not be viewed from the same standpoint or, otherwise, by mere contrast the results obtained in the transmission across the globe would prevent the service ever getting a start, yet the results are amply satisfactory for conveying entertainment to listeners throughout the Empire. One could not help noticing the sentiments of the announcer of the Sydney, Australia, station when he opened with "Hallo, dear old London," and many letters written in this strain have been published in the Correspondence columns from readers throughout the Empire.



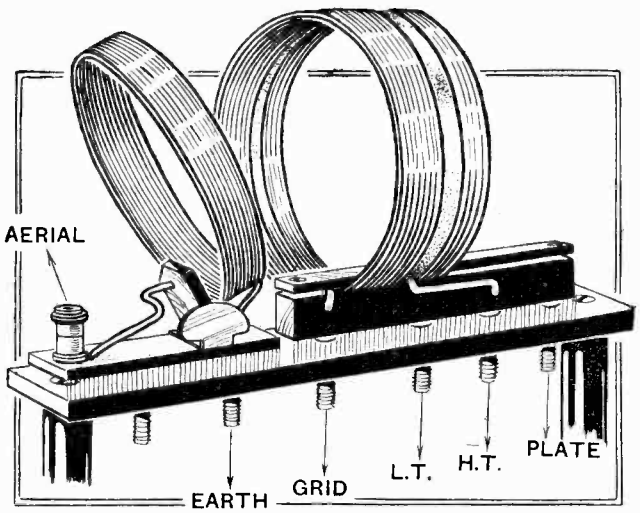
A more uniform control of regeneration is brought about by the use of a resistance in place of the usual choke. The transformer has a liberal primary winding and incorporates the bridging condenser shown here.



In order not to limit the permissible range of grid potential swing in the L.F. amplifier, the resistance-coupled stage precedes the transformer coupling. A high impedance value is used as a leaky grid detector with potentiometer control.

Short Wave II and Short Wave III.—

The sheer fascination of listening-in to these long-distance broadcasts has created a demand for a new type of set—a short-wave broadcast receiver—as distinct from the type of receiving set used by the short-wave enthusiast. The requirement is for a set tunable from 10 to



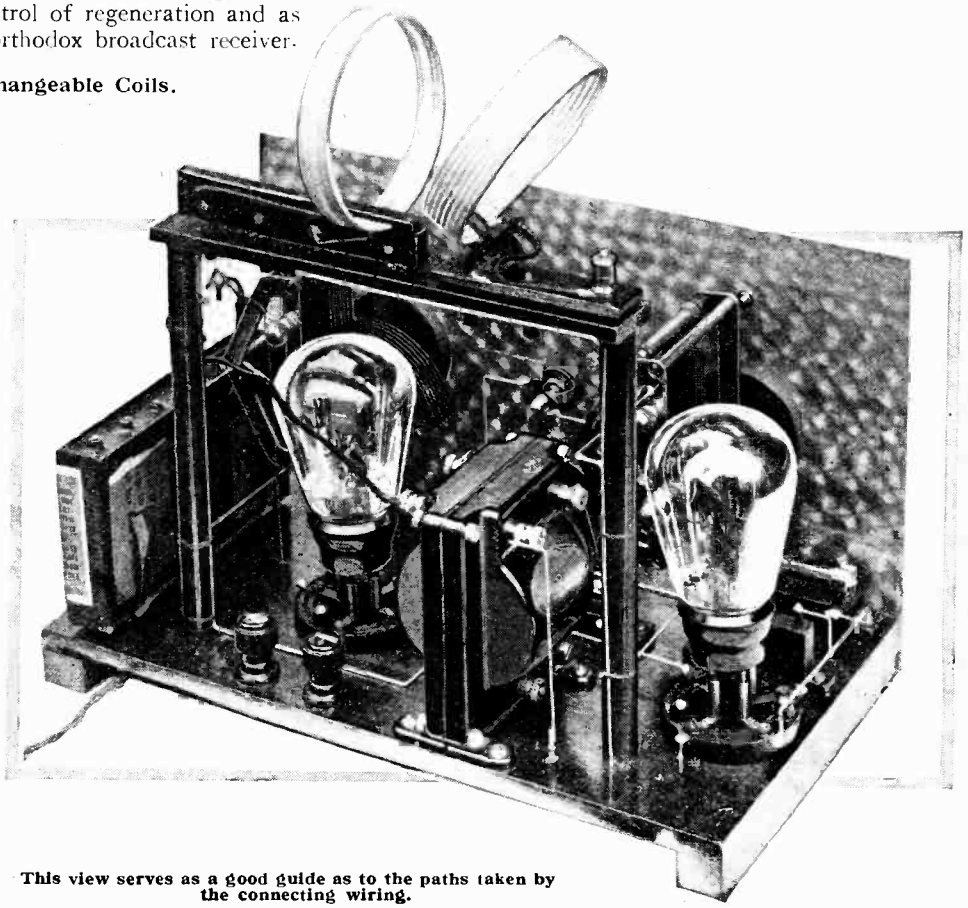
Robust interchangeable coils cover a wide wave-range. The turns are spaced wound and secured to very thin celluloid.

100 or more metres, free from capacity effects, possessing a particularly smooth control of regeneration and as easy to operate as the more orthodox broadcast receiver.

Short-wave Interchangeable Coils.

To fulfil the first requirement interchangeable plug-in tuning coils must be used. The form of construction adopted has many advantages. The coils are robust, and will withstand rough handling, although the turns are air-spaced and are supported by the minimum of dielectric material. The leading-out wires do not pass down through the former of the coil as required by the vertical form of mounting, and the leading-out wires of the grid circuit inductance do not exceed 1in. in length. These coils are similar to the form of construction developed by the Grebe Corporation in the United States and now produced by several American radio manufacturers. With a successful system for interchanging coils a small value of aerial tuning condenser may be used, so that the inductance-capacity ratio of the tuned circuit will be such that a maximum potential across the coil is maintained. The control of regeneration is, moreover, facilitated, while each coil covers only a limited range and carries a reaction coil of the requisite size.

The closed circuit and reaction coils are carried on "Bakelite" strips with four-pin mounting, the grid coil being linked with the aerial by means of inductive coupling. Only one aerial coil is used over the entire short-wave range, the turns being supported in an insulating clip and hinged from a two-pin base which gives support to the aerial terminal. On the higher range of short waves the coupling between aerial and grid coils is essentially inductive, though on the ultra-short wavelengths the coupling becomes a capacity one, as evidenced by the fact that only a small change results when the earth end of the coil is disconnected. It is desirable to avoid nutted connections in a tuned short-wave circuit, and positive contact is ensured by soldering the end of the wire to a small brass bush, which is in turn actually in soldered contact with the split pin. The manufacturing details of these coils have been developed by Collinson's Precision Screw Co., Ltd. An ebonite plate fitted with six sockets and long connecting tags supports the coils, and is elevated on ebonite pillars so that the coils may, in the case of a compact set, be arranged external to the cabinet away from masses of metal such as tuning condensers, inter-valve transformers, etc., and remote from the hand capacity effects of the operator.

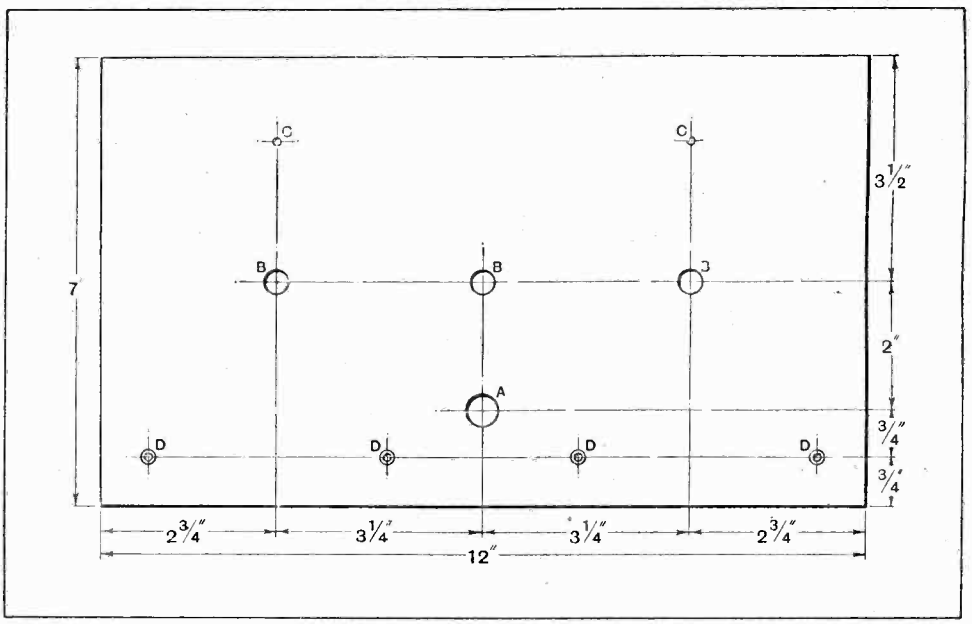


This view serves as a good guide as to the paths taken by the connecting wiring.

Short Wave II and Short Wave III.

Small Capacity Tuning Condenser.

To obtain a convenient tuning scale the capacity change of the condenser follows a logarithmic law. Its maximum value is as low as 130 micro-microfarads. A geared tuning dial is necessary, and it is desirable that the operating knob should be large not only for convenience of handling, but so that the surface leakage path can, if necessary, by careful fingering be made as long as possible. It is most important that the friction surfaces of a geared dial move without microphonic vibration as this might be imparted to the valves, for on short wavelengths valve microphonic properties are intensified. This special condenser for short-wave tuning is a product of the Ormond Engineering Co., Ltd.



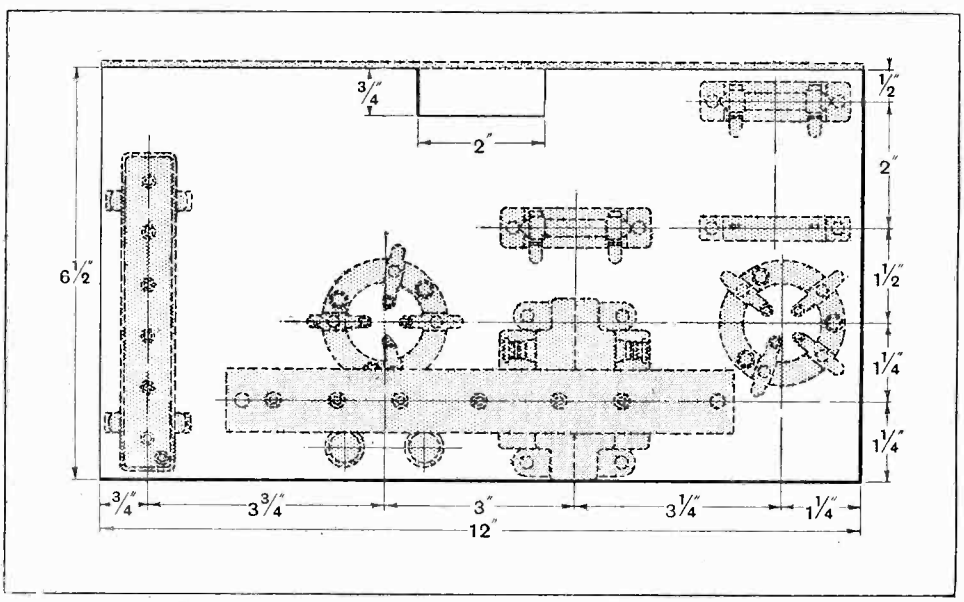
Panel drilling for the two-valve set. A, ⅛in. B, ⅛in. C, ⅛in.—holes for screws and back nuts with screw slot to serve as dial indicator. D, ⅛in. and countersunk for No. 4 wood screws.

For uniformity a condenser of similar outline is used for reaction control, its scale of adjustment being sufficiently critical. Although the capacity is 250 micro-microfarads, the overall depth behind the panel is uniform with the tuning condenser.

Short-wave and Microphonic Noise.

Care must be taken in short-wave work in the selection of the holder which supports the detector valve. What might appear to be a non-microphonic valve-holder by the fact that it is fitted with coiled springs may actually, on critical adjustment in the short-wave circuit, be found to be an additional source of microphonic noise. This is clearly evidenced by the pitch of the note set up, brought about by the circuit constants becoming changed by the vibrating valve mount.

It should be noted, also, that the components of the tuning circuit possess microphonic properties on short wavelengths. The vibrating plates of a condenser, shaky wiring, or the loose turns of a coil can all produce microphonic noise. This is easily demonstrated by bringing an absorption wavemeter, say, to within nine inches of the grid-plate coil of the just oscillating set and tapping the wavemeter container. A ringing sound is heard in the telephones which suggested to the writer the use of a tuning fork attached to the wavemeter so that its note is heard at resonance, the vibrations being actually transferred to the plates of the wavemeter condenser, causing minute changes in its capacity. Valve-holders should, of course, possess a minimum of dielectric material, and the two types shown in this article, as well as others of nearly similar construction, have been found particularly good.



Dimensions for laying out the components of the two-valve set.

Designs are given for both a two- and a three-valve set, and the choice as to which might be constructed is personal rather than technical. For instance, apart from cost, D.E.5 type valves

LIST OF PARTS.—SHORT WAVE II.

1 Aluminium panel, 12in. × 7in. × 3/32in. (hard rolled sheet.)
1 Baseboard, 12in. × 6in. × ½in.
1 Variable condenser, 0.00013 mfd., Logarithmic scale (Ormond).
1 Variable condenser, 0.00025 mfd., Logarithmic scale (Ormond).
Set of Short-wave coils and stand (Colvern, Collinson's Precision Screw Co., Ltd., Provost Works, Macdonald Road, Walthamstow, London, E.17).
1 Potentiometer (Igranic).
2 Friction control dials, Type R/137 (Ormond).
1 L.F. transformer, 3½ to 1 (A.F.3 Ferranti).
2 Valve holders (Bowyer-Lowe Co., Ltd.).
1 "Wearite" or "Benjamin" switch.
1 Grid leak, 5 megohms.
1 Resistance, 50,000 ohms (Ediswan).
2 Resistance holders (Dumetohm, Dubilier Condenser Co., Ltd.).
1 Fixed condenser, 0.0001.
1 9-v. grid bias battery.
2 Grid bias spring battery clips. (Deckorem, A. F. Bulgin & Co., 9-11, Cursitor Street, London, E.C.4).
2 Ebonite shrouded telephone terminals (Belling & Lee).
1 Cabinet, 12in. × 7in. × 7in. deep, with slotted top and lid, preferably finished in green polish with black front beading (W. & T. Lock).
Wander plugs, flex, screws, wire, etc.

requiring a heavy filament current are used owing to their non-microphonic properties, and liberal filament current supply may present difficulty. The three-valve set will not have a greater range of reception than the two, though the signals will be slightly stronger and, in consequence, the set will be more susceptible to microphonic valve noise when the table is knocked or the loud-speaker stood immediately alongside.

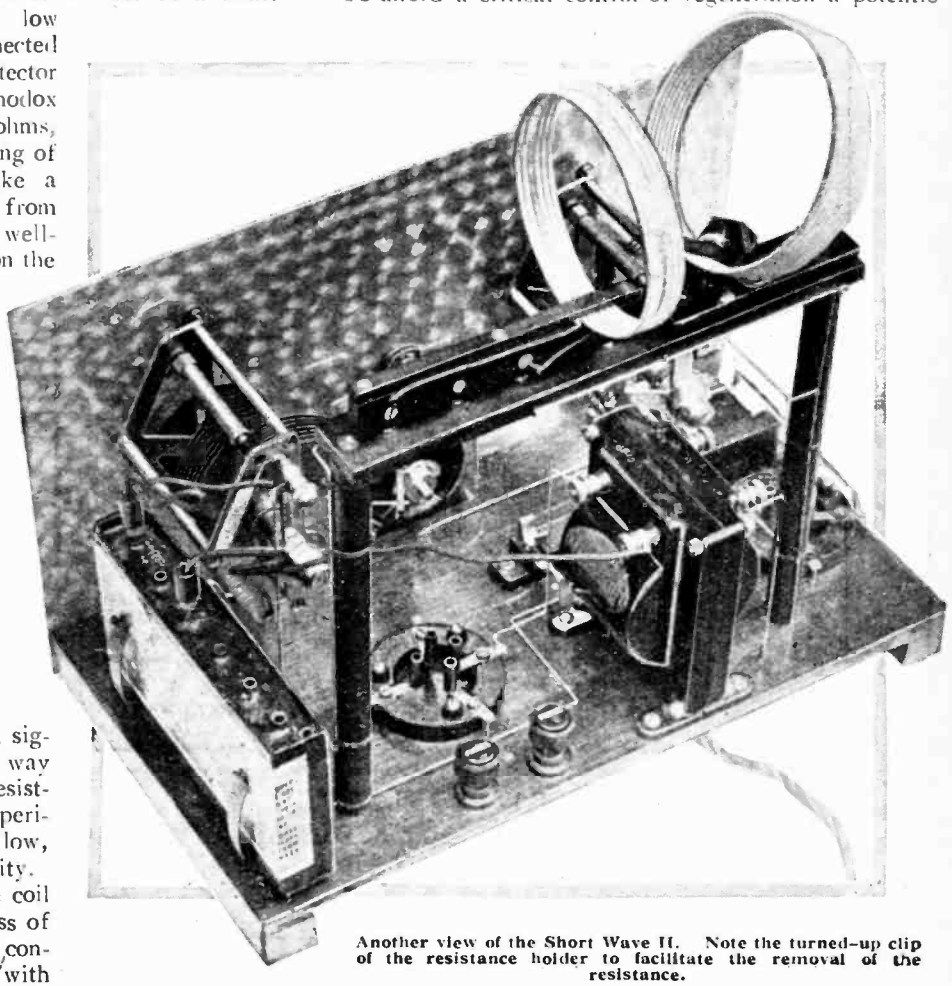
Resistance Instead of R.F. Choke.

The tuning circuit having been discussed, the only unusual detail in the two-valve set is the use of a small clip-in resistance having only low capacity between its ends connected in the plate circuit of the detector valve in place of the more orthodox choke coil. Its value is 50,000 ohms, ample to permit of the functioning of the reaction condenser. Unlike a choke coil, it is entirely free from resonances, which produce the well-known effect of "blind spots" on the reaction condenser scale where regeneration is only possible by increasing to a maximum setting, rapidly readjusting again to a low value as soon as the tuning is moved from the critical wavelength. Part of the signal voltage is, of course, dropped across this resistance, and for this reason it is necessary to use a transformer possessing high primary inductance, so that only a small part of the potential developed in the anode circuit is lost in the resistance. Before adopting the resistance, tests were made with a high-frequency choke, and the signal did not appear to be in any way superior. The actual value of resistance adopted was a matter of experiment, and, being comparatively low, has ample current-carrying capacity.

In the three-valve set a choke coil must necessarily be used or a loss of signal strength would result from connecting 50,000 ohms in series with the 100,000 ohm anode resistance and passing on to the first L.F. valve only that portion of the signal voltage which is set up across the coupling resistance. This coil is sectioned to reduce the self-capacity and assembled on a Paxolin tube, the turns being arranged as a compact air-spaced winding of small diameter so that the turn-to-turn capacity is small and the field of the coil is limited, eliminating the possibility of local station pick-up if the set is to be operated within a short distance from a high-power broadcasting station.

Potentiometer Control.

To afford a critical control of regeneration a potentio-



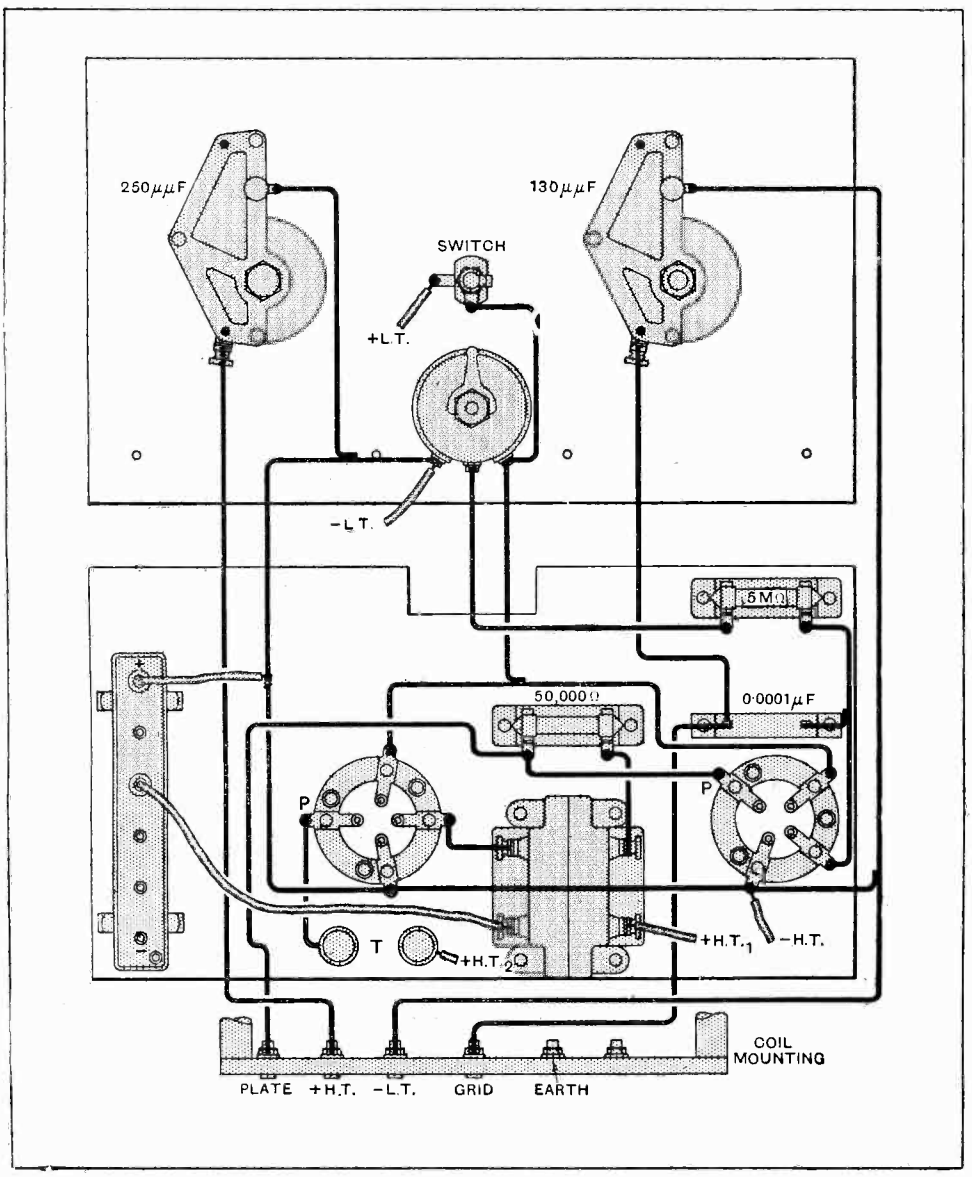
Another view of the Short Wave II. Note the turned-up clip of the resistance holder to facilitate the removal of the resistance.

Short Wave II and Short Wave III.—

meter is included in the circuit, though for maximum signal strength the aim should be to use the potentiometer to apply a positive bias. When searching, however, it may be set over to the negative side and slowly advanced to positive when bringing in the required signal, at the same time adjusting the reaction condenser and making the necessary slight compensating adjustments on the aerial tuning dial. The best values of grid leak and condenser for short-wave telephony reception are about 4 to 5 megohms and 0.0001 mfd.

Preparing Aluminium Panels.

Turning now to the construction of the sets, one would recommend the use of metal panels. Hard rolled aluminium sheet (British Aluminium Company) of $\frac{3}{32}$ in. gauge is comparatively easy to cut to size, and can be drilled with almost the same facility as ebonite. Panels exact to size, figured and lacquered, can be obtained (White Bros. and Jacobs, Ltd., 46, Chalk Farm Road, London, N.W.1.), while, if the reader cares to finish a panel himself, there will be no difficulty in producing the mottled effect by rotating beneath the thumb a piece of the finest grade "blue back" emery paper at intervals of about $\frac{5}{8}$in. in straight lines across the panel. It is worth while treating both sides of the panel in this way, and, while the markings are still bright, applying a transparent lacquer or one having amyl acetate as the solvent. The only screw heads, other than the dial indicators, appearing are those that secure the baseboard, and for uniformity with the white aluminium they should be warmed, dipped in soldering flux, and then tinned.

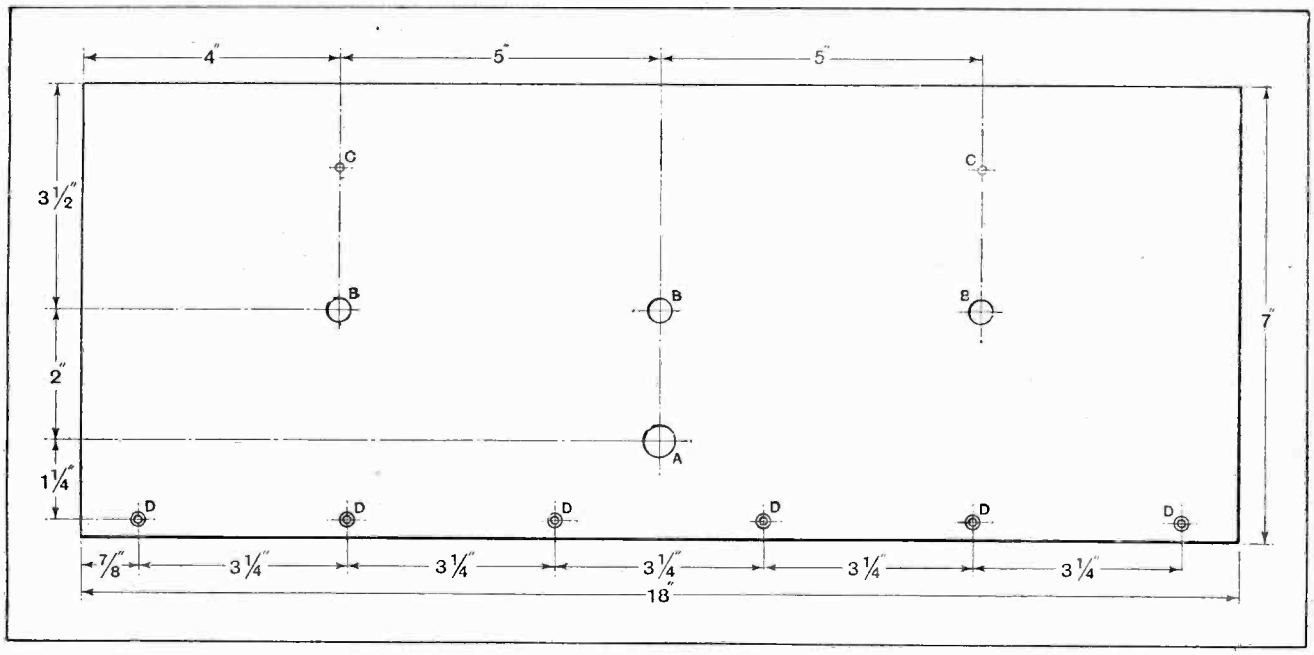


Leads and exact branching points of the two-valve set. Most of the battery lead wiring is beneath the baseboard.

The condensers are attached without bushing, and to make up the thread of the one-hole fixing $\frac{1}{4}$in. spacers are inserted at the back of the panel. These should not exceed about 1in. in diameter, or there will be distortion of the condenser, and care is needed when tightening the centre screw to avoid pulling the moving plates out of position. The movement of the dials is limited by a peg held under the centre nut, which should be so set that it stops the rotation of the condenser at exactly the maximum capacity in order to prevent the plates overturning. The dials should then read exactly 180°, and it will be found that the o precisely coincides with the indicator, though this time the rotation is limited by the moving plates coming into contact with the bar on the condenser.

Details of Assembly.

The potentiometer is secured by means of screws and nuts in preference to the one-hole fixing with which it is provided, the centre hole being drilled out to give clearance to the spindle. As it does not improve appearance, the silvered indicating plate of the potentiometer is omitted. It will be seen that the face of the panel connects through the frames of the condensers to the L.T. −. It is advisable to scrape away the lacquering



Drilling details for the panel of the Short Wave III. Hole sizes are given in the drawing of the panel of the two-valve set.

under the condenser fixing nuts to ensure good contact, so that it only becomes necessary to clamp up a small piece of bent metal under one of the potentiometer terminals, bedding this, also, against the cleaned face of the panel before tightening up the fixing screw.

The "on and off" switch, being connected in the positive L.T. lead, must be insulated from the panel, the bushes being made from pieces sawn off of ½in. ebonite tube or drilled ebonite sheet.

Assembly is carried out according to the dimensional

The Short Wave III. Small ebonite cleats are useful for holding down the battery and L.F. leads tightly against the baseboard.

LIST OF PARTS.—SHORT WAVE III.

1 Aluminium panel, 18in.×7in.×$\frac{3}{32}$in. (hard rolled sheet.)
1 Baseboard, 18in.×8in.×$\frac{1}{2}$in.
1 Variable condenser, 0.00013 mfd., Logarithmic scale (Ormond).
1 Variable condenser, 0.00025 mfd., Logarithmic scale (Ormond).
2 Friction control dials, Type R/137 (Ormond).
Set of Short-wave coils and stand (Colvern, Collinson's Precision Screw Co., Ltd. Provost Works, Macdonald Road, Walthamstow, London, E.17).
1 Potentiometer (Igranic).
1 L.F. transformer, 2 to 1 (B.T.H.).
3 "Tiger" valve holders (Athol).
1 "Benjamin" or "Wearite" switch.
1 Grid leak, 4 megohms.
2 Resistance holders (Dumetohm).
2 Fixed condensers, 0.0001 mfd.
1 15-v. grid bias battery.
1 Anode resistance, 100,000 ohms.
1 H.F. choke (Watmel Wireless Co.).
1 Fixed condenser, 1 mfd.
1 Fixed condenser, 0.1 mfd., mica.
6 Ebonite shrouded terminals, optional (Belling & Lee).
2 Ebonite shrouded telephone terminals (Belling & Lee).
1 Ebonite shrouded earth terminal (Belling & Lee).
2 Ebonite shrouded aerial and counterpoise terminals (Belling & Lee).
1 Cabinet, 18in.×7in.×8in. deep, fall front (Carrington).
Sistoflex, wire, Wander-plugs, flex, screws.

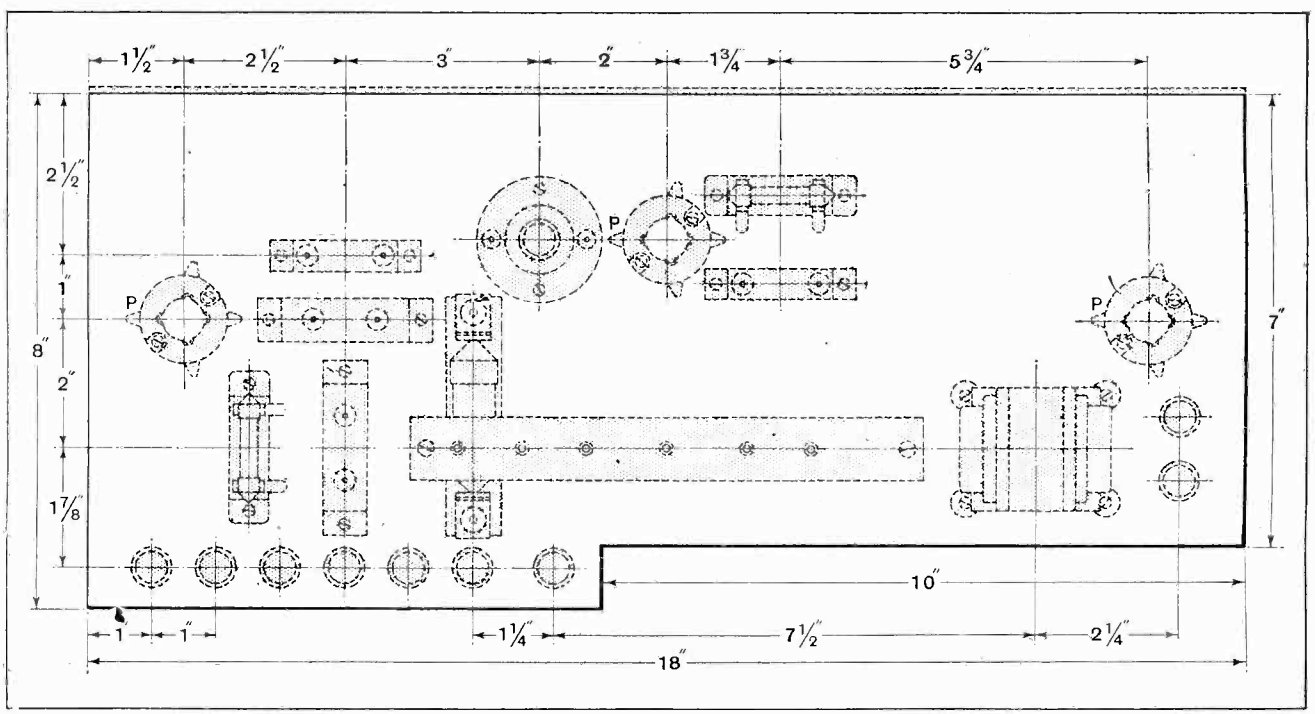
drawings, the baseboard of the two-valve set being elevated on $\frac{1}{2}$in. battens so as to accommodate low frequency and battery leads beneath it and to give clearance to the projecting stems of the terminals. In the case of the three-valve set there is a recess in the base of the cabinet, so that there is no need to raise the baseboard to accommodate the underneath wiring and terminal stems, though if a different form of cabinet is used from that specified the fitting of battens becomes necessary.

Spacers made from $\frac{1}{4}$in. ebonite sheet are inserted under the porcelain Athol valve holders to prevent the grid and plate connectors making contact with the baseboard. This precaution is only essential, of course, in the case of the detector valve. The clips of holders for the grid leaks may with advantage be bent up to facilitate the insertion of the resistances.

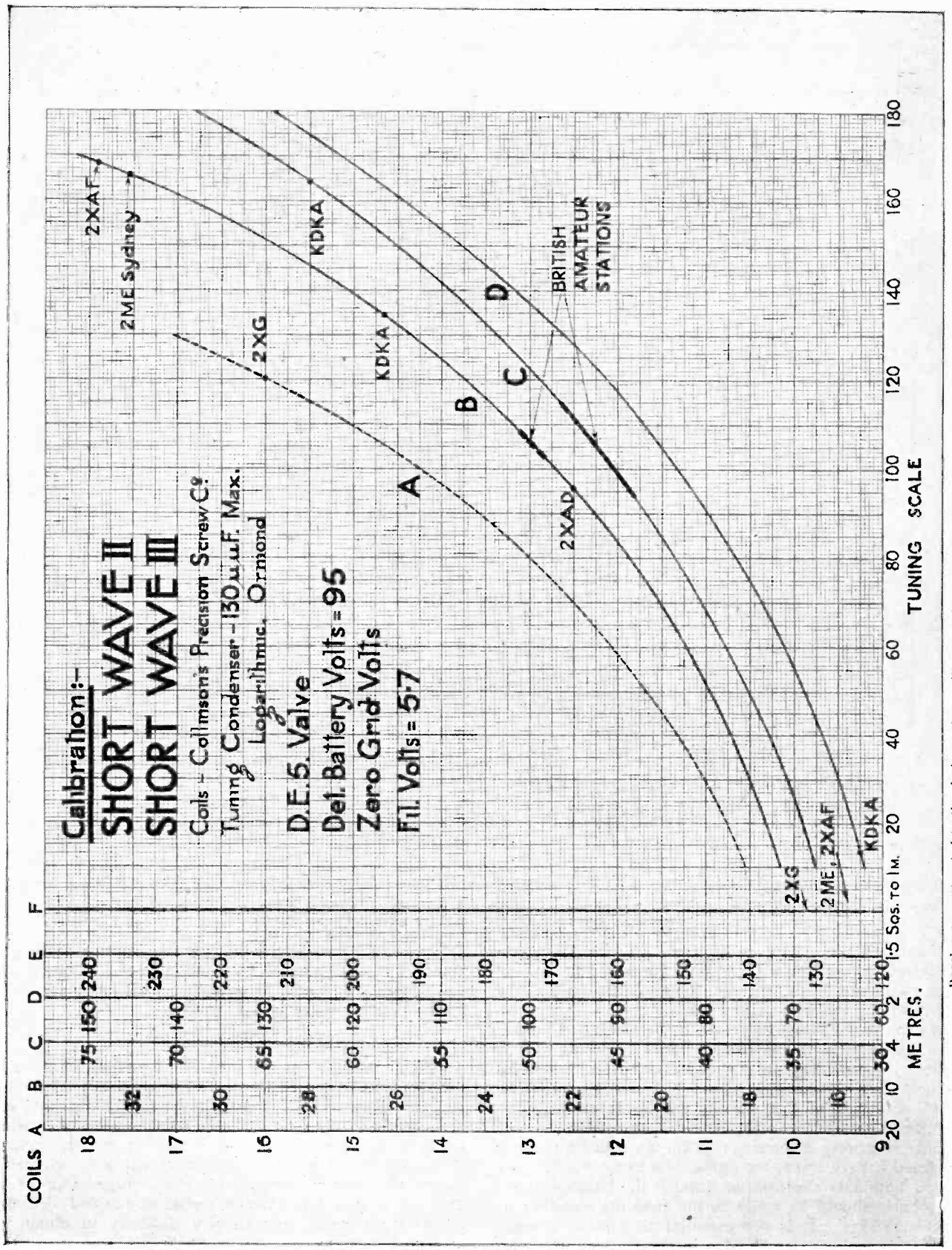
Drilled ebonite rods $\frac{3}{8}$in. in diameter support the coil platform. If these are made by the reader, he is reminded of the need for making the ends perfectly square. Tapping for the fixing screws can be avoided by drilling an under-sized hole. Care is necessary in locating the holes on the baseboard for securing these uprights, as regards the two-valve set, in order that the strip may exactly coincide with the slot in the top of the box, though the wood may be slightly bevelled away on the underside to guide the strip into position. These rods are $6\frac{9}{16}$in. and $2\frac{3}{16}$in. respectively for the two- and three-valve sets.

Precautions when Wiring.

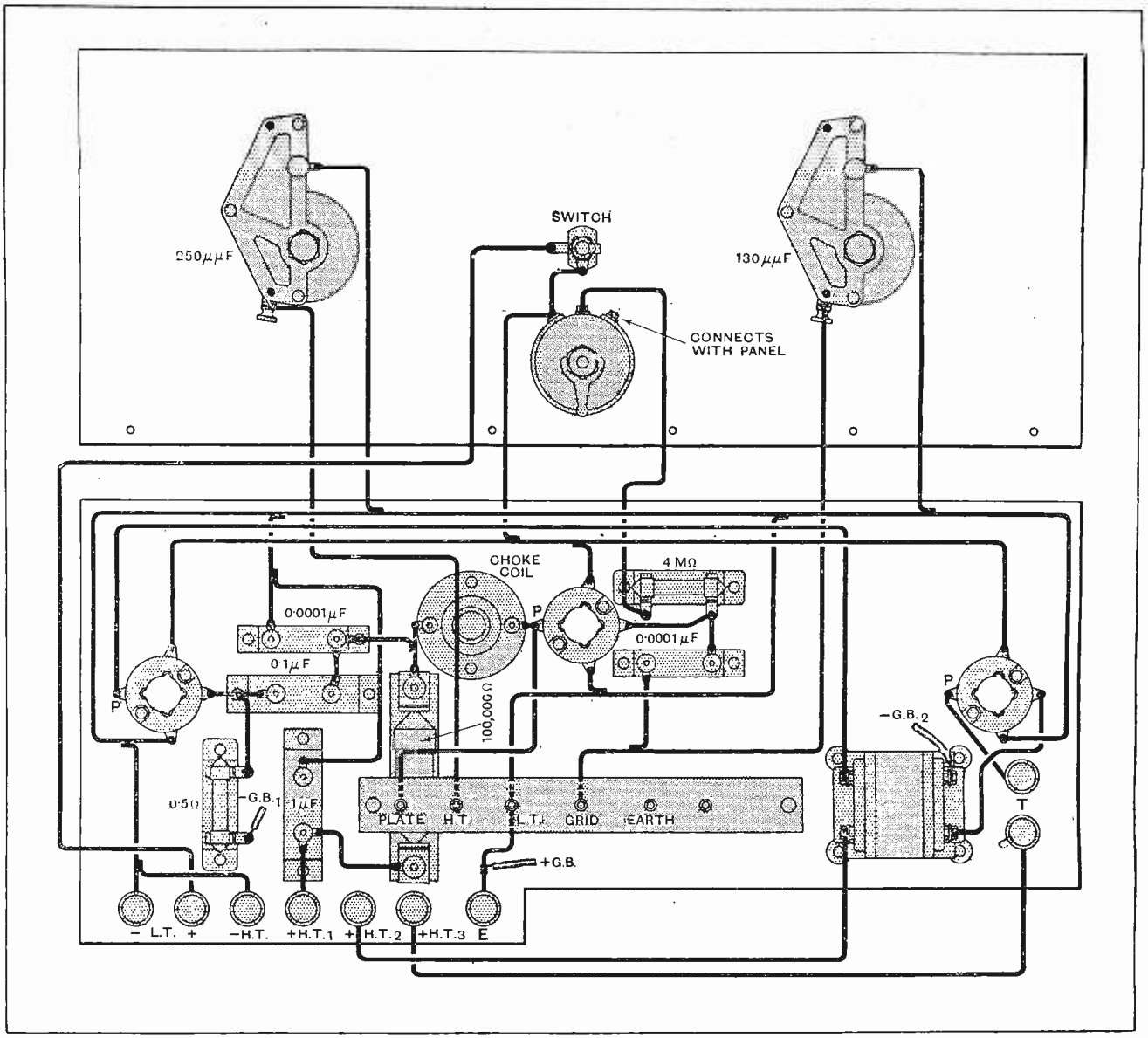
Take every care possible when wiring, particularly in regard to the tuned closed circuit and the grid and plate leads of the detector valve. Wires which pass down from the coil holder strip, in the two-valve set, may be tied with waxed thread to the upright pillars. No. 18 S.W.G. tinned wire is used, and all wires running along the face or beneath the baseboard should be slipped in sleeving before being bent to shape.



The positions of the components on the baseboard of the three-valve set.



Receivers constructed to the designs given will not differ widely in their tuning from this calibration.



Practical wiring of the Short Wave III. The battery terminals may be abandoned and substituted by a row of tags screwed to the baseboard. One common H.T. positive terminal is satisfactory.

Small ebonite cleats sawn from ebonite sheet and measuring about $\frac{5}{8}$in. × $\frac{1}{4}$in. × $\frac{1}{8}$in., for securing the surface baseboard leads, will be found particularly useful for clamping the wire in position.

As the panel is in contact with the baseboard, and in turn connected with the battery supply, nothing will be gained by providing an elevated ebonite terminal strip, and, in fact, the insulating properties of dry wood to the D.C. potentials of the batteries are far in excess of the insulation existing in the batteries themselves. Terminals, or merely connecting tags for use with permanently attached battery leads, are screwed on to the wood. Telephone terminals also are put through the baseboard, and $\frac{3}{8}$in. holes should be made in the case for inserting the telephone tags. It is not essential to provide separate H.T. terminals for each valve in the three-valve set, as the resistance coupling following the detector valve demands a higher value of H.T. for self-oscillation on all wavelengths, and critical adjustment of the plate volts of the detector valve is not required.

Threshold Oscillation.

When searching for distant stations rotate the reaction dial backwards and forwards all the time, through a few degrees, while slowly advancing the tuning dial over its entire scale so as to " feel " the point where self-oscillation, as indicated by a faint breathing sound, occurs. The set must not go into regeneration with a " pop," and using the valves suggested earlier—type D.E.5 or D.E.5B in the case of the resistance-coupled detector valve—there should not be any difficulty in obtaining exceedingly critical control of oscillation.

Short Wave II and Short Wave III.—

Between the setting on the reaction dial of strong oscillation where signals are weak, and the point where the condenser just creeps into oscillation, will probably be a movement of never less than 10 degrees on the dial, and at some settings considerably more. There will always be at least one degree to move over when obtaining good quality from distant telephony stations, and the dial can be rotated backwards and forwards, any setting giving just the same effect irrespective of the direction of rotation. There will be very little need to widely swing the reaction condenser except when using, perhaps, one particular coil and when the wavelength to which the set is tuned corresponds with an harmonic frequency of the aerial. To tide over this precise setting with a good control of regeneration the aerial coil may be dropped over, say, to an angle of less than 45° from the horizontal, though the normal position should be, perhaps, about 10° from vertical. Failure to obtain regeneration is often due to a fall in the H.T. battery potential, and the simple expedient of keeping a testing voltmeter to hand is strongly advised.

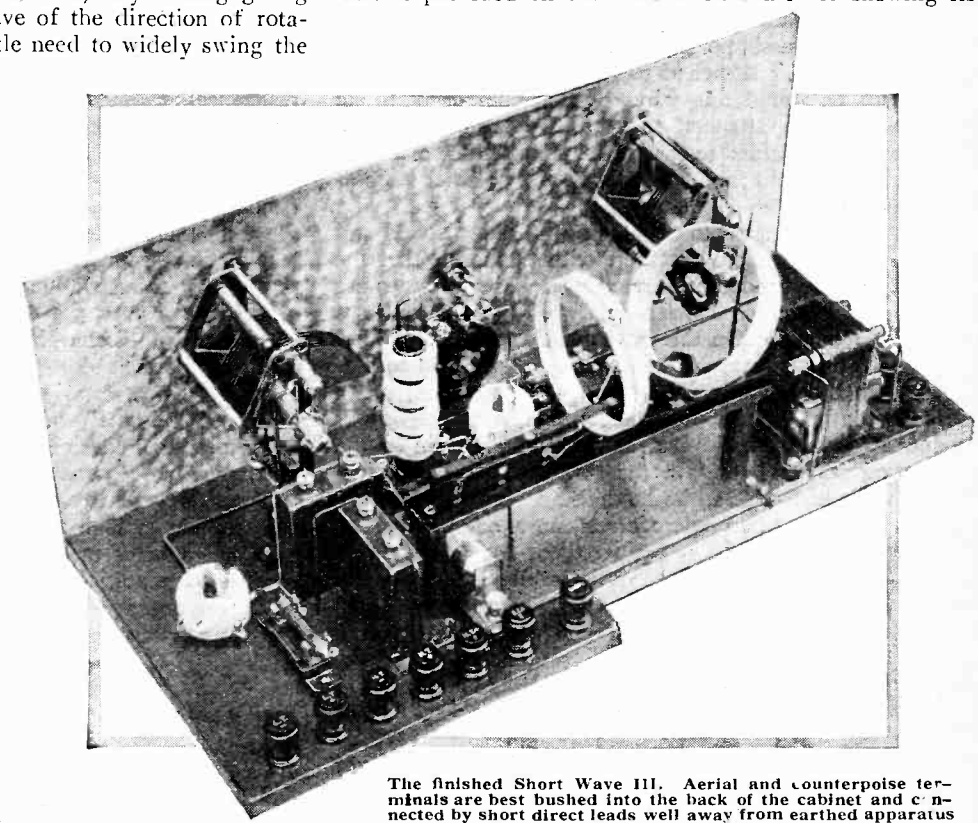
Operating Hints.

The earth tag of the coil is not shown connected in the wiring diagrams as it will be found that a counterpoise, or separate earth connection, may give better results when receiving from a particular station, the effect being to control the elevation of the angle of reception from the Heaviside layer.

The calibration, as given, will be found to hold good within, say, 1 or 2 metres on 45 metres. Actually, the two sets were found to differ on this wavelength by only 0.5 metre. Stations received are shown on the curves, though when the particular wavelength is obtained near the maximum end of the tuning condenser scale it is worth while substituting a larger coil and searching near the minimum. For this reason it may be found useful to add to the range of coils by introducing intermediate sizes, though each coil in the range specified overlaps with those on either side.

A coil to cover the broadcast band with an optimum to tune to the local station will extend the scope of the sets giving loud-speaker reception, the circuit being equivalent to the popular Reinartz. For this reason a grid bias of 15 volts is fitted to the three-valve set, and in the output stage a small power valve should be substituted.

On the completion of the construction of either of the sets the reader may be quite confident that he will be able to receive 2ME (or 2FC) Sydney, Australia, on 32 metres, using the "C" coil and adjusting the tuning condenser to a position near the zero end of the scale. The best time to listen being at present between 6 and 7 p.m. B.S.T. Local conditions will not materially affect reception, and it may be found that a small aerial will give just as good results as one which is much higher and unscreened. For broadcast reception an additional coil (F) may be used, and in order to record station settings a line is provided on the calibration chart for showing its wave range. On the extremely short wavelengths the calibration curve shown dotted may involve an appreciable error owing to stray parallel capacities, and the inductance of the leads being comparable with the inductance of the coil. The use of interchangeable coils is a feature of outstanding importance, and is essential for embracing the present wavelength range covered by the short-wave broadcasting stations.



The finished Short Wave III. Aerial and counterpoise terminals are best bushed into the back of the cabinet and connected by short direct leads well away from earthed apparatus and the operator.

Readers undertaking the construction of either of these sets are advised that receivers constructed exactly in accordance with the designs given will be available for their inspection at *The Wireless World* Stand at the forthcoming Radio Exhibition at Olympia.

WIRELESS EXHIBITION AT OLYMPIA.

September 24th to October 1st.

***NEXT WEEK'S ISSUE:* GUIDE TO THE SHOW.**

Forecast of the new apparatus to be exhibited

Constructional details of a Long-range Receiver.

"THE WIRELESS WORLD EXHIBITION FIVE."

VALVE CAPACITIES.

Reasons for Increase of Grid-filament Capacity under Working Conditions.

By W. JAMES.

IF we break open a three-electrode receiving valve and examine it carefully we shall see that the elements of the valve are supported on wires whose ends are embedded in glass. Attached to the ends of the wire supports will be found fine wires of platinum or platinum substitute, while attached to these are ordinary copper wires which are joined to the valve's pins. The valve pins themselves are held in a shell of bakelite or other insulating material.

The wires connected to the elements (filament, grid and anode) run fairly close together, with the result that the capacity of the condenser formed by a pair of electrodes is quite appreciable. The capacity of the electrodes is larger, of course, when the valve is mounted in a holder. If, therefore, we measure the capacity of the grid to filament with the anode connected to earth we shall get a surprisingly large value due to the proximity of the various connecting wires, valve pins, etc., and the nature of the insulating material used in the construction. A typical power valve measured in its holder had a grid to filament capacity of 10.5 micro-microfarads, an anode to filament capacity of 8.1 micro-microfarads while the capacity measured between the grid and anode terminals was a little less, being 5 micro-microfarads.

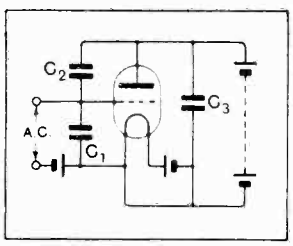


Fig. 1.—The principal inter-electrode valve capacities.

Strictly speaking, then, when we represent a valve in a wireless circuit we should show three condensers connected between the elements of the valve. This is not done as a rule, probably in order to simplify diagrams; but as a result of this omission it is safe to say that the presence of these condensers is not always realised. These condensers, tiny as they are, play a most important part in the behaviour of high- and low-frequency amplifiers, and in the operation of detectors as well.

Their effect in low-frequency amplifiers and detectors is apparently only just beginning to be appreciated, but readers will know that these capacities are held responsible for most of our troubles in high-frequency amplifiers.

Losses Due to the Valve's Capacity.

One or two effects can be explained very easily. Thus, suppose we have a valve, Fig. 1, whose anode is connected to the filament through a battery. We apply an alternating voltage to the grid-filament as indicated, and by the usual valve action cause the anode current to vary according to the input voltages. But across the grid-filament terminals is a condenser C_1 representing the valve capacity; this condenser will therefore have to be charged by the applied alternating voltages, and as the capacity is one having an imperfect dielectric (glass, bakelite, etc.), a small amount of energy is absorbed. This will tend to reduce the applied voltages because a load (which can be represented as a perfect condenser shunted by a resistance) is joined across the circuit. As is well known, an imperfect condenser can be represented by a perfect condenser shunted by a resistance, or by a perfect condenser in series with a resistance, and the poorer the condenser, that is, the larger its losses, the smaller will be the equivalent shunt resistance, and the larger the equivalent series resistance.

The first thing we notice, then, is that the grid circuit of a valve absorbs power. This, of course, is wasted in charging and discharging the condenser formed by the grid and filament electrodes, wires, valve pins, etc. Further, it will be clear that if the valve is mounted in a holder of the type comprising valve sockets embedded in an insulating material having poor dielectric properties, that much more power will be wasted.

Tests show that certain valve holders are quite unsuitable for use in high-frequency circuits because they have a large capacity measured between their terminals and because the material used in the construction of the valve holder is not a good insulator as regards its dielectric properties when subjected to high-frequency currents.

Valve Holders for H.F. Work.

It should be understood that the valve holders referred to have a very high insulation resistance as measured with a megger, and that the losses which we are discussing are due to the behaviour of the material when subjected to high-frequency voltages. This point was investigated by

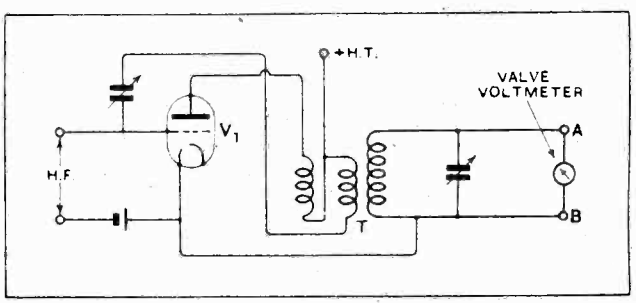


Fig. 2.—Circuit for testing insulation of valve holders at high frequencies.

the writer some time ago, and it was found that certain valve holders put such a load on the grid circuit as to lower the applied voltage by a serious amount and also to have an adverse effect on the selectivity of the circuit.

The circuit used for the tests is given in Fig. 2. An oscillator adjusted to 400 metres was set up and connected to the input of valve V_1, and the high-frequency transformer T was tuned to 400 metres. Across the secondary

Valve Capacities.—

winding, at terminals A B, a carefully designed valve voltmeter of the anode rectification type was connected, and the input to valve V_1 was adjusted to give exactly three volts across terminals A B. The grid and filament terminals of various valve holders were then connected to points A B and the voltage indicated by the valve voltmeter was noted. It was necessary to retune the circuit to compensate for the valve holder's capacity, but beyond this no changes were made. The high-frequency transformer was a specially made one, having a secondary winding of high-frequency cable, and its resistance at 400 metres was 2.5 ohms with the valve voltmeter connected.

Tests on Valve Holders.

A large number of valve holders of different makes were tested and the results were very surprising—in fact, the writer became quite alarmed at the losses of most of the valve holders because, at that time (about two years ago), he was developing high-frequency transformers characterised by their low-loss secondary windings.

It seemed at first as though the ordinary valve holders put such a load on the circuit that the transformers he had developed would not show up to great advantage, but it was found that there were three or four valve holders which caused only a small drop in the voltages set up across the secondary. One of these was made of solid ebonite, another was of porcelain, while the third, the Bowyer-Lowe, had a skeleton construction.

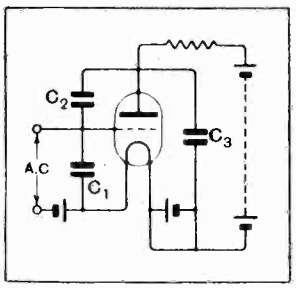


Fig. 3.—Circuit of Fig. 1 with resistance in anode circuit.

Certain popular valve holders had alarmingly large losses, and in order to put the matter on a proper basis the equivalent resistance of the holders was determined by removing them from the circuit and connecting grid leaks of known value to give the same voltmeter readings.

For the tuned circuit specified, and with a secondary coil of 200 microhenries, it was found that the effect of connecting the grid and filament terminals of a popular valve holder to points A B was equivalent to putting a resistance of 200,000 ohms across the circuit. In one particular instance the voltmeter reading fell from 3 to 2.1 volts when the valve holder was connected. This is a very serious matter, and proves what many people have probably noticed, that the type of valve holder used plays an important part in determining the stability of a high-frequency amplifier using good coils.

Stability in H.F. Circuits.

Anyone interested can find for himself the effect of using a valve holder of the type having its sockets and terminals embedded in an insulating material of doubtful properties (there are many of them on the market). He will find it is very much easier to stabilise a set having a neutralised stage of high-frequency amplification when such a valve holder is used instead of one having really low losses.

A careful experimenter will also have no difficulty in detecting the effect on selectivity of changing from a good to a bad one, and, as a matter of fact. when a neutralised set is troublesome, that is, inclined to oscillate uncontrolably, changing the valve holder may make a lot of difference. The writer has not himself resorted to this trick, preferring to retain the efficiency of the circuit and to stabilise it by some other means not involving a loss.

The matter is dealt with at some length because it is of importance to the reader who constructs receivers, and will enable him to see why, in the writer's sets at all events, it is necessary to use the components specified.

Importance of Anode-grid Capacity.

Returning now to the circuit of Fig. 1, we have, in addition to the grid-filament condenser C_1, the capacity of the grid to anode represented by condenser C_2. Alternating currents will therefore pass direct from the grid circuit to the anode circuit, and more energy will be absorbed by the grid circuit, depending, of course, on the nature of the anode-grid capacity. The anode-grid capacity is, of course, in effect connected between grid and filament in the circuit of Fig. 1, because the anode battery has a low resistance. As this condenser has the same electrical properties as that of the grid-filament condenser, though the actual capacity is smaller, we see that the total loading effect across the grid circuit is still more increased. The applied voltage is therefore further reduced by the anode-grid capacity.

If now we connect a resistance in series with the anode battery as in Fig. 3, the alternating current applied to the grid will produce alternating voltages across the anode resistance, and we know from the simple formula for resistance amplification that the magnitude of the voltages set up depends on the value of the added resistance compared with that of the valve. It is important to remember, too, that as the grid voltage increases the anode voltage falls.

Values of Working Capacity.

If, therefore, the anode resistance is equal to the A.C. resistance of the valve the voltage magnification will be half the voltage factor of the valve. In other words, if we apply V volts to the grid and the magnification obtained is M, the voltage of the anode with respect to the filament is MV volts, from which it follows that the voltage of the anode with respect to the grid is $(M + 1)$ V volts. The charging current which tends to flow through the anode-grid capacity is therefore determined by the value of this condenser and the voltage $(M + 1)$ V, and the effective capacity of the grid is therefore $C_1 + (M + 1) C_2$.

Thus the working capacity of the grid is mainly determined by the anode-grid capacity of the valve and the amount of magnification obtained. If the valve is of the high voltage factor type and a high resistance is connected to the anode, we shall therefore expect the working grid capacity greatly to exceed the capacity measured when the valve is not connected to a circuit, that is, under static conditions. Further, and this is a point which is very important, the working capacity of the grid will vary every time a change is made to the anode circuit, to the

Valve Capacities.—

grid bias, or to the filament voltage. In fact, the capacity will vary *every* time an adjustment is made which alters the amplification.

These things are well known in practice. A valve wavemeter, for instance, is usually provided with a filament voltmeter and a milliameter for the anode circuit in order that the conditions which obtained when the instrument was calibrated may be repeated, for in the light of the foregoing explanation it is easy to see that changes in filament current, which affect the impedance of the valve and therefore the alternating voltage developed in the anode circuit, will alter the valve capacity and so upset the calibration. In order to minimise this effect, wavemeters have been produced in which the grid circuit is joined across only a small portion of the grid tuning coil instead of across the whole coil.

An ordinary receiver having a reacting valve will exhibit this effect, a change of filament current or anode voltage almost invariably altering the pitch of a beat note which may be heard, showing that tuning has been affected.

Testing Valve Capacity.

The important point to remember is this, that the effective grid capacity of the valve under working conditions, that is, when the valve is connected in an amplifier, depends on the anode-grid capacity and on the amplification. Anything which alters the amplification alters the effective grid capacity

From the information given above it is easy to see that this capacity can reach very large values in practice. For instance, if the valve has an anode-grid capacity of 5 micro-microfarads and the magnification is 20, the effective grid capacity is of the order of 105 micro-microfarads to which must be added the static capacity of grid to filament.

It is also important to remember that by the anode-grid capacity of the valve is meant the capacity of the valve itself, its holder and connecting wires. Bulky pieces of

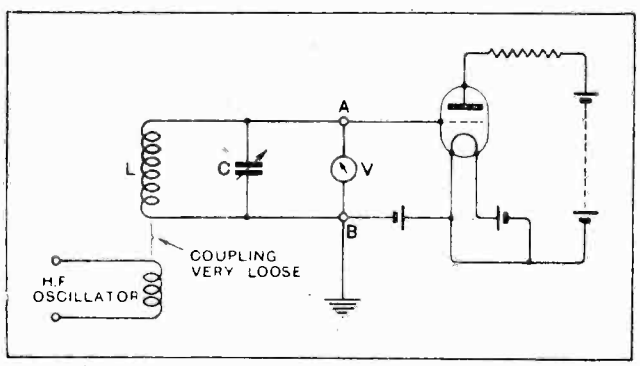


Fig. 4.—Experimental arrangement for demonstrating effect of anode resistance on grid-filament capacity.

apparatus connected to the grid and anode may have a large capacity, which is included in the term "anode-grid capacity." For this reason it is often important to screen apparatus electrostatically, as the writer has done on many occasions. As an example, a coil connected to the grid may be so placed in a receiver as to have an appreciable capacity with a coil connected to the anode; screening will reduce, or practically eliminate, this capacity.

A further experiment which proves conclusively the effect of the anode circuit in increasing the valve's effective capacity is easily performed. Set up a tuned circuit as in Fig. 4, and connect a valve voltmeter of the anode rectification type to points A B. This instrument is used to indicate resonance. Loosely couple an oscillator tuned to, say, 400 metres, to the coil L, and tune circuit L C to resonance, as indicated by the maximum reading of the valve voltmeter. Having noted the reading, which may be 3 volts, connect a valve holder and retune the circuit.

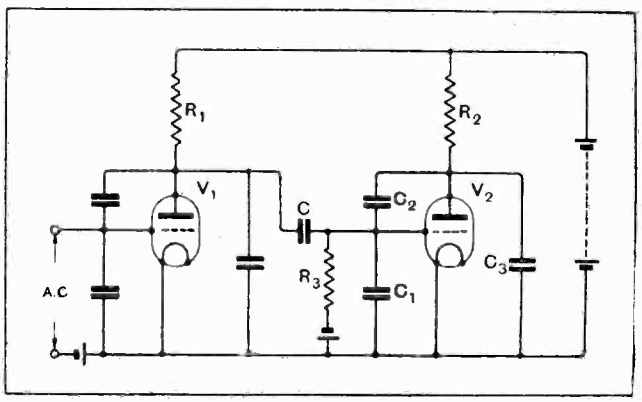


Fig. 5.—Resistance-capacity coupling showing inter-electrode capacities.

Notice that the voltage has fallen, perhaps to 2.5 volts, because of valve holder losses. Now place a valve in the holder, retune, and notice that once again the voltage has decreased, being, say, 2.3 volts. The next step is to light the valve and connect the anode battery to it, but do not join the anode resistance. Retune the circuit again if necessary and note the voltmeter reading—probably it will still be 2.3 volts.

We are now ready to connect the anode resistance. When this has been done, notice that the condenser C has to be turned by quite a considerable amount in order to bring the circuit into resonance once more, showing that the effect of the resistance in the anode circuit is very materially to increase the grid's capacity. It will also be noticed that the voltage has fallen very considerably. If the resistance is altered in value it will be necessary to retune the circuit, and, in general, the voltage across the tuned circuit will vary according to the anode resistance. If a switch is fitted across the anode resistance so as to short-circuit it, or open-circuit it, we can see very easily what a large effect the anode circuit has on the grid circuit.

Another thing which will be noticed is that the value of the anode resistance affects the sharpness of tuning of the circuit L C by an amount depending on the value of the resistance used. The effect is an important one, and shows that the input circuit is loaded by an impedance instead of a pure capacity.

The Resistance Amplifier.

We can now consider one or two more of the very important effects produced as a result of the valve's inter-electrode capacity.

Valve Capacities.—

The first concerns the resistance amplifier. Here we have a circuit connected as in Fig. 5, which shows part of two stages of resistance amplification with valves V_1 and V_2, a coupling condenser C, and condensers representing the valves' capacities. When a signal is applied to the grid of V_1 an alternating voltage is set up across the anode resistance R_1, which is passed to V_2 by the condenser C, and so produces further amplified voltages across anode resistance R_2.

The anode-grid capacity of valve V_2 will therefore pass a current depending on the amplification given by valve V_2, and the voltage applied to the grid of V_2. But this voltage, which is applied to the grid through the anode-grid capacity, is out of phase with the voltages applied to the grid by valve V_1. The phase difference depends on the magnitude of the condenser C_2 and the effective resistance in series with it, this resistance having a value determined by the grid leak R_3 shunted by the resistance R_1 and by the anode filament resistance of valve V_1.

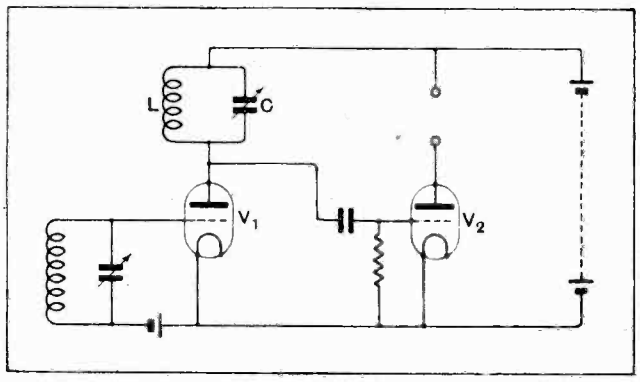


Fig. 6.—Simple H.F. amplifier with tuned-anode coupling.

Thus the net applied voltage representing the signal is reduced by an amount which depends on the two factors just mentioned, and the overall amplification is reduced. In other words, we get here an anti-reaction effect which cuts down the signal strength.

Valve Capacities in Radio-frequency Amplifiers.

Valve capacities are particularly troublesome in radio-frequency amplifiers, and act to limit the amount of amplification which can be obtained with stability. As an illustration of this we may take the case of the well-known tuned-anode circuit, Fig. 6. Here we have a valve V_1 to whose grid circuit is connected a tuned circuit comprising a coil and condenser. The incoming oscillations induced in this circuit set up voltages across the grid and filament of the valve. Connected to the anode is the coil L and condenser C.

When circuit L C is tuned to resonance with the oscillations it offers an effective resistance of magnitude $\frac{L}{CR}$ ohms, L being the inductance of the coil, C the capacity across the coil, and R the loss resistance of the circuit at the frequency considered. The phase angle is zero, and therefore it would seem that the circuit should produce precisely the same effects, as regards the grid circuit, as would a pure resistance of the same value, $\frac{L}{CR}$ ohms, joined to the anode—that is, the input voltages would be reduced in value owing to the anti-regenerative effect which was explained above. But what happens in practice? Everybody knows that the circuit oscillates most violently. This is due to the fact that the circuit is not tuned to resonance at all, but is tuned to give the loudest signals.

The action of the circuit is rather complicated under these conditions, but, briefly, we may say that when the circuit is tuned to a longer wavelength than that being received, that is, when the impedance of the anode circuit is capacitative, self-oscillation cannot so readily occur because the phase of the current fed back to the grid is such as to reduce the applied voltages. In other words, the effect is one of anti-reaction. (We are assuming, of course, that there is no magnetic coupling in this circuit.)

When the anode circuit is inductive, however, as it will be if the capacity of the tuning condenser is not quite sufficient for resonance, that is, the circuit is tuned to a lower wavelength than the resonant wavelength, the effect produced is quite the reverse. The E.M.F. applied to the grid through the anode-grid capacity is such as to assist the signals already there. A positive reaction effect is produced and signals are strengthened. The strengthening may be such that continuous self-oscillations are produced. This will depend on the constants of the grid circuit, the valve used, and the battery voltages. Generally, it is only too easy to set up continuous oscillations in this way, as users of tuned anode sets know only too well. For self-oscillations to be avoided, then, it is necessary to tune the anode circuit to resonance, but this can hardly be effected in practice, as one naturally tunes for the strongest signals. These will be obtained when the anode circuit is slightly inductive, producing positive reaction which strengthens the signals.

Thus the circuit will not be working at its best because it is slightly out of tune with the incoming signals, although it has to be admitted that in practice one will always tune for the strongest signals except when a separate reaction coil is used to strengthen them, when it is better to work with the anode circuit properly tuned.

Summing up, then, we may say that the effect of valve capacity is to provide a connection between grid and anode circuits such that the valve is not a truly unilateral device. This means that the electrical constants of the anode circuit affect the grid circuit, reducing the amplification and impairing the selectivity in some instances, and increasing the amplification and sharpening the tuning in other instances. Further, when the anode circuit is inductive by an amount depending on the remainder of the circuit, self-oscillations may be set up and the circuit rendered extremely difficult to handle. A definite limit to the amount of amplification which can be obtained is therefore set.

Special Valves.

The question might therefore well be asked as to whether it is not possible so to arrange the circuit that the harmful grid-anode capacity is balanced out or neutralised in some manner, and one might also enquire as to whether valves cannot be redesigned in order to overcome this defect. The answer to the first question is, of

Valve Capacities.—

course, Yes; it is easily possible so to arrange high-frequency circuits that the anode-grid capacity is neutralised. Quite a number of circuits are known, and we can say at once that many are easy to set up; but the subject is such a large one that further consideration must be left for the time being.

With regard to the second question asking whether valves having a very small or negligible anode-grid capacity can be designed, readers will know that for several years one or two types of valves having small capacities have been available to the public. Such a valve is the Marconi type V.24, which has the following electrode capacities measured with the valve in its holder :—

Grid to filament = 1 micro-microfarad.
Anode to grid = 1.6 ,, ,,
Anode to filament = 1.1 ,, ,,

This type of valve is unfortunately not very efficient, reckoned in terms of its anode A.C. resistance and voltage factor, and it happens to be quite expensive, probably because of its special construction and because so few are made. Even so, at one time this type of valve was used a good deal. But nowadays attention is being directed to other forms of construction, and one, which will apparently be very extensively used in the near future, has a fourth electrode.

This is placed between the normal grid and anode, and being connected to earth or to a point on one of the batteries serves as an electrostatic screen, reducing very effectively the harmful anode-grid capacity of the valve.

The circuit of a simple receiver comprising one tuned anode stage connected to a detector is therefore as drawn in Fig. 7 (compare with Fig. 6), where the fourth electrode is shown between the usual grid and anode. It is connected to a point on the anode battery, thus acting as a space-charge grid as well as an electrostatic screen.

Because this arrangement has such a small anode to grid capacity the circuit's tendency to instability is greatly reduced. We are, of course, still left with the capacities of connecting wires and apparatus external to the valve, but these can easily be taken care of by suitably arranging the circuit.

The simple valve just described, having a fourth electrode, has not a practically zero anode-grid capacity, and investigators who have interested themselves in the problem are not satisfied that such a simple arrangement by any means represents finality in design. Only quite recently Doctor Hull, in America, has published the results of experiments with valves which were specially

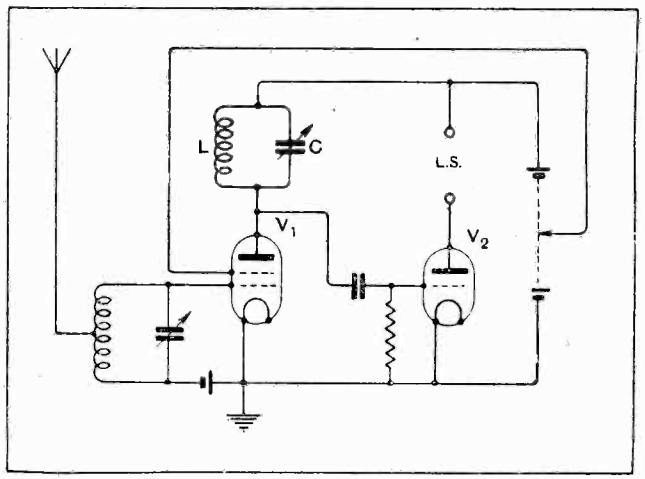


Fig. 7.—Circuit of shielded valve amplifier.

constructed and have only a minute anode-grid capacity. With such valves it is, of course, practicable to obtain very high amplifications merely by properly proportioning the circuits associated with the valves.

One should remember, however, that *all* stray couplings have to be eliminated before really successful high-frequency amplification can be obtained, and in this connection it is of the utmost importance to remember that in many of the receivers described in the technical papers of to-day the valve capacity is not the fundamental cause of instability. Rather is it due to lack of skill, or perhaps just to lack of care on the part of the designers really to eliminate all unnecessary coupling by proper circuit arrangement and disposition of parts in the receiver.

(Since this article was prepared the Marconi and Osram companies have produced a four-electrode valve of the shielded type, details of which were given in the August 31st issue of this journal.)

Marconi Exhibits at Olympia.

Several new features illustrating the development which is continually being made in maritime wireless apparatus are exhibited by the Marconi International Marine Communication Co., Ltd., at the Shipping, Engineering and Machinery Exhibition, which opened at Olympia on September 8th.

Perhaps the most interesting of these exhibits, having regard to recent developments, is the Marconi Auto-Alarm, which has been designed to respond to the alarm signal when the wireless operator of a ship is off watch and so to recall him to the wireless room.

Another piece of new apparatus is the Marconi 1½ kW. C.W.-I.C.W transmitter, type MC6. This set works on

TRADE NOTES.

wavelengths of from 600-850 metres and from 2,000-2,700 metres, to cover which wavelengths it was formerly necessary to use two transmitters. It is a valve transmitter operating on continuous waves and interrupted continuous waves, both of which are very selective forms of transmission. Signalling on the long wavelengths will only be effected by continuous waves, but for the shorter wavelengths either continuous waves or interrupted continuous waves can be used.

The Marconi marine direction finder, which is now carried on some 300 vessels of the British mercantile marine, and has proved itself of great assistance in navigation, is a well-known instrument which will again be seen on the Marconi stand.

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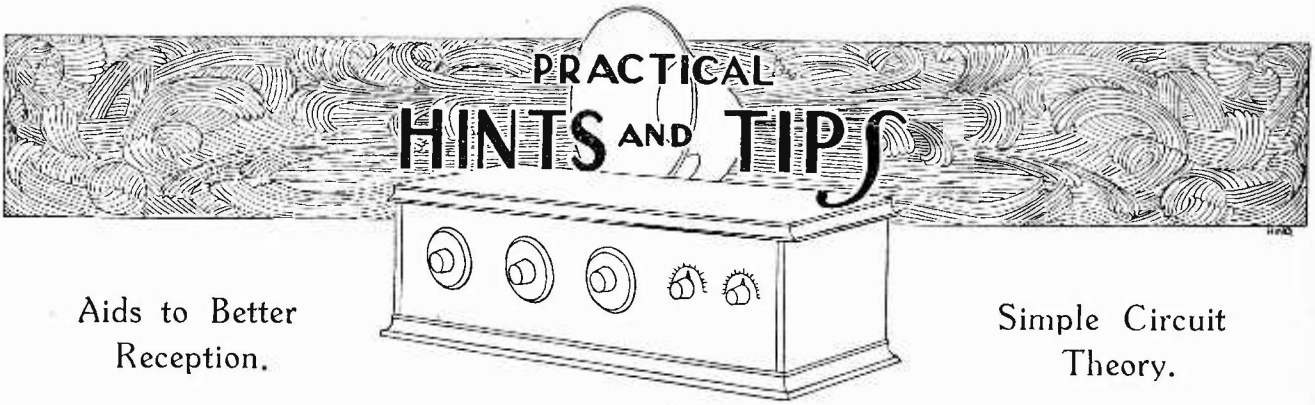
Wireless at British Industries Fair.

Next February's British Industries Fair at London and Birmingham promises to beat all previous records in regard to space taken by exhibitors. In a recent interview an official of the Department of Overseas Trade said that among the sections which at this early date are already larger than last year is the wireless section. Each year the number of visitors has steadily increased.



Aids to Better Reception.

Simple Circuit Theory.

GRID BIAS SAVES THE H.T. BATTERY.

WHEN using valves of fairly low impedance, such as the D.E.5 type, always use as much negative bias on the grids as is possible without weakening signals or introducing distortion. Quite apart from the other and more frequently-mentioned reasons a negative bias on the grid of a valve reduces the steady D.C. anode current and thereby lessens the drain on the H.T. supply. This is particularly important when ordinary dry H.T. batteries are used. For headphone work with an anode voltage of 60 or 80 we sometimes do not trouble to provide any bias other than is obtained by completing the grid circuit to the negative wire of the filament circuit, because we find that additional bias does not bring any noticeable improvement in signals. But there is the other side of the question. The inclusion of a biassing battery of 4 or 5 volts, although it does not make a great difference to the signal strength, may prolong the life of the H.T. battery considerably. This applies to the use of medium and low impedance valves such as are supplied for L.F. transformer-coupled amplifiers and power stages. With high-impedance valves, of course, the case is different, as these cannot take much grid bias, and in any case the anode current is seldom much greater than one milliampere.

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IMPROVING THE DIRECTIONAL EFFECT OF A FRAME AERIAL.

AN ordinary frame aerial such as may be found connected in the usual manner to a broadcast receiver does not give a very sharp directional effect, nor is such an effect greatly required in the majority of cases. The position of minimum reception of any given station is not sharply defined and the signals from the station are not completely eliminated, whichever way the frame is turned. It may sometimes be desired to improve the directional effect either for the purpose of direction-finding work or for the elimination af some interfering station. This may be done very simply by using an exact centre-tapping on the frame windings and connecting as shown in the figure. It will be seen that the frame aerial tuning condenser is across the whole of the frame wendings, while the potentials for the grid of the first valve of the set are only taken across half, the centre-point of the frame being connected to the filament circuit and thereby maintained at earth potential. The spare half of the frame winding can conveniently be used to supply reaction if required by inserting the variable condenser shown by

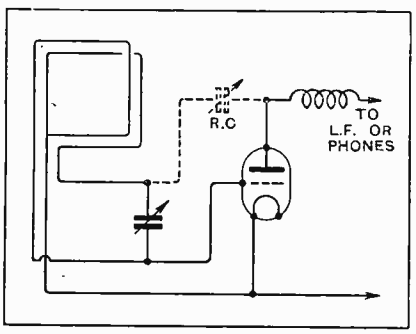

Fig. 1.—Frame aerial circuit giving sharply defined minimum.

the dotted lines. Leads from the frame to the receiver should be as short as possible, equal in length and close to each other.

This simple procedure eliminates the non-directional electrostatic pick-up, and can be made to give a sharp zero comparable with that given by more cumbersome methods.

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ACTUAL ANODE VOLTS.

THE practice of reading valve curves and fixing the value of the H.T. and grid batteries is growing and is to be commended. It must not be forgotten, however, that the voltage applied to the valve anode is not the same as the voltage across the terminals of the H.T. battery or the "mains unit." There is, of course, always a drop due to the resistance of the load, be it resistance, choke, transformer, or loud-speaker.

In all cases but that of resistance coupling, the valve will receive something like 10 per cent. to 25 per cent. less than the voltage of the battery, which should be increased accordingly.

In the case of resistance coupling, a very sensitive milliammeter is necessary to help to ascertain the voltage the anode of the valve is receiving. The voltage dropped in the resistance equals the product of the value of the resistance in ohms and the current in milliamperes divided by 1,000.

This drop may be considerably more than that across the valve, and leads one to expect distortion, owing to the fact that a low anode voltage, and therefore a very limited straight portion of characteristic curve, is available. Actually, for reasons which cannot be dealt with here, the presence of the high resistance in the anode circuit straightens up the characteristic curve very considerably, thus ensuring the freedom from distortion which one associates with well-designed resistance coupling.

MOUNTING A BALANCING CONDENSER.

A CONSIDERATION of the circuit diagram of a typical neutralised H.F. amplifier will show that both sides of the balancing condenser are at high oscillating potential, and thus, in whichever way it is connected up, hand-capacity effects will be observed. To prevent trouble from this source the majority of manufacturers fit an ebonite extension handle, some two or three inches in length. This arrangement is perfectly satisfactory as long as the condenser is mounted on the baseboard, inside the receiver, but when it is fitted to the panel, in order that a control of regeneration may be easily obtainable, the fragile extension rod is likely to be broken off.

The possibility of this accident is avoided by mounting the condenser in the manner shown in the accompanying illustration. A small bracket of the type sold for supporting panels, which is screwed to the baseboard, serves as a support. The hole in the metal bracket through which the shank is passed should be bushed with ebonite or other insulating material.

The bracket is placed in such a position that the end of the control rod projects about half an inch through a hole drilled in the panel.

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LOOSER LOOSE COUPLING.

THE keen amateur constructor of a few years ago almost invariably used a separately-tuned and loosely-coupled aerial circuit, and there seems to be a distinct tendency nowadays to revert to this well-tried and inherently sound arrangement, particularly in receivers which are intended to cover a wide band of wavelengths. The matter has been dealt with at some length in this section of *The Wireless World* as well as in constructional articles, but a few additional hints will be of value to those who have failed to derive the fullest possible benefit from loose coupling. It should be noted that the more popular direct aerial connection came into general use only because it eliminated an extra control and tended to simplify and cheapen the receiver. These advantages were obtained at the cost of selectivity, a quality which is now more desirable than ever, or which, at any rate, will become so when the regional scheme is in full operation.

The benefit of a separately tuned aerial circuit is not fully appreciated until the coupling between the two coils is made really loose, and, particularly on the longer waves, where large coils are necessary, it is often a difficult matter to provide sufficient separation between primary and secondary inductances. Where sufficient space is available it is a good plan to weaken coupling by "splitting" the aerial coil into two parts, as shown in Fig. 2. By adopting this plan, it is an easy matter to find a combination of coils which will give the desired transference of energy between closed and open circuits, and which at the same time will tune over the waveband required. For example, if the aerial is of normal dimensions and capacity, it will sometimes be found that a No. 25 loading coil (L_1) in conjunction with a coupling coil (L_2) of the same size will cover the upper part of the 200-500-metre band. It should be observed that the sum of the turns in the separate coils will be somewhat greater than that required to give the required inductance value when a single coil is used. This is because the two parts of the aerial inductance are (or should be) out of inductance relationship with each other. In order to obtain this condition it is desirable to place an earthed metallic screen between the coils, as indicated in the diagram; unless this is done, it may be difficult to provide the physical spacing which would otherwise be necessary.

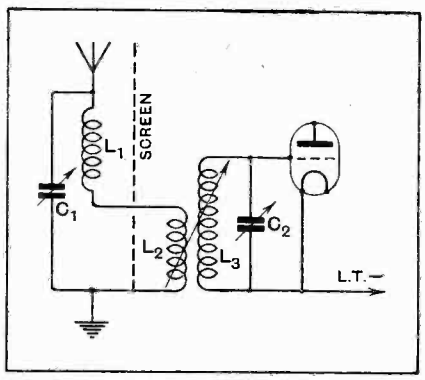

Fig. 2.—Divided aerial coil for obtaining loose coupling.

A coupling inductance of 25 turns, as mentioned above, may prove excessively large, particularly when the construction of the holder (or the space available) is such that the coils cannot be widely separated. In this case it is necessary to use a still smaller coil, with possibly some 15 turns; these are not generally obtainable from wireless dealers, but it will be found an extremely easy matter to remove turns from several of the more popular commercially-made coils.

The arrangement suggested may often be applied to an existing receiver by mounting L_1 externally to the instrument; the axis of this coil should be at right angles to that of L_2, from which it may be separated by as much as 8in.

There is another small matter which has been found to trouble those whose previous experience has been confined to the simplest type of receiver. All the reaction necessary for a set such as the "Regional" receiver, described in the issues of this journal for August 17th and 24th, 1927, is obtained by setting the neutralising condenser at a point slightly "off balance." Now it will often be found that a given adjustment will result in complete stability (or freedom from self-oscillation) over the waveband covered by the transformer in use as long as aerial coupling is moderately close, but, when this is loosened very considerably, oscillation will be produced, due to a reduction in the amount of aerial damping. Troubles of this sort may be overcome by operating the set in a completely balanced condition, or by unbalancing only when it is desired to increase the strength of a weak signal which is already audible.

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H.F. AMPLIFIERS.

A HIGH-FREQUENCY amplifying valve is usually followed by a detector valve in the anode circuit of which is either a pair of telephones, a resistance, or the primary of a transformer. These telephones or transformer primary should always be shunted by a by-pass condenser so that there can be no appreciable H.F. voltage set up on the anode of the detector. If this condenser is omitted the set may become unstable and signal strength may be lost. This is particularly so in the case of neutralised H.F. amplifiers.

CURRENT TOPICS

News of the Week — In Brief Review

A HANDSOME PROPOSAL.

The Southwark Guardians propose to spend £1,000 on a wireless installation for their hospital.

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EMPIRE BEAM SCHEME COMPLETE.

The opening of the beam wireless service to India last week marked the completion of the Government scheme of 1923 for linking up the entire Empire by wireless. The other beam services are those to Canada, Australia, and South Africa.

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FRENCH TESTS FOR BRITISH LISTENERS.

A special experimental transmission will be made by the French broadcasting station, Radio Agen, in the department of Lot-et-Garonne, on Sunday next, September 18th, at 11.30 p.m., using the wavelength of 297 metres (1,009 kc.). The station directors are anxious to obtain reports from British listeners, with information as to quality, fading, power, and other conditions of reception.

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ATTACK ON RED TAPE.

A handshake to Councillor Townsend, of the Blackburn Town Council! At the last Council meeting Mr. Townsend recommended that steps should be taken to make it easier for persons applying for powers to erect wireless aerials. At present they had to draft plans, etc., and this was difficult for the ordinary layman.

Councillor Townsend is evidently an enemy of red tape. May his good works prosper.

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AERIALS AS AIR BEACONS.

A double purpose is served by the two 300ft. aerial towers of the new 50 kW. station of the American National Broadcasting Company at Belmore, Long Island. They act as a valuable beacon for aviators, and for this purpose are painted in alternate 12ft. bands of black and yellow, besides being fitted with flood-lighting equipment.

Tests are being conducted regularly on a frequency of 610 kilocycles. The experimental call-sign is 2XZ, but the station will shortly adopt the familiar call letters WEAF when the new transmitter supersedes the present 5 kW. instrument in New York City.

HAVE YOU HEARD COMO?

The new Italian broadcasting station at Como has started transmissions, working on a wavelength of 500 metres with a power of 5 kilowatts.

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MODEL ENGINEERS' EXHIBITION.

The Tenth Annual Model Engineer's Exhibition will open at the Royal Horticultural Hall, St. Vincent's Square, Westminster, on Saturday next, September 17th. The exhibition will close on the following Saturday.

We understand that a feature of the exhibition will be a demonstration of television and "noctovision" by Mr. J. L. Baird.

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LEAGUE OF NATIONS BROADCASTS.

The proceedings of the Eighth Assembly of the League of Nations at Geneva are being relayed by a number of French broadcasting stations this week, both at 10 a.m. and 3 p.m. The stations participating are: Ecole Supérieure, 458 metres; Eiffel Tower, 2,650 metres; Lyon, 476 metres; Marseilles, 309 metres; Toulouse, 260 metres; Bordeaux, 270 metres; and Lille, 286 metres.

FARMERS AND WIRELESS.

Approximately one out of every five farmers in the United States relies on broadcast market reports and agricultural information, according to the U.S. Secretary of Agriculture.

In this country the proportion of wireless-informed farmers is probably higher.

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BERLIN'S GIANT LOUD-SPEAKER.

The largest loud-speaker in use in Berlin has been installed at the Tempelhof aerodrome, writes a correspondent. It is of the Siemens and Halske type and has been designed to give audible reproduction over a radius of 1,000 metres. The valve amplifier to operate this huge instrument employs a 1,500-volt anode supply, the last power valve carrying an effective load of 500 watts.

The loud-speaker is used for making announcements to the large crowds frequenting the aerodrome on race days and other occasions.

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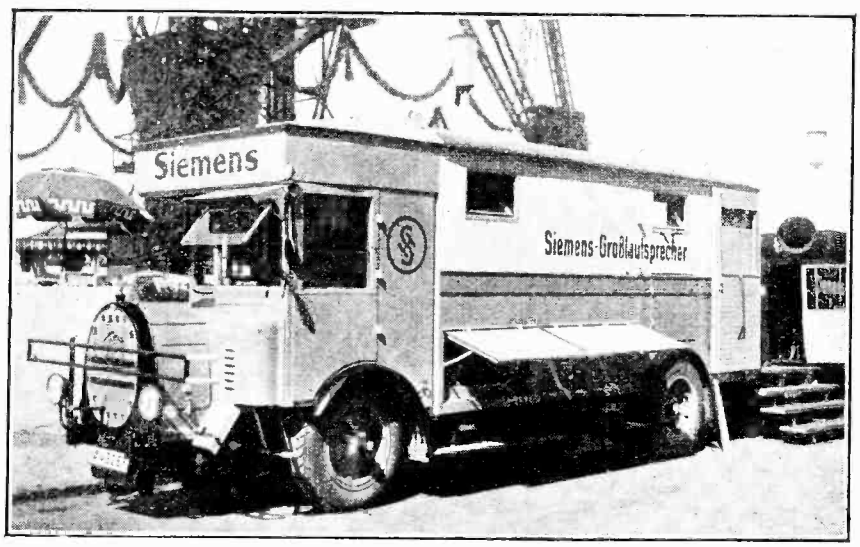
SHORT-WAVE BROADCASTING TRIUMPH.

A new era of broadcasting was opened on Sunday, September 4th, when the



SEEN AT THE BERLIN SHOW. One of the large demonstration vans which toured the grounds at the Berlin Radio Exhibition last week. A portion of the huge broadcasting mast can be seen in the background.

B.B.C. was able for the first time to relay a programme broadcast from Australia The Australian station was 2ME broadcasting a programme from 2FC, Sydney, on 32 metres.

In spite of much atmospheric disturbance, the reception was fairly good, the general impression being that the relay was better than the first one from America attempted by the B.B.C. two years ago.

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MAJOR VINCENT SMITH.

We regret to record the death, on September 5th, of Major T. Vincent Smith, who for two years had been wireless correspondent to our esteemed contemporary, *The Times*. Major Smith had been associated with wireless for over twenty years, having joined the Amalgamated Radio Telegraph Company in 1906. During the war he served as Senior Wireless Officer to the Royal Flying Corps in France, and subsequently was placed in charge of wireless at the Air Ministry for all theatres of the war. He was a member of the wireless section of the Institution of Electrical Engineers and of the Radio Society of Great Britain.

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N.S.W. BROADCASTING POLICY.

In broadcasting matters the New South Wales Cabinet is putting its trust in the principle of one main station assisted by a number of relays. Plans have been approved for the establishment of a 15 kW. station in or near Sydney, with six relay stations in various parts of the country. The total cost is estimated at £30,000.

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VACANCIES FOR FLIGHT CADETS.

The Air Ministry announces that an examination for the entry of flight cadets into the R.A.F. Cadet College, Cranwell, will commence on November 15th, when no fewer than thirty-five cadetships will be offered for competition. Application to sit for the examination should be made to the Secretary, Civil Service Commission, Burlington Gardens, W.1, but in no circumstances will completed entry forms be accepted after September 28th. All candidates must be between the ages of 17½ and 19½.

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POLYTECHNIC COURSES IN WIRELESS.

Courses in wireless and high-frequency engineering will begin at the Polytechnic, 307-311, Regent Street, London, W.1, on Monday, September 26th. The courses extend over a period of five years (including a preliminary first year course for the elementary student) and aim at giving complete tuition in the technique and practice of modern radio communication.

Enrolments begin to-day (Wednesday) and full particulars regarding fees, etc., can be obtained on application to the head of the wireless section, Capt. W. H. Date, B.Sc. (Eng.), at the above address.

BOOMING RADIO IN RUSSIA. The Soviet Government is losing no opportunity of fostering an interest in wireless throughout the country. The photograph shows part of a Soviet radio display in a small Russian town.

NEWS FROM THE CLUBS.

Radio Society of Great Britain.

Vacancies exist in the Radio Society of Great Britain for new members, and enquiries should be addressed to the Hon. Secretary, Radio Society of Great Britain, 53, Victoria Street, S.W.1. The qualifications necessary for the granting of membership are that the applicant should have been engaged in research or experimental work in the science of radio communication for at least two years and possess the necessary qualifications and training. Other grades of membership are associate members and associates, the last-named not being corporate members. A membership diploma is granted and the proceedings of the society are issued monthly, post free to all members, in the "T. and R. Bulletin," the official organ of the society.

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Objects of the Society.

Founded in pre-war days, the society has among its objects the general advancement of the science and practice of radio communication and the exchange of information and ideas among members, and obtaining the maximum liberty of action consistent with safeguarding the interests of all concerned. During the session two meetings a month are held at the Institute of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

Full particulars regarding the membership and subscription are obtainable from the hon. secretary.

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Transmission: Yesterday and To-day.

Radio transmission was dealt with in an able lecture delivered by Mr. L. C. Holton at the last meeting of the North Middlesex Wireless Club. Mr. Holton described the *desiderata* of a transmitter as being (*a*) reliability, (*b*) purity, (*c*) limited elasticity of wavelength. From the point of view of the amateur, portability should not be lost sight of. The lecturer began with a brief account of the early days of valve transmitters when an ordinary French "R" valve was used. He explained that the tendency towards long waves was due to the fact that the early valves refused to work on the shorter wavelengths. A reduction in wavelength came with the improvement in valves and the introduction of the choke control method of transmitting telephony. After touching upon crystal control of wavelength, Mr. Holton concluded with advice on the design of an amateur transmitting station. Variation in pitch in the sending, causing a slight change in wavelength, which in turn is produced by a fall in plate potential, was responsible for much difficulty in reading Morse signals and led the lecturer to recommend the use of a circuit where the valve oscillates all the time even when the key is raised.

Hon. secretary: Mr. H. A. Green, 100, Pellatt Grove, Wood Green, N.22.

IMPRESSIONS of THE BERLIN SHOW

Electrostatic Loud-speakers.—Switching in H.F. Circuits.—Novel Receiving Valves.

By A MEMBER OF OUR STAFF IN BERLIN.

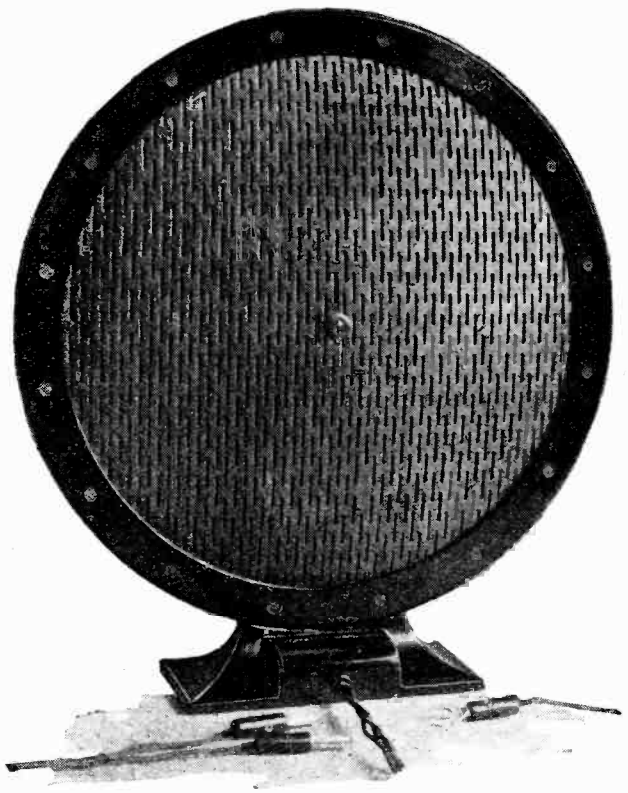
THE annual exhibition of the representative Association of German Wireless Manufacturers was held this year from September 2nd-11th in a building erected specially for the purpose, which was completed shortly before last year's show, and in which the 484-metre Berlin broadcasting station is permanently housed. The main tower supporting its aerial is in the grounds, and access to its top, or to a restaurant half-way up, is available to the public.

There were approximately 300 exhibitors—an increase of about 20 per cent. as compared with last year—and it was observed that manufacturers of components, as opposed to complete valve receivers, were in the majority. In fact, half the firms which originally made valve sets under licence have either dropped out of the radio industry or have concentrated their energies on the production of such accessories as may be freely exported without difficulties in regard to patents. It is clear that at the present time the home market, which includes a considerably smaller number of listeners than this country, is amply catered for as far as complete receivers are concerned, and that a large number of manufacturers look to export business for the greater part of their returns.

Almost every stand has an aerial, and many have a demonstration booth, but it was observed that quite a number of firms do not show their apparatus in operation. This seems to be a reasonable attitude, as it is a difficult matter to do justice to even the best receiver amid the noise and bustle of a crowded exhibition. There is, however, a loud-speaker in the centre of the hall, and another in the grounds. The latter deserves special mention, on account of the enormous volume delivered and the high quality of reproduction. In the open air, speech is clearly intelligible at a distance of 100 yards (and probably further). The instrument, manufactured by Siemens and Halske, is of unusual construction, having a rectangular corrugated aluminium diaphragm some 2ft. square. The speech-current coils are fixed to this diaphragm, and are in the field of a powerful magnetic system, in which 200 watts is dissipated. An elaborate system of generators and converters, running on a common shaft, supply the very considerable amount of energy consumed in the amplifier associated with the loud-speakers, as well as the field current. Sponge rubber damping strips are fitted between the face of the diaphragm and horizontal metal bars. The construction of the instrument is, of course, extremely robust, due to the very considerable amplitudes to be handled, and its appearance reminds one of a motor car radiator. The writer has not before heard equal volume associated with reproduction of such high quality.

Impressions of the Berlin Show.—

As the loud-speaker is at present the weakest link in the chain connecting broadcaster and listener, it is natural that this accessory should receive the first attention of the visitor. The most interesting and novel exhibit in this

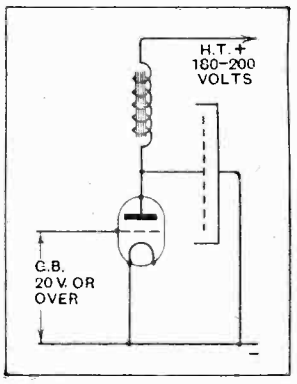


The Vogt electrostatic loud-speaker in which the moving diaphragm consists of an aluminium disc only 0.02mm. in thickness.

class was the Vogt electrostatic loud-speaker, the appearance of which is shown in the accompanying illustration. It is, in principle, a two-plate condenser, one electrode of which is a rigid aluminium casting with radial ribs, and the other a disc of metal, only 0.02 millimetre thick; separation between the plates is 0.03 millimetre, and the dielectric is air. A choke output or similar arrangement, as shown in the circuit diagram on this page, is essential when an instrument of this kind is used, as otherwise H.T. voltage would be unable to reach the anode of the last valve; in certain models the necessary choke is included in the base.

The drawback of electrostatic loud-speakers is that a considerable H.T. voltage is required; the type in question needs from 160 to 200 volts; it is comparatively insensitive, but not unduly so, as it gives a reasonable output with a power or super-power valve biassed to 20 volts or over. Fortunately, the Vogt exhibit is housed in a small cottage in the grounds (a relic of the "Week-end" exhibition which preceded the radio show), and thus it was possible to listen to a demonstration under fair conditions. With anode voltages of the order of those stated above, reproduction was extremely pleasing, but, in the writer's view, the output on the lower frequencies was somewhat lacking in strength; this opinion is supported by the response curve issued by the makers. Apart from this, only extremely favourable criticism can be offered. A model fitted with a baffle is sold in Germany for the equivalent of £5 15s., while instruments of the type illustrated on this page are priced at £4 12s., or £4 5s., depending on whether or not a choke is fitted.

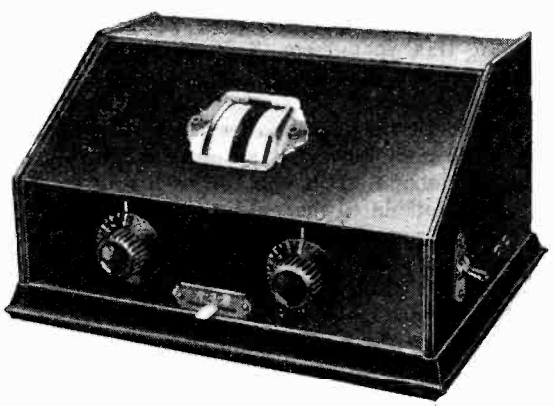
The Reisz electrostatic loud-speaker, already described in *The Wireless World*, is not generally available, but a specimen was in evidence on the stand of the Reichs - Rundfunk Gesellschaft (the German Broadcasting Co.). Dr. Reisser, the chief engineer, informed the writer that this type of instrument was used extensively by his organisation. It was noticed that two of them were fitted to the motor van (exhibited by the Post Office authorities) which is a specimen of those which are sent into the more remote districts of Germany to demonstrate the advantages of broadcasting. (It is presumed that the Government will recover their expenditure in this direction in the shape of an increased revenue from their percentage of the licence fees.)



Output connections for the Vogt electrostatic loud-speaker.

Conventional Loud-speaker.

Still another electrostatic loud-speaker, very similar to the Vogt, was exhibited by the important A.E.G. firm. Apart from this, the majority of instruments on show followed fairly conventional lines; apparently the



Telefunken four-valve receiver (H.F., det., 2 L.F.).

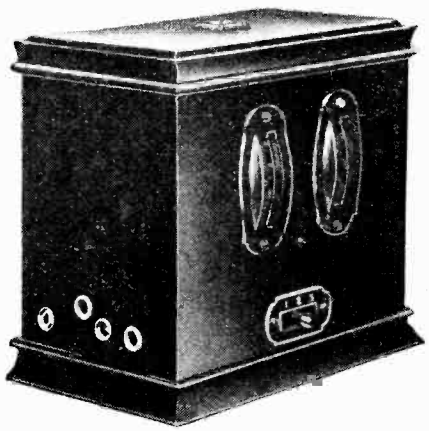
"folded-diaphragm" type described in connection with last year's exhibition is still extremely popular, and various models were seen on the Siemens stand.

The new N. and K. loud-speaker is interesting, inasmuch as it is fitted with a balanced armature movement of unusual construction. The armature, which is heavily damped, operates in the field of a four-pole magnetic arrangement, and drives a cone through a rod connected to

Impressions of the Berlin Show.—

a form of stirrup which is fixed to the ends of the armature. The most ambitious model, which is fitted with a "tone regulator" (a tapped choke), sells for 82 marks (£4 12s.), while the price of a simpler instrument (but with the same magnetic system) is only 28s. 6d.

The outstanding point of interest in the design of receivers is the method whereby provision is made for changing from one waveband to another. With few exceptions, interchangeable coils are used in the simplest receivers only, and in the majority of cases a somewhat elaborate switching arrangement is fitted. It appears that German designers consider simplicity of operation to be a matter of prime importance (as it undoubtedly is in sets intended essentially for the non-technical broadcast listener), and are willing to make the inevitable sacrifice in amplification per stage in order to obtain an easy change-over from one waveband to another.



An example of German mass production methods: the Telefunken three-valve set which includes only two soldered connections and sells for the equivalent of £2 15s.

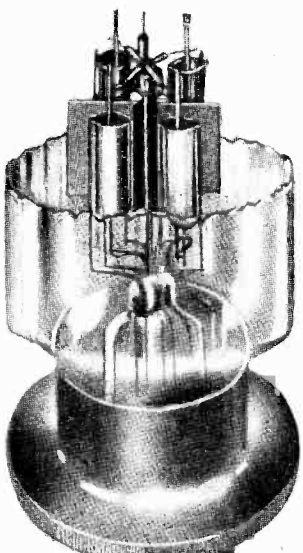
Switching in H.F. Amplifiers.

In a "two-H.F." receiver it is possible to obtain a very considerable overall amplification, even when a wave-change switch is fitted, and the five-valve Telefunken set is a good example of what can be done by careful design. The components are mounted on a metal "chassis," and the H.F. transformers are completely screened. The aerial is capacitatively coupled, and there is a "one-knob" control of tuning, with provision for individual adjustment (by means of small levers projecting through the panel) of the stators of each bank of the three-gang condenser. The inductance of each transformer is changed by an ingenious rearrangement of its windings by means of a switch. It is extremely interesting to note that the first four valves of this set have cathodes indirectly heated from A.C. mains, while the output valve is of the ordinary type.

The Telefunken Co. also show a simple three-valve set which is a typical example of modern mass-production methods as applied to wireless receiver manufacture. It is assembled under the press, and has only two soldered connections, the remainder being stamped. The two L.F. stages fitted are coupled by resistances, and there is capacity-controlled reaction. The set has a wave-change switch, and is sold for 55 marks (a mark equals approximately one shilling). A similar set, but with the addition of an H.F. valve, coupled by a simple neutralised tuned anode circuit, is also shown.

The Loewe multiple valve, which is already known to readers, is used in a combination gramophone-radio set made by the Loewe firm. The receiver, which comprises a two-way coil holder (untuned aerial circuit) and a tuning condenser only, sells at the extremely low price of 40 marks, complete with valve (which of course contains the coupling resistances, etc.). The other unit (at the same price) consists of an electromagnetic gramophone pick-up device and a turntable driven by a spring motor. The output of the pick-up is connected to the amplifier at will by inserting the plug with which it is fitted in place of the grid coil. The exhibit was a popular one, judging by the number of visitors on the stand, and the multiple valves seem to be widely used. The pick-up appears to be sensitive, and possibly this accounts for the fact that the output was overloaded when an average record was being played; the quality of reproduction was otherwise quite pleasing, and it is not a difficult matter to reduce intensity by a slight rearrangement of the input circuit. According to Baron von Ardenne, who is largely responsible for the development of resistance-capacity coupling with high resistances, there is a possibility that these valves may be manufactured in England.

Another representative receiver is the two-stage "Neutrodyne" shown by the Seibt firm. This has a single-dial control, with an elaborate arrangement of three switches, coupled together with a rod, by operation of which separate H.F. transformers are thrown into circuit. By means of a second rod provision is made for simultaneous variation of coupling between primary and secondary windings. In almost every set with a stage of H.F. amplification, more or less complete screening was provided; the general tendency is to screen the stage rather than the transformer. Resistance-coupling is extremely popular, and there is every indication that the need for an output valve of liberal design is recognised. It is noted that ebonite is little used; synthetic resin compounds take its place in most instances.



The "Delta Polytron" valve which incorporates four sets of electrodes with internal screening. Two sets of elements are connected in parallel, so that there are virtually three stages.

One of the most interesting valves is that with an indirectly heated cathode, manufactured by the Telefunken Co. Its construction is extremely simple; the filament, which is heated from D.C. at 4 volts and 1 amp., is passed through a small tube of specially impregnated Kaolin, having an external diameter of barely a millimetre. It is this tube which emits electrons when its temperature is raised to a very dull red heat. The impedance of the valve is 10,000 ohms, with a voltage factor of 10, so it may be placed in the L.F. or "general purpose" class. Another new valve with promising characteristics is the R.E.134 power valve, the filament of which

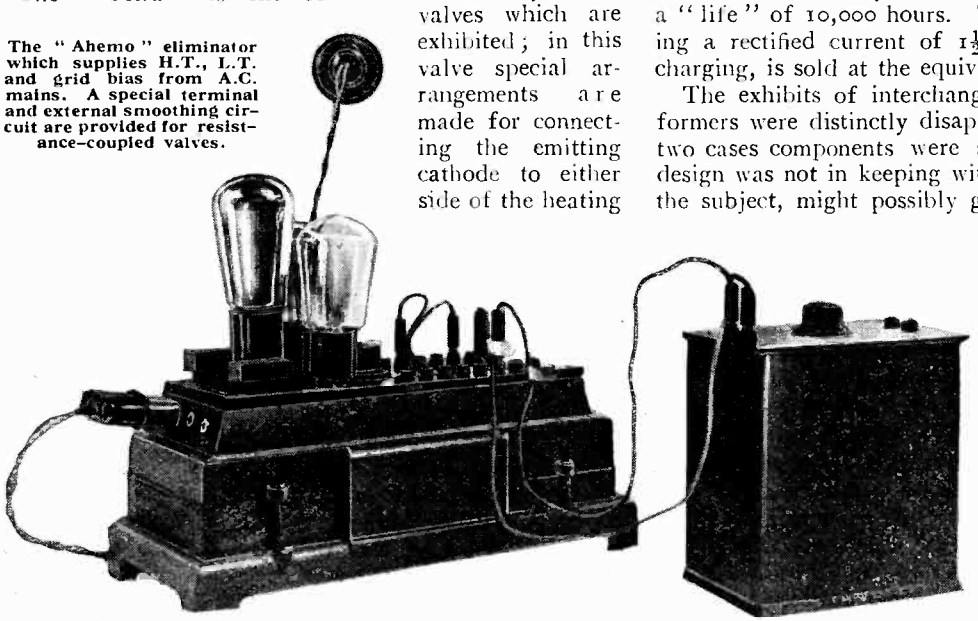
Impressions of the Berlin Show.—

consumes 0.15 amp. at 4 volts; its impedance is only 5,000 ohms, with a voltage factor of 10. Anode voltages up to 200 are specified by the makers.

A new Loewe multiple valve, in which there is provision for reaction from the first anode, is exhibited. Apart from the addition of another external connection, it is substantially the same as the "Type 3N.F." valves already described in this journal, and includes a detector and two L.F. valves, with appropriate coupling condensers and resistances, all being contained in a single bulb.

Another multiple valve, but of a different kind, is the Polytron, which has four complete sets of elements (filament, grid, and anode) mounted in a single bulb, with a screen interposed. Actually, it should be considered as three valves in one, as two sets of elements are wired internally in parallel. It is fitted with a multi-pin base, and of course requires a special socket. The filaments are wired internally in a series-parallel arrangement.

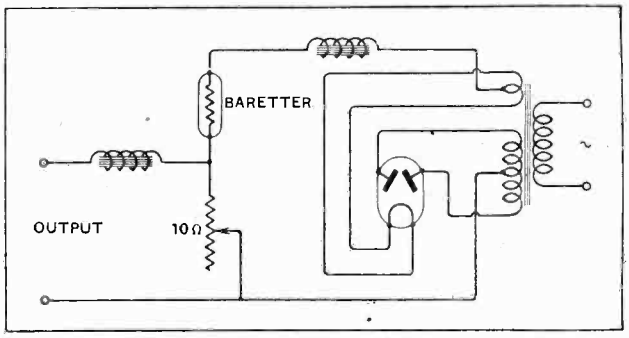
The "Ultra" is one of several indirectly-heated valves which are exhibited; in this valve special arrangements are made for connecting the emitting cathode to either side of the heating filaments at will. It is claimed by the makers that a correct connection does much to reduce trouble from hum.



The "Ahemo" eliminator which supplies H.T., L.T. and grid bias from A.C. mains. A special terminal and external smoothing circuit are provided for resistance-coupled valves.

Almost every valve manufacturer exhibited rectifying tubes, both of the filament and gas-discharge types. The "Rectron" range was particularly interesting. It is claimed that an exceptionally small voltage drop takes place in the valve, and a demonstration circuit showed that the variation in output volts with reasonable changes in output current was almost negligible—in fact, no greater than might be accounted for by voltage drop in the smoothing chokes. By the application of suitable voltages to the twin anodes the same valve may be made to supply either a large current at a small voltage, or *vice versa*; for example, the Type R.33 gives either 20 milliamps. at 120 volts or 1 amp. at 20 volts. It is thus possible to use the same valve for either H.T. supply or accumulator charging.

In every show the visitor expects to find at least one mystery exhibit; the one under discussion was no exception



Filament battery eliminator circuit designed by M. von Ardenne.

to the rule, and the writer admits to being intrigued by the "Weilo" rectifier. This device is supplied in various types, giving currents up to as much as 25 amperes. The rectifying element is a small cartridge containing a combination of metals, the composition of which is not disclosed. An efficiency of over 70 per cent. is claimed, with a "life" of 10,000 hours. The popular model, delivering a rectified current of 1½ amperes for L.T. battery charging, is sold at the equivalent of 27s. 6d. complete.

The exhibits of interchangeable high-frequency transformers were distinctly disappointing, although in one or two cases components were shown which, though their design was not in keeping with our preconceived ideas on the subject, might possibly give reasonable amplification and selectivity. It was noticed that some English designs—unfortunately of the less effective kind—had been copied in their entirety.

A large number of battery eliminators were shown, among the most interesting of which were those made under the "Ahemo" trade mark by the firm exploiting the patents of von Ardenne. A combined H.T., L.T., and grid bias eliminator for A.C., with a somewhat unusual circuit arrangement, is illustrated; it is provided with a special positive high-tension terminal for feeding resistance-coupled valves; the connection to this terminal is taken through a special smoothing circuit. The same firm manufactures D.C. eliminators in which high-capacity electrolytic condensers are used for smoothing purposes.

The exhibit of the German Post Office included the propaganda van already mentioned, as well as a demonstration of picture transmission and reception. There was also an educative collection of models (with accompanying diagrams) showing how interference from electric motors, massage apparatus, etc., might be eliminated at the source by the connection of suitable capacities, resistances, etc.

A number of out-of-date overhead tramway collectors—so often responsible for trouble—were also shown, together with specimens of more modern types which tend to eliminate sparking.

Broadcast Brevities

NEWS FROM ALL QUARTERS.

By Our Special Correspondent.

Empire Broadcasting Experiments.—5GB's Mixed Reception.—Next Regional Station.—Concerts from Manchester.—The National Concerts.—Grand Opera in Full.

B.B.C. and Empire Broadcasting.

The impression has spread about that the B.B.C.'s short-wave experiments in Empire broadcasting will take place at Daventry. I learn from a reliable source that the Daventry site will not be used, there being quite enough ether shaking in that district already!

The tests will probably be conducted somewhere in the Home Counties.

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In Scotland.

5GB is not, apparently, making much of a noise North of the Tweed. I hear that a number of canny Scots are dubious about wasting their battery juice on it. Their dissatisfaction is not surprising considering that at the present moment 5GB is using considerably less than 20 kilowatts. No doubt the new mast will improve the range, but it is a pity that something nearer the advertised 30 kilowatts is not employed.

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Censuring 5GB.

As Captain Eckersley recently remarked, the inauguration of 5GB has provided listeners with another station to grouse at.

Now that the precocious youngster has been busy for two or three weeks it has been possible to take stock of the praise and censure, both of which have been received in generous proportions. The B.B.C. have accepted the praise with becoming modesty, and have turned their attention to the complaints. Broadly speaking, the complaints fall into four classes.

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The Four Grouses.

The first, and most agonising, complaint comes from Birmingham, where many people are finding that years of "shock reception" from a local station, situated, as it were, at one's elbow, tend to vitiate the sense of proportion and make a station received at medium strength sound like the angel's whisper.

I understand that a B.B.C. experimental van is patrolling Birmingham in an attempt to discover how far the residents in the area surrounding the old 5IT are justified in protesting at the inadequacy of 5GB.

Two Programmes at Once.

The second lamentation concerns residents within ten to fifteen miles of Daventry, who complain that 5GB and 5XX can be heard simultaneously. The B.B.C. answer is that within the area of very strong signal strength from both stations saturation occurs in the receiver. In other words, it behoves the listener to secure greater selectivity by reducing the size of his aerial.

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A Waiting Game.

Listeners within the service areas of the London, Cardiff, and Manchester stations provide the third form of complaint, their plea being that it is difficult, if not impossible, to cut out the local station to get 5GB. The B.B.C. admits that at present a good deal of selectivity is needed by the London, Cardiff or Manchester listener who wishes to enjoy 5GB, but the trouble will disappear when the five-station double-programme regional scheme is achieved. In the meantime, patience!

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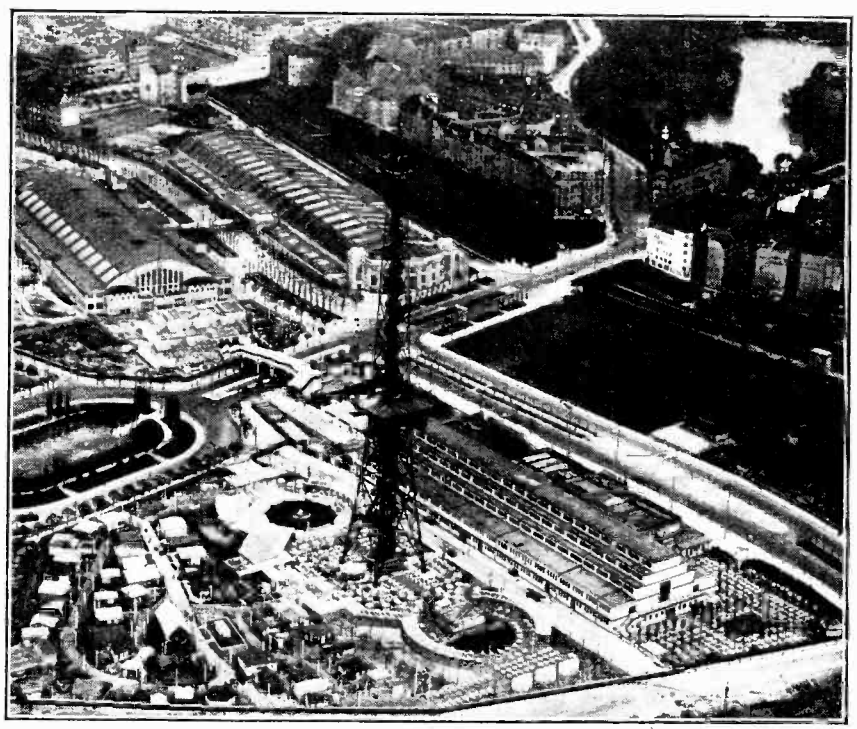
On the Coast.

The listener on the coast, who has generally had more solid reasons for grumbling than the majority of town listeners, supplies the last form of grouse. He cannot pick up 5GB because of Morse interruption from ships due to the proximity of the two wavelengths. This is very sad, especially as conditions



THE BERLIN RADIO EXHIBITION. A bird's-eye view of the exhibition buildings showing the famous wireless mast which houses a restaurant on the "first floor."

are likely to remain as they are for some time. 5GB employs the 491.8 metres wavelength as providing the maximum chance to everyone to cut out the local station.

oooo

Developing the Regional Scheme.

None of the sites for the five new stations has yet been chosen, and I gather that it will be many months before further developments occur. There is a strong feeling, however, that the Manchester area will be the next to receive attention. Meanwhile 5GB is coming in very well at Manchester, notably in the south.

oooo

Manchester Concerts.

Talking of Manchester, it is possible that listeners will get some of the Hallé concerts in the late autumn and winter. A good deal of disappointment was felt last year when the Hallé orchestra ceased to broadcast. If Sir Hamilton Harty can satisfy himself that broadcasting is not prejudicial to the attendance there is every likelihood that a whole series of Hallé concerts may be heard "on the air" during the approaching season.

The success of the "Proms" this year has impressed many eminent people in the musical world whose opposition to broadcasting was based on the supposition that the microphone inevitably led to empty halls. It would be interesting to know whether Mr. Boosey has revised his opinion of broadcasting in the light of recent experiences at the Queen's Hall.

oooo

In Devon.

A friend who has just toured Devon tells me that 5XX is the favourite station in that part of the world. Several hotels in the smaller towns advertise the wireless set in the lounge as the principal attraction. In fact, 5XX beats the XXX!

oooo

Gaelic on the Ether.

Recognising that there must be countless listeners in the North of Scotland who speak Gaelic, the Aberdeen station will, on September 16th, inaugurate a Gaelic Corner which, if successful, will be given at fortnightly intervals. Mary Orr (soprano) will sing Gaelic songs and Neil Orr will render Gaelic poems and stories.

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The National Concerts.

October 7th will be the opening date of the forthcoming series of B.B.C. National Concerts. The first concert will be given in the Queen's Hall. Subsequent concerts will be given in both the Queen's Hall and the People's Palace, Whitechapel, two a month in the Queen's Hall and one a month in the People's Palace.

Sir Henry Wood and Mr. Percy Pitt will figure on the list of conductors, and I understand that Sir Landon Ronald and Sir Edward Elgar may also appear. The soloists will include many artistes of international reputation.

FUTURE FEATURES.

London & Daventry (5XX).

SEPTEMBER 18TH.—Vocal Concert. Religious Service from the studio.

SEPTEMBER 19TH.—A Garden Programme.

SEPTEMBER 20TH.—Italian Programme.

SEPTEMBER 21ST.—"The Liars," an original comedy in four acts.

SEPTEMBER 22ND.—Concert of new works.

SEPTEMBER 23RD.—Variety Programme.

SEPTEMBER 24TH.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

Daventry (5GB) experimental.

SEPTEMBER 18TH.—Religious Service from Birmingham. Military Band Concert.

SEPTEMBER 19TH.—"The Barber of Seville," as played by the British National Opera Co., relayed from Newcastle.

SEPTEMBER 20TH.—"The Liars," an original comedy in four acts, by Henry Arthur Jones.

SEPTEMBER 21ST.—Symphony Concert.

SEPTEMBER 22ND.—From the Musical Comedies and Comic Operas.

SEPTEMBER 23RD.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

SEPTEMBER 24TH.—Popular Concert.

Bournemouth.

SEPTEMBER 19TH.—Station Concert Party.

SEPTEMBER 22ND.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

Cardiff.

SEPTEMBER 19TH.—Welsh Vocal Concert.

SEPTEMBER 22ND.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

SEPTEMBER 24TH.—"No Class," a comedy in one act.

Manchester.

SEPTEMBER 19TH.—"My Programme," by the Mayor of Rochdale

Newcastle.

SEPTEMBER 23RD.—Richard Cuthbert in Impersonations and Impressions of famous actors.

Glasgow.

SEPTEMBER 22ND.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

SEPTEMBER 23RD.—"The Reed in the Wood," a romance, by Edwin Lewis.

Aberdeen.

SEPTEMBER 19TH.—Folk Music.

SEPTEMBER 22ND.—B.B.C. Promenade Concert, relayed from the Queen's Hall, London.

Belfast.

SEPTEMBER 21ST.—"Samson and Delilah," an opera in three acts, by Saint Säens.

A New Plea.

If the B.B.C. were to yield to the importunings of a certain Yorkshire listener, an uncomfortable precedent would be created. The listener in question recently purchased an eighty-guinea receiver specially to hear the Promenade and B.B.C. Symphony concerts. All went well for a week; then 5GB stepped in and cut him off. "Is there any doubt," he asks, "that the B.B.C. are open to an action for damages for breach of contract?"

If this gentleman gets a penny out of the B.B.C., Old Moore sees a long queue stretching from the Accountant's Office, Savoy Hill, all along the Embankment, to Westminster and beyond.

oooo

Grand Opera in Full.

The British National Opera Company's production of "The Barber of Seville" will be relayed from the Theatre Royal, Newcastle, and broadcast in its entirety from Daventry experimental station (5GB) on Monday next, September 19th. The cast includes Heddle Nash, Percy Heming, Dennis Noble, Robert Radford, Bernard Ross, Philip Bertram, Eric Craie, Miriam Licette, and Gladys Parr.

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Famous Play Revived.

"The Liars," to be broadcast from 5GB on September 20th, will be the first of Henry Arthur Jones' plays to be heard by wireless listeners. First produced at the Criterion Theatre in 1897, it is generally considered to be the author's finest play. London and 5XX listeners will have an opportunity of hearing it on September 21st.

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The Month's "Proms."

Promenade concerts will be broadcast in the near future from the following stations:—September 22nd, Bournemouth, Cardiff, Glasgow, Aberdeen, Dundee, Edinburgh, Swansea; September 23rd, Daventry experimental station; September 24th, London, Bournemouth, Manchester, Belfast, Hull, Leeds, Bradford, Liverpool, Nottingham, Plymouth, Sheffield, Stoke-on-Trent, and Swansea.

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"Burlington Bertie."

Miss Ella Shields, who is shortly leaving for America, will be heard by 5GB listeners on September 26th, when she will include her popular favourite, "Burlington Bertie," in her programme.

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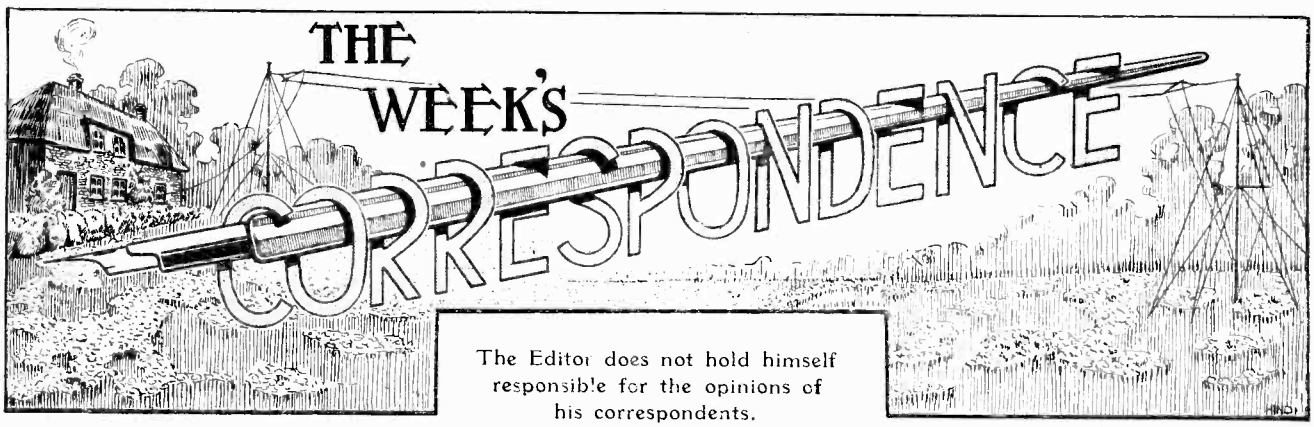
Old Danube Days.

Viennese waltzes are famous for their sparkle and tunefulness. A programme entitled "Old Danube Days," reminiscent of the music of pre-war Vienna, will be broadcast from Bournemouth station on September 21st. Viennese waltzes by Johann Strauss and Lehar, and selections from Kalman's operetta, "Autumn Manœuvres," and Fall's "The Dollar Princess," with duets and solos by Olive Groves and Harold Kimberley, will go to make up the programme.



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.

THE AUSTRALIAN SHORT-WAVE TRANSMISSIONS.

Sir,—The following may be of interest to your readers :—

To-day, Saturday, September 3rd, at 7.35 p.m. B.S.T., I received Station 2ME, Amalgamated Wireless (Australasia), Ltd., transmitting a test on 32 metres.

The following is an outline of items heard : 7.40 p.m. B.S.T. Dance music ("Save Your Sorrow till To-morrow"), followed by announcement of station, further dance music, each item played twice.

7.55 p.m. B.S.T. Announcement from station that Big Ben would be heard in five minutes' time and giving his time 4.45 a.m. Dance music, then Big Ben striking (this came through perfectly at about R7). More dance music, announcement from station, and closed down at 8.10 p.m. B.S.T., remarking that they would be transmitting to-morrow morning and wishing everybody "Good morning."

The above transmission came through very well at R5 to R6 most of the time, very little fading; speech was broken up occasionally by a few atmospherics; carrier wave strong and consistent. I was using a 0-v-1 receiver.

Boston Spa, Yorks. ERIC A. TOPHAM.
September 3rd, 1927.

Sir,—I wonder if there are any who, after hearing 2LO's relay of Australia yesterday, would begrudge a fraction of their licence towards an Empire short-wave station. If there are they are not entitled to laugh at a Scotch joke any more, and I feel sorry to think that such shortsightedness may exist after hearing the general enthusiasm over there.

There have been many critics of the advocates of Empire broadcasting. Some state with a superior air that the enthusiasm arises only as a result of the novelty of a new thing, but they must not think that newcomers to short-wave reception are the only ones that have unlocked the door. There are thousands who are still keen searchers, but with whom the actual novelty of bringing in distant lands disappeared years ago, and a good many of them are still advocates of Empire broadcasting; so that on close examination the novelty idea does not hold good.

Then there is the statement that it is merely required for the personal benefit of a few experimental short-wave enthusiasts. That statement does not reflect very deep thought. The majority of advocates are here at home, and if some of them are short-wave enthusiasts it would be no fun for them to receive a station at their own door. They are likely to be among the last ones to advocate for purely personal benefit the erection of a powerful home station which would not be exactly an aid to searching, but the reason, I surmise, is that they possess, in these days of the iron heel, that disappearing commodity, a little bit of sentiment—not a bad thing to possess either.

Again, there is the oft-repeated statement from the quarter most concerned, that distant reception is unsatisfactory, and is indulged in not for the sake of the programme but for the interest of "getting distance."

My own answer to that is, that after 2LO shut down I changed over and received the transmission direct from Australia up to 7.25 p.m. I give the programme received up to then, and think if I am able to give the programme in such detail it must have been received well enough to be worth listening to.

Announcement: "You will now hear Australia's Big Ben strike four" (which was not so majestic as our own B.B.).

Mr. ——, from Princes Theatre Orchestra, playing some old Irish airs.

Address by Mr. L. A. Cook.

Male voice singers.

Lord Mayor of Sidney's greeting to the Lord Mayor of London, given by Mr. Oswald Anderson.

Solo violin, by Mr. Ewart Samuel.

Greetings to all parts of British Empire.

The above was received on one valve, which is a common experience nowadays—the horizon is not so obscure as Captain Eckersley seems to think.

One of these days some station will startle the world by showing how to send through short-wave transmissions well under any conditions, and it will not be the B.B.C. if they give way to jeremiads and do not get into a practical stride. There is nothing like actual working practice to get to the bottom of most things. Practice has found out a lot, and has upset a lot of theory before now, and will do so again. We know the B.B.C. is jealous of its high standard—a very desirable thing to possess—but most people are aware of the B.B.C.'s technical excellence, so they need not be afraid; it is only the few that would grouse if bad conditions beyond control spoilt their good work sometimes. T. CLARK.

London, E.4.
September 5th, 1927.

Sir,—I should like to report reception of the Australian transmission. I first heard it at 6.45 p.m., September 2nd. However, thought it might be American, but on returning to the set at 7.20 the same station was transmitting, and announced "Amalgamated Wireless, Australia. Hallo London, Dear Old London." Quite perfect speech and music, but a fade that prevented the 100 per cent. reception which the quality and strength would have provided had there been no fade.

No doubt a large number of short-wave enthusiasts experienced the thrill of receiving a so distantly located British colony. The call "Hallo, London, Dear Old London," conveyed more than a friendly feeling of relationship.

But why are British broadcasting engineers ignoring the short-wave band 15 to 35 metres? In addition to its proved efficiency for annihilation of distance, it is almost free of static.

If those directing the affairs of British broadcasting would get busy now on a really good short-wave transmission for the pleasure of our overseas relations, they will only be one year behind the times. They will eventually tackle the job despite their demonstrated reluctance. The Empire demands

the effort. Our B.B.C. seems the only organisation with wool in its ears.

F. E. COLLINSON.

Managing Director, Collinson Precision Screw Co., Ltd.

London, E.17.

September 3rd, 1927.

EMPIRE BROADCASTING.

Sir,—The opposing views of J. C. Finglass and "Enthusiast" in your issue of July 27th fairly represent the ideas of those who live in the distant dominions, and of those who do not. The only people who can possibly appreciate the value of short-wave transmission over long range are those who receive them. I know that Captain Eckersley has always been of the opinion that what was being done by American and Dutch stations for the last three years could not be done. And I attached just the same importance to his view on that subject as I did to his attack on home constructors.

The fact remains that in this country anyone who has a moderately efficient two-valve short-wave set can rely upon receiving programmes from America or Holland daily and without any appreciable amount of static. All that we distant people ask for is a British station which will transmit at times which will not make it necessary for us to get up in the middle of the night to get reception.

It is a pity that Mr. Marcuse and Captain Eckersley cannot exchange enthusiasm for a few months. If they did we should not have to wait long for what we want.

Captain Eckersley's trouble is conservativeness in its most obstinate form. I give him full credit for the good work he has done, and admit his knowledge of certain branches of radio, but it is galling to Britishers who know that their country can lead the world to find that they have to rely upon foreigners for what they want, because their own countrymen will not try.

J. D. CUMMING.

Cape Town.

August 18th, 1927.

VALVE DATA.

Sir,—Your readers will be well advised to test any valves which they intend to use in a receiver drawing its filament current through the house lighting mains. A recent experience of mine may be a warning to them.

I have been working off the mains fnr the last two years, using 250-milliamp valves, which have been entirely satisfactory, but, of course, a trifle prodigal of current. Following the recent overdue reduction in prices, I decided that the time was ripe for new ones. Consulting the useful list which you presented to me with your issue of April 6th, I chose a detector-resistance amplifier, a low-frequency transformer amplifier, and a power valve, all described as "6-volt, 0.1 amp." I then wound a resistance of 2,000 ohms with 38-gauge wire, tested it, and, having connected it in place of my 16 c.p. carbon lamp, put in the new valves. The result was horrible. The first thing I suspected was my high tension, and I tested that, and every other thing in the circuit, before I found that the filament leads were only passing 69 milliamps. Thinking that there might rather more resistance in my filament chokes than I had imagined, I shorted a section of the resistance and brought the current up to the correct figure.

The reproduction was then perfect for about two days. When it went off I put the old valves back again and had an inquest on the new ones. The power valve was all right, but the others had been overrun. Upon discovering this I consulted a friend who uses valves of the same type, and, on measuring his filament current, found that the alleged "point-one" valve actually took about 68 milliamps! The makers will hear from me good and plenty about it, but there may be others who are doing the same, so perhaps you will give the matter some publicity. Let them put "6-volt, 0.1 amp." all over their boxes if they like, but let them give us *data* in the specification.

I bought a "Pye" choke this morning. I have never met Mr. Pye, nor have I previously bought any of his wares, but I shall certainly buy more after reading the little slip inside the box. It told me what valve (impedance) should be used, the size of the coupling condenser and the value of leak, the D.C. resistance of the choke, its inductance, and its safe milliampere current. All this, mind you, not only for the choke I bought, but for all the others he makes. That is the way to do business. Surely it would not hurt the makers of the valves regarding which I am complaining to have said that the valve worked best at 5.25 volts and took 0.068 amps.

Wireless is now such an exact science that the amateur has a right to exact information, and an error, whether accidental or deliberate, of 31 per cent. in a data slip is unpardonable.

JOHN WELLINGS.

Birmingham.

September 3rd, 1927.

THE NEW SCREENED VALVE.—A CORRECTION.

I REGRET that in my article in the August 31st issue an error has arisen in interpreting the mathematical analysis, the sign "less than" being misread as "greater than." The following is the correct version: Page 262, line 17, for "greater" read "less." The caption to Fig. 7 should read: "For oscillation $R_0 - \rho$ must be *positive*. At a frequency of a million (300 m.) oscillation will occur with a low-loss coil." From a physical viewpoint this is pretty obvious, because a high coil resistance would damp the oscillation out. In the September 7th issue, on page 309, No. 3 of Summary, delete "equivalent." On page 310, line 5, for "less" read "greater."

The condition for oscillation can also be written thus:

$$\frac{R}{2L} - \frac{1}{2C\rho} \leqslant 0.$$

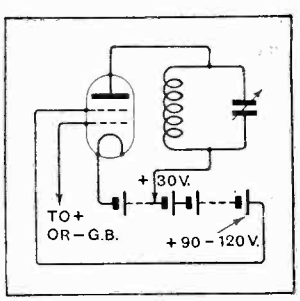
The lower sign is where the error arose.

Now R/2L is the coil damping factor, and $-\frac{1}{2C\rho}$ the valve damping factor. When the sum is zero there is no damping, so that an oscillation is not damped out. When the sum is negative an oscillation can build up. This is the condition required in practice. By manipulating the above formula we get

$$\frac{CR}{L} - \frac{1}{\rho} \leqslant 0 \quad i.e. \quad \frac{1}{R_0} - \frac{1}{\rho} \leqslant 0$$

or $R_0 - \rho$ must be zero or positive.

To confirm this I have taken the secondary of an "Everyman Four" H.F. transformer, and, with a G.E.C. low-loss condenser, produced oscillations beating with 2LO. When 20 ohms was added to the circuit the oscillation restarted on increasing the screen grid volts. Oscillation can be accentuated by increasing screen volts and reducing the grid bias. The latter can be made positive which helps, since it reduces ρ. I have also produced oscillations at audio-frequency by the same means. The circuit diagram is shown in the figure.



Circuit for producing audio-frequency oscillations with valve S625.

A point liable to cause misunderstanding is the use of low-loss coils. These usually give rise to self-oscillation when used for a tuned anode. When, however, a low-loss coil is used as the secondary of a H.F. transformer, the ratio of the turns can be increased by tapping the primary. A point is found where oscillation ceases. This is due to the reduced equivalent dynamic resistance of the primary winding causing reduced magnification. On the other hand, the equivalent primary capacity increases, thereby enhancing the selectivity.

N. W. McL.

READERS' PROBLEMS

"The Wireless World" Information Department Conducts a Free Service of Replies to Readers' Queries.

Questions should be concisely worded, written on one side of the paper, and headed "Information Department." One question only should be sent at a time, and must be accompanied by a stamped, addressed envelope for postal reply. Any diagram accompanying the question should be drawn on a separate sheet. No responsibility will be accepted for questions sent in which do not comply with these rules.

Choosing a Choke.

Why is it that it is always recommended that a choke of 100 henries or more in inductance value be used after a detector valve for choke coupling purposes, but that 20 henries is considered sufficient after an output valve? Would not a 20-henry choke be equally suitable after a detector valve, and a 100-henry choke equally suitable, or even more so, after an output valve? R. S.

In order to preserve quality in the matter of good reproduction of the lower musical tones, it is necessary that the impedance of the external circuit be considerably in excess of the impedance of the internal circuit. Now, the average detector valve is of medium or high impedance, because such a valve makes a better detector. Therefore, the impedance in its anode circuit (that is, the external impedance) must be high, and, since inductance governs the impedance of a choke, it follows that a high-inductance choke of 100 henries must be used. A 20-henry choke will result in a certain attenuation of the lower frequencies. Moreover, owing to the comparatively small plate circuit in the case of a detector valve, the iron core of the choke need not be of generous proportions in order to avoid magnetic saturation.

In the case of the output valve we are dealing with a valve of very low impedance, and we use such a valve because it gives proper results in the matter of handling large power without distortion; since the impedance of the valve is low (that is, the internal impedance of the circuit) it follows that the external impedance need not be nearly so high as in the case of the high-impedance detector valve, and a 20-henry choke is ample. It might be argued, however, that, at any rate, a 100-henry choke will do no harm here. Speaking of the average 100-henry choke, this is quite wrong, because, in the first place, such a choke usually has a high D.C. resistance, and, since the plate current of an output valve is large, there is a big D.C. voltage drop across the choke, and, therefore, the D.C. volts on the valve anode are lessened and the valve's power handling capacities are correspondingly reduced. In the second place, owing to the high inductance, and owing to the limitations of core design in the average 100-henry choke, magnetic saturation of the iron core will undoubtedly set in under the influence of the large plate current of the output valve, and, naturally, this causes distortion. It is possible, of course, to design a 100-henry choke with very generous dimensions of its iron core so that it is entirely suitable for use after an output valve, but such an instrument is expensive to make, and since, as we have pointed out, it is entirely unnecessary, we do not use it.

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"Wire Wound" or "Metallised"?

I intend to build a resistance coupled amplifier, using a 30,000 ohm type valve as detector, and an anode resistance in its plate circuit of 150,000 ohms. Would you advise a "wire wound" type or one of the new "metallised" type of resistance in this case? L. T.

Undoubtedly, in this case, we would recommend the wire-wound resistance. Our reasons are that, in the first place, the plate current will be comparatively high, since the metallised resistances are mainly designed for use with 70,000 ohm valves, the resistance being in the value of about ½ megohm. In this latter case the current is very limited, but with a 30,000 ohm valve and a 150,000 ohm resistance the current will be comparatively greater, and a wire-wound resistance is advised. In any case, if you are going to use reaction in conjunction with your detector valve, you will have to shunt the anode resistance with a 0.0001 mfd. fixed condenser, and any small capacity in the wire wound resistance will be completely overshadowed by the condenser capacity. As a matter of fact, however, modern wire-wound resistances have an extremely low self-capacity compared with some of the earlier types.

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Situation is More than Circuit.

I intend building the "All Wave Four" receiver. Will you tell me whether in my locality it will enable me to receive a large number of distant stations? S. W.

It would be quite impossible to answer this query definitely. We notice from your address that you live in the middle of a large industrial city, and therefore it might so happen that you are badly screened by steel frame buildings, or similar structures. Used in the country, or in the town in any reasonably unscreened situation, the receiver will undoubtedly bring in a number of stations, but no definite ruling can be given as to the performance in a definite locality, unless actual tests have been carried out with the receiver.

We should advise that you endeavour to get into touch with other broadcast listeners in your locality, and ascertain from them what results they get from distant stations on any given set. If you could ascertain what results are obtained by other people, and write to us again, mentioning the type of set they use (*i.e.*, number of valves, whether the receiver uses H.F., etc.), we shall be able to advise you more definitely on this matter.

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Components for Remote Control Systems.

I have been studying the article on "House Wiring Systems," published in your August 17th issue, and have decided to experiment with both systems, described at some length by the author. He makes no mention of where to purchase the various component parts, and I shall be glad if you will assist me in this matter. R. G. A.

Referring to the system illustrated in Fig. 1 of that article, the jacks may, of course, be obtained from almost any reputable wireless dealer as they are merely ordinary filament control telephone jacks. With regard to the relay, this may be purchased from Messrs. Garnett, Whiteley and Co., Ltd., Lotus Works, Liverpool, among other firms. A suitable output transformer may be obtained from various firms, such as Messrs. Ferranti, Ltd. Referring to the alternative scheme, illlustrated in Fig. 2 of that article, the special triple jack plugs may be obtained from Messrs. Igranic Co., 147, Queen Victoria Street, London, E.C.4, and are known as "Multijacks." The volume control shown in dotted lines may be obtained from various firms such as Messrs. Automobile Accessories (Bristol), Ltd., 93-95, Victoria Street, Bristol, Messrs. Marconiphone Co., 210-212, Tottenham Court Road, London, W.1, Messrs. Dubilier Condenser Co., Ducon Works, Victoria Road, North Acton. The Volume Control Plug may be obtained from Messrs. Rothermel Corporation of Great Britain, 24, Maddox Street, London, W.1, whilst naturally, other items such as bell wire, bell pushes, wooden casing, etc., are readily obtainable from any electricians.

Transformers *v.* Resistance Coupling.

I have heard it stated that in the case of a two-stage resistance coupled amplifier, if the last valve is overloaded, due to very strong signals or improper adjustment of H.T. and G.B., the resultant distortion will be considerably worse than would be the case if the last stage were transformer coupled, or the amplifier were transformer coupled throughout. I wish to know if this is true, and if so, why? L. R. T.

As you probably know full well, the result of overloading the output valve is to cause an abnormally large grid swing, which on the one hand will cause the grid potential to come down to the bottom bend of the grid volts anode current curve, and on the other hand will cause it to cross the zero grid volts axis, and so cause grid current to flow, the reason that grid current flows being that the grid has become positive. In fact, the case is analogous to that of plate current flowing when we make the plate positive, provided there are no other causes tending to check the flow of plate current. If the last stage is resistance coupled, it will be obvious that the grid condenser associated with the last valve grid will become charged up, and it will retain its charge until such charge has leaked away *via* the grid leak. Now, if this condenser is large and the grid leak is of high value, it will be obvious that quite an appreciable amount of time will be taken before the condenser is fully charged, and during this period the amplifier will be as it were "choked," and bad quality will result for quite a considerable period, until the condenser has become discharged. A strong atmospheric, or an abnormally loud passage of music, or even the fact of the announcer raising his voice, will often be enough to momentarily overload the valve and charge up this condenser, unless we are playing for safety by using an unusually large power valve in the output stage. It is the fact of the grid leak having a high ohmic resistance which prevents the charge leaking away immediately.

In the case of transformer coupling, any momentary overload of the output valve will still place the charge upon the grid, but this will almost instantaneously leak away, due to the comparatively low D.C. resistance of the transformer secondary. This obviously is the reason why transformer coupling is often inferior in the final L.F. stage, and it will be obvious that choke coupling is in exactly the same class as resistance coupling in this respect. It may be argued that a small value of grid leak should be used in order to ensure a quicker discharge of the condenser. This cannot be done, however, for it will result in frequency distortion, but this point was discussed fully in the "Hints and Tips" section of a recent issue of this journal, and we cannot go into it here.

On the surface, it would appear that a smaller grid condenser (leaving the value of grid leak as it is) would remedy matters, as naturally, a smaller condenser would not accumulate so great a charge, and therefore the time period of discharge would be small. If we do this we shall again run into distortion trouble for reasons already discussed in another section of this journal, to which we have just made reference. The only means of preventing this trouble is to have a large margin of safety by using an output valve of large power-handling capacity, and adjusting the H.T. and G.B. values applied to it correctly. Use plenty of H.T. and plenty of G.B., as directed by the makers of the valve. The statement then that in ordinary circumstances a transformer is "safer" than a choke or resistance coupling in the last stage of an amplifier is quite true, for the reasons which we have just given.

o o o o

Tracing Trouble.

I have constructed a four-valve receiver to the circuit diagram enclosed, but have not succeeded in receiving any signals although the local station is only 5 *miles away. The wiring has been carefully checked, and all joints and connections examined, but I can find no error. I recently borrowed a milliammeter and noticed on connecting this in the negative H.T. lead that the plate current was about* 50 *milliamps.*

*The valves used are P.M.5X, P.M.5B, P.M.5X and P.M.*256 *in the order named, and with* 150 *volts H.T. A slight reduction in current takes place on alteration of the grid bias to the last valve, but variation of G.B. on valve* V_3 *seems to have no effect. I notice a small spark occurs on removing the G.B. plug for valve* V_3 *from the grid battery. Can you indicate where I should look for the fault.* R. B.

We have carefully examined your circuit diagram, and conclude that provided the receiver has been wired correctly to this it should function in a satisfactory manner. Assuming the wiring to be correct, the fault must lie with one or more of the components, and we accordingly suggest a series of tests on the following lines. Connect your milliammeter in the H.T.+ lead to each individual valve, and note the current taken in each case. If our diagnosis is correct, you will find that valve V_3 is taking an abnormal anode current. You should also find that disconnecting H.T.+2 from the H.T. battery will result in the feed to V_3 falling to the normal value. A consideration of this effect will show that the fault lies with the coupling condenser C_4, Fig. 1, as owing to either a breakdown of the insulation or a leak of some description the grid of the valve V_3 is receiving a positive bias. This was deduced from the information that a small spark became visible on inserting or removing the wander plug applying the grid bias to valve V_3.

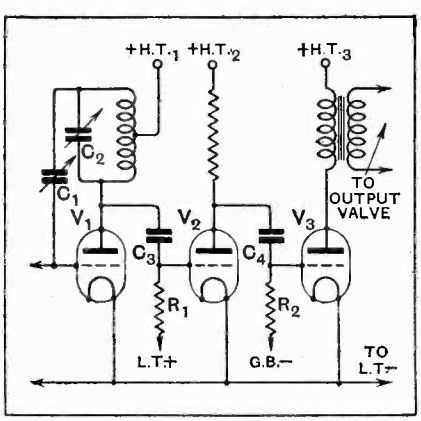

Fig. 1.—Faulty insulation in C_4 was the cause of excessive anode current in this circuit.

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Correct Connections of a Milliammeter.

I have a three-valve set containing two L.F. stages, the loud-speaker being connected directly in the plate circuit of the last valve. I wish to put in a milliammeter in order to give me an indication of valve overload. In what manner must I connect up? R. S.

If you merely desire to connect the instrument temporarily in circuit, then all you need do is to connect the positive terminal of the milliammeter to that terminal of your set which is marked loud-speaker positive, the negative terminal of the milliammeter connecting up to that terminal of the loud-speaker which is marked positive, the terminal of your loud-speaker which is marked negative going, of course, to the negative loud-speaker terminal of your set. If you wish to insert the milliammeter permanently in your set, you must break the internal connection which you will find running from the positive loud-speaker terminal of your set to H.T. positive, and, having broken this lead, insert the milliammeter, the negative of the milliammeter going to that terminal on your panel marked loud-speaker positive, and the positive of your milliammeter going to H.T.+

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Battery Eliminator and Pot Magnet.

I have decided to construct the moving coil loud-speaker described in "The Wireless World" of August 10*th last, but the lighting supply in my district is* 220 *volts D.C. I possess a D.C. battery eliminator giving a number of output voltages, the lowest being marked* 35 *volts. Could I connect the "pot" magnet to this tapping, and would you advise a series resistance to regulate the voltage?* R. P. F.

We do not think it would be practicable to energise the field magnet of a moving coil loud-speaker from a D.C. battery eliminator designed for the supply of H.T. to a receiver. The smoothing equipment and potential divider, or series resistances, would not pass sufficient current for the purpose, and we suggest you either use a 6-volt accumulator of suitable capacity or wind the field coil in accordance with the instructions given for the moving coil loud-speaker described in our issue of April 13th last.

The Wireless World AND RADIO REVIEW

(15th Year of Publication)

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OLYMPIA, 1927.

AT the time these lines are read we shall be on the eve of the opening of the 1927 Wireless Show at Olympia. It is probably unnecessary to say that the Exhibition promises to be by far the largest and most interesting which has yet been held, because as wireless progresses so it is necessary that receivers and other apparatus should keep pace. It is, however, evident even at this stage, before the Exhibition has opened, that the show will be of outstanding merit. There are a number of new products, some of which are referred to briefly in this issue, and no doubt there are many others concerning which no information will be available until the actual opening of the Exhibition.

Although we may consider that the standard which has been set during the past twelve months is high, yet those who have been in touch with progress have realised that finality is as far off as ever. The modern three-electrode valve, for example, is a very efficient product, and will give a good performance for some time to come, but the introduction of new types of valves, such as the screened valve, which several manufacturers are showing in different forms, opens up a wonderful new field of research for the experimenter.

A feature of special interest to visitors to the Exhibition this year is that arrangements are being made whereby manufacturers will be able to demonstrate their apparatus to the public, whereas in previous years the public has had to be content with what we may describe as a "dumb show."

There is one point in particular in connection with the Exhibition which we would like to emphasise, and where our readers could be of valuable assistance in bringing about an all-round improvement in the standard of broadcast reception. We refer to the need for increased selectivity in receivers in order that advantage may be taken of the service of alternative programmes. The price of valves has fallen considerably, the complication of running valve sets has been greatly reduced, and the price of valve receivers complete is very far below anything which has been available to the public in previous years. Taking these points into consideration, we think the time has come when the crystal receiver, except under very special circumstances, should be regarded as almost an obsolete piece of apparatus. There was a time when headphone reception was popular if only for the reason that the reproduction was far superior to what could be obtained with loud-speakers, but to-day it would be no exaggeration to say that with a really good loud-speaker and receiver where careful attention has been paid to quality the very reverse is the case. Broadcasing will take its proper place in the home only when the public realises the immense superiority of loud-speaker reception from a valve set over listening-in on a crystal set with headphones.

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WIRELESS SETS AND THE B.B.C.

UNDER "Correspondence" in this issue we publish a letter from a reader who enquires why the B.B.C. does not undertake the manufacture and sale of broadcast receivers, and he puts forward arguments in support of the suggestion. We submitted a copy of this letter to the B.B.C., and are fortunate in being able to publish their reply, in which it is made clear that it would not be in accordance with the policy of the B.B.C. to enter into competition with the trade and the legitimate set manufacturer.

We consider that the reply of the B.B.C. is a fair and proper statement of what their attitude should be, and we believe that it will be reassuring to many who may have visualised the possibility of the B.B.C. entering into the set manufacturing business, which would result not only in unfair competition with the legitimate industry, but would also deprive the listener of the advantage he has at present of a wide choice of types of receivers to meet his particular fancy.

Two Tuned H.F. Stages without Screening or Neutralisation.

IT is not always an easy matter to build a receiver and obtain the predicted results when good performance is dependent upon using components of the highest efficiency, and where there is a possibility of destroying that efficiency in the process of construction. A well-designed set may fail owing to some obscure condition existing in a component, or where the home constructor has neither the testing instruments to carefully examine the parts, or the opportunity to interchange them with others in his endeavour to get better results.

Avoiding Indifferent Performance.

Whatever the design may be, two apparently similar sets will rarely be equally successful. Particularly is this true where high-frequency amplification is involved. For this reason a design differing radically from recent trend has been developed. Principally, it differs in the H.F. amplifier, in that two stages of simple and less efficient form than others which have appeared recently in these pages are adopted, but the important consideration which one must not overlook is that the amplification of two robust H.F. stages may far exceed a single stage of the most perfect design.

That an extra valve is required is, perhaps, of small importance in a multi-valve amplifier, as the additional filament current required for the extra H.F. valve is only a fraction of the total filament current, particularly where a special output power valve may be used requiring more filament and H.T. current than all the rest of the valves in the set. Producing stability and the tuning required for the second H.F. stage are, of course, the problems involved, and it is generally contended that the additional complication stands in the way of the use of two stages. The introduction of resistance as a preventive of self-oscillation, to which a two-valve H.F. amplifier is particularly prone, reduces amplification to a value far inferior to that obtainable from a good single stage. Effectively to stabilise by neutralising involves constructional difficulties demanding carefully arranged neutralising and primary windings, complete magnetic and electrostatic screening between all apparatus composing the stages, and, even if one is sufficiently skilled to carry out the constructional work, a knowledge of the peculiarities of stabilised circuits is required before good reception can be obtained over the entire tuning range, without the circuits breaking into oscillation. The screened valve is another solution to the problem, and promises much, yet here, again, the difficulties of maintaining the utmost efficiency, and of screening, are involved, and the use of an extra valve in a simpler arrangement may be found to give superior results and fully compensate for the inefficiency of the stages.

Screening and Neutralising Avoided.

There is another way, however, of solving the problem. Regeneration is produced by the voltage feed-back across the grid-plate capacity of the valve when the grid and anode circuits are approximately in tune. It follows, therefore, that by limiting the primary winding of the H.F. intervalve coupling to fewer turns than are normally used, and employing a particularly loose coupling between the primary and the tuned secondary, that the potential developed across the primary can be kept to a sufficiently low value that, in spite of the capacity feed-back of the valve, the point is not reached at which regeneration can occur. Incidentally, the losses in the circuits are increased by the use of valves of somewhat low impedance, so further tending to produce stability.

In spite of these modifications, the overall amplification for the two stages exceeds that of any single stage ampli-

fier, and there is now no serious objection to the creation of other losses which, in proportion to the total losses, are of minor importance. Thus no special precautions are required as to the nature of the windings of the transformers, neither does harm result by making them interchangeable to cover all wavelengths, and, should incidental losses occur in valve holders or tuning condensers, little detriment will result. The coils used for long-wave reception have more tightly coupled primary to secondary windings owing to the smaller feed-back through valve capacity on the long waves. The transformers used in the two stages are not quite identical, it having been found that a tighter coupling is permissible in the transformer between the first and second valves than that which precedes the second valve.

Logarithmic Condensers for Simultaneous Tuning.

The separate yet simultaneous operation of three tuning dials arising from the use of two H.F. stages is undesirable, and a set so arranged might appear to give very poor results unless a wavemeter is used to assist in the slow process of tuning each of the circuits.

A pair of condensers having plates following a logarithmic law are linked together to a common control. If these are suitably set in relation to one another, they will tune the two intermediate circuits irrespective of any differences in the inductance values of the two secondaries providing the self and stray circuit capacities are nearly equal, and that the shape of the plates has been determined to suit the stray capacities existing in these circuits. Actually, with a similar number of secondary turns on each of the transformers, there will be no need for the individual adjustment provided on the condensers, and both should be set to move off together.

From the illustrations it will be seen that the three coils are mounted with their axes at right angles, which together with a particularly liberal baseboard spacing, prevents magnetic coupling. The standard "Colvern" coils have been modified for this purpose, and can be obtained for either vertical or horizontal mounting as required in following this design, thus extending their utility in a number of other useful applications. Better spacing of the pins also results from arranging them around the circumference of a circle in preference to the cross formation formerly employed.

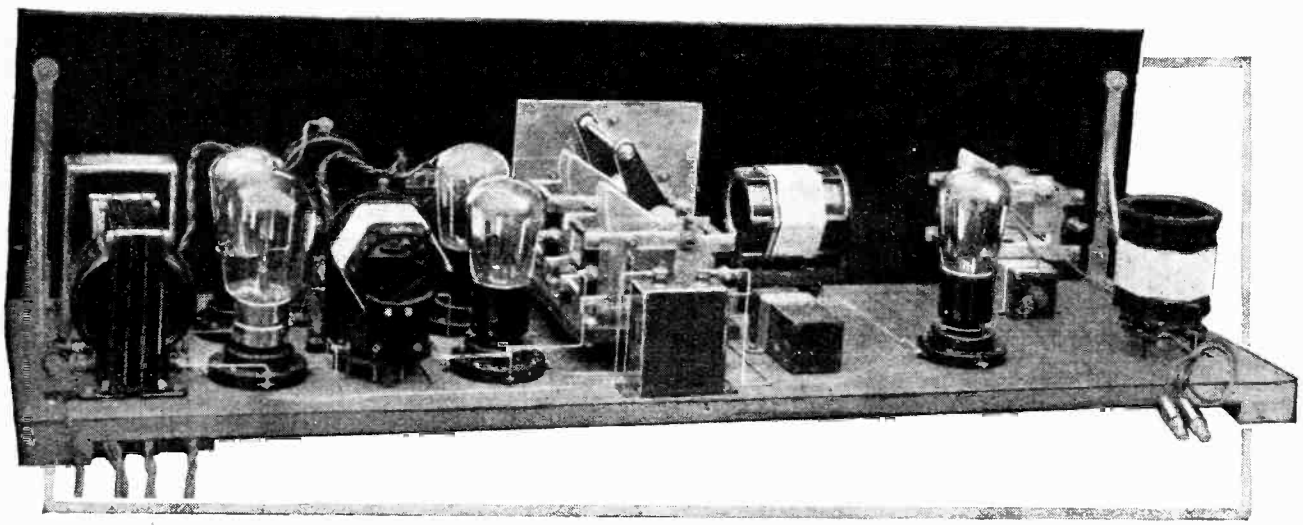
The Detector Circuit.

Anode bend detection, a requirement for good quality, by means of a high impedance valve, which may be so suitably followed by resistance coupling, is adopted and gives good performance in view of the liberal H.F. voltage swing applied to the grid of the detector. As a shunt condenser is required in the anode circuit of the detector valve, the value of which must be liberal to by-pass the lower frequencies of the long waves, it is considered advisable to limit the value of the anode resistance, which is shunted by this condenser to a value not exceeding 100,000 ohms. The coupling condenser and the grid leak are of the corresponding typical values of 0.1 mfd. (mica) and 0.5 megohm. A transformer coupling is used in the second L.F. stage, and a transformer output feeds the loud-speaker.

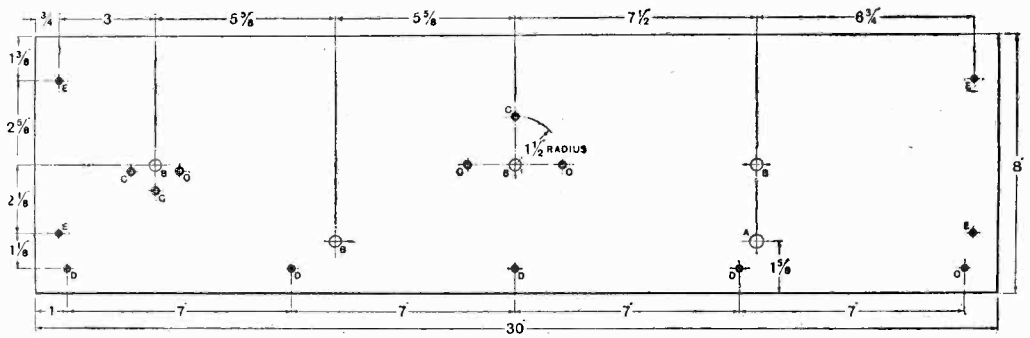
Gramophone Loud-speaker Reproduction.

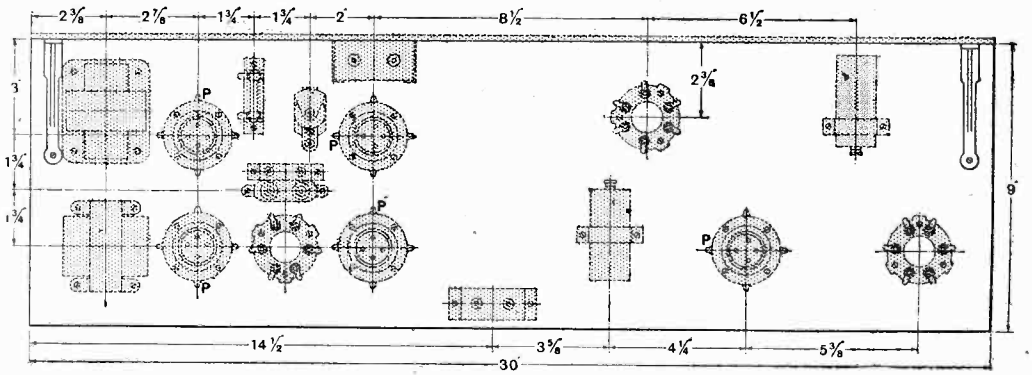
New features introduced include a volume control and a breakjack for use with a gramophone pick-up. Although there are many ways for controlling volume the most uniform results are obtained by a variable resistance shunting the secondary of the intervalve transformer. A potential divider as an output from the resistance-coupled stage may affect quality, while a sliding contact on a current-carrying resistance is noisy when operated.

Silence of operation is a feature of loading the transformer secondary, which is practically a no-current winding, while the resistance improves the amplification characteristics of the transformer. These merits outweigh the point usually advanced that volume control should come



Rear view of panel and baseboard assembly with valves and transformers in position. The transformers are spaced well apart with their axes at right angles.





Panel and layout dimensions. Sizes of holes are as follows: A, 7/16in. dia.; B, 3/8in. dia.; C, 5/32in. dia. and countersunk for No. 4BA screws; D, 1/8in. dia. and countersunk for No. 4 wood screws; E, 1/8in. dia. for No. 6BA screws.

The Wireless World "Exhibition Five."–

earlier in the amplifier to prevent overloading of the detector or first L.F. valve.

Contacts on the breakjack are arranged to break the filament circuit of the H.F. valves, interpose the pick-up winding into the grid circuit of the detector on the earth side of the tuning coil, and to reduce the grid bias so that the valve is no longer an anode bend rectifier. That resistance amplification is employed in the first stage is almost essential owing to the liberal output obtainable from the pick-up and in conjunction with the volume control shunt resistance, exceedingly good quality can be obtained.

Clean Panel Layout.

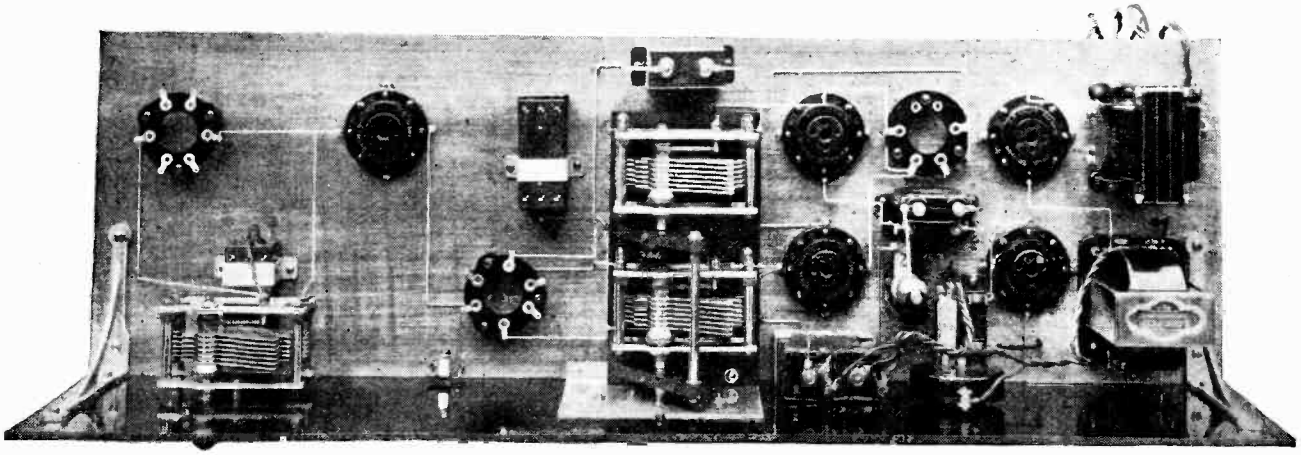
On the front of the panel, therefore, appears the two tuning dials, the small dial of the volume control together with the jack for the gramophone pick-up and an "on-and-off" switch. Economy has been observed wherever possible, as instanced by the omission of filament resistances rendered quite unnecessary by the use of modern 6-volt valves, while only one H.T. bridging condenser is fitted in association with the H.F. stages. Simplification is effected by using only two H.T. values for the five valves.

Instead of a metal or ebonite panel the new "Paxolin" or "Pertinax" polished sheet may be considered an improvement. It is of pleasing colour, easy to work with a sharp drill, has excellent insulating and dielectric properties, though these are of little consequence in the present instance, but most important of all is its stiffness and durability.

Little need be said concerning assembly. Starting off with the panel, purchased exact to size, the baseboard is made up from planed ½in. mahogany or American white wood, and is fitted with glued and screwed ½in. battens to stiffen it and permit of underneath wiring. No. 18 S.W.G. tinned copper wire is used for connecting up and is, perhaps, less conspicuous without sleeving. Actual branching points are shown in the wiring diagram, those leads which pass beneath the baseboard being broken. Leads forming part of H.F. circuits, particularly those connecting to grids and plates, are short, direct and out of contact with the baseboard. These together with the grid biassing leads are above the baseboard. Battery distributing leads run beneath the board, and for good appearance should be shaped only with right-angle bends. Contact is picked up by drilling through the baseboard alongside the leads, and the liberal use of small ebonite cleats sawn from ¼in. square ebonite is advised.

The H.F. Intervalve Couplings.

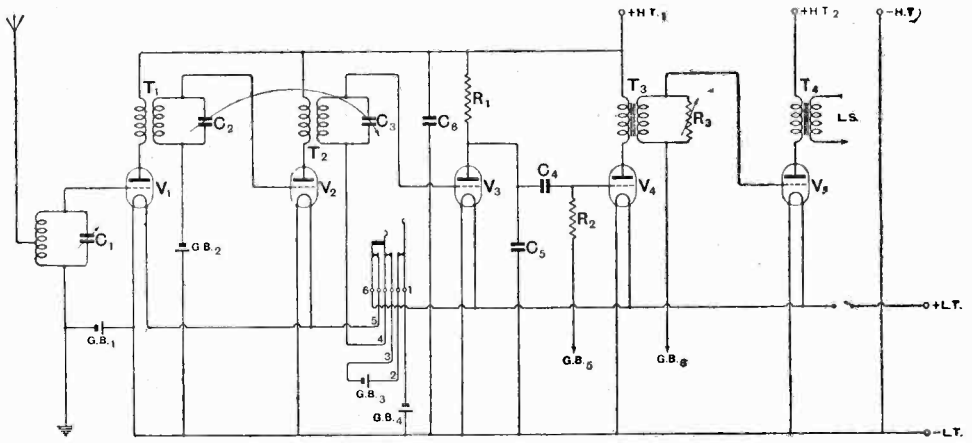
Winding the transformers is a straightforward operation and the 80 secondary turns of No. 30 D.S.C. wire are terminated in pairs of holes in the former or through the ribs before connecting to the sockets. The primary windings, consisting only of 5 turns wound in the same direction as the secondaries, should be arranged so that they can be slid away from the secondary turns towards the ends of the coils. Actually, with an H.T. potential of 80 to 100 volts and valves of an average impedance of about 10,000 ohms, the primary to secondary spacing on the first H.F. transformer will be about $\frac{1}{32}$in., and on the second ¼in. The grid and plate connections are farthest away from each other. Take care that primary and secondary turns do not actually touch, or if the insulation is frayed a short circuit of the H.T. battery may result.

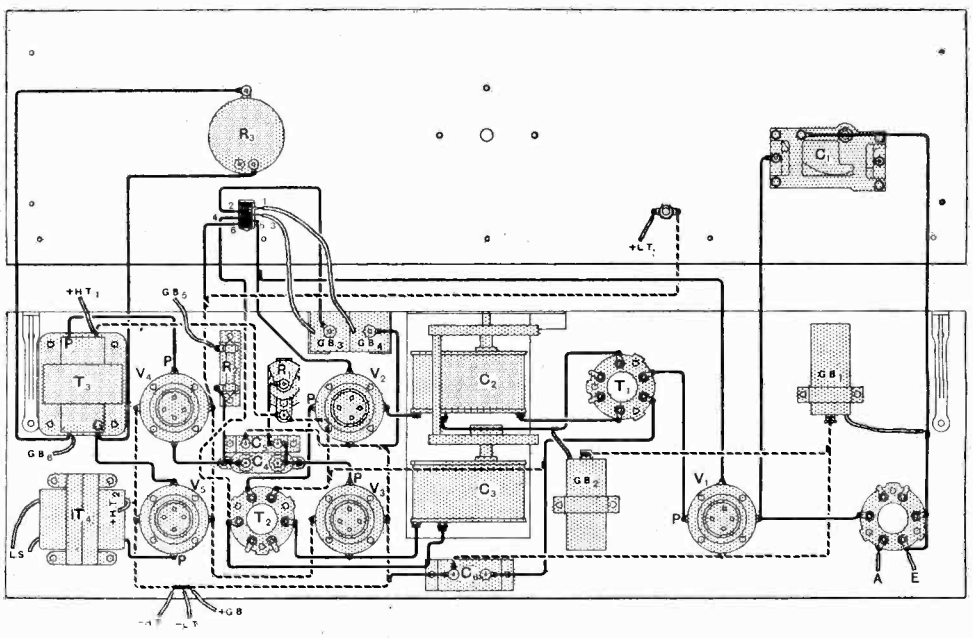


Plan view of layout showing coupled logarithmic condensers.

The aerial input transformer consists of 75 turns, a tapping for the aerial being made at the 25th turn from the earth end of the coil, which is at the bottom, giving a satisfactory degree of selectivity with an average aerial. If a near-by station is found to be too broadly tuned, fewer turns may be included in the aerial, whilst if the local station is some ten or more miles away and swamping is not experienced, distant reception may be further improved by slightly increasing the number of aerial turns. To provide adjustable aerial tapping the spare pins on the holder may be made use of.

For long-wave reception on the 900-2,600 metre band the modified "Colvern" long formers should be wound with 280 turns of similar wire comprising eight slots each containing 35 turns. The adjoining slot is wound full with 40 turns in the case of the first H.F transformer, and 35 to 40 for the second.





Theoretical circuit and complete wiring diagram.

LIST OF PARTS.—

1 "Cyldon," 0.0003 mfd. two-section condenser, independent adjustment on the driving spindle is not essential (Sydney S. Bird & Sons).
1 "Cyldon" 0.0003 mfd. single condenser.
2 Micro-log dials ("BR" C. F. & H. Burton, Bernard Street, Walsall).
1 "Ferranti" output transformer 1 to 1 (Ferranti, Ltd.).
1 "Igranic-Pacent" Audio-former, 3½ to 1 (Igranic).
3 New type "Colvern" formers with stands and bases, broadcast wavelengths (Collinson's Precision Screw Co., Ltd.).
3 New type "Colvern" formers and stands, long wave (Collinson's Precision Screw Co., Ltd.).
5 Valve holders ("W.B." Whiteley, Boneham & Co., Ltd.).
1 Duvolcon 10,000 ohms (Dubilier).
1 Fixed condenser, 2 mfd.
1 Fixed condenser, 0.1 mfd. (mica).
1 Fixed condenser, 0.0005 mfd.
1 Grid leak, 0.5 meg. and holder.
1–16½ v. Grid battery (Siemen's type with flap for attaching to wall of cabinet).
4–1½ v. "T" cells (Siemens).
1 Pair brackets ("Camco" Carrington Mfg. Co., Ltd.).
1–100,000 Ohms. anode resistance and vertical holder (Varley, R.I.).
1 Switch (Benjamin Elec., Ltd., or Wright & Weaire).
1 Six spring Jack type, P 70 (Igranic).
1 Plug, type P 40 (Igranic).
1 Baseboard, 30×9in. Planed American white wood or mahogany, and ½×1½in. battens.
1 Paxolin or Pertinax panel, 30×8in. (Wright & Weaire, 740, High Road, Tottenham, N.17, wood grained), or (George L. Scott & Co., Ltd., 69, Fleet Street, E.C.4, plain brownish yellow).
1 Cabinet, 30×8×9in. deep ("Camco" Carrington Mfg. Co., Ltd.).
Plugs, flex, wire, screws, etc.

Approximate cost, less cabinet—£11.

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.

Lengths of flex terminated on coloured tags and plugs are used for all external connections in place of terminal strips. Not only are these much more readily fitted, but they greatly facilitate the rapid connecting up of the set and avoid the danger of short circuit across terminals, at the same time effecting an economy.

With the H.F. valves suggested earlier, and an R.C. valve (30,000 to 60,000 ohms impedance) as detector, followed by an L.F. and power valve, good loud speaker reception is easily obtainable from some 12 to 20 European stations, depending upon conditions and nearness to a powerful broadcasting station. Self-oscillation as denoted by the heterodyning of carrier waves does not occur even at the minimum end of the condenser scales, and it is at this position that the primary turns of the transformers are slid up to the secondary turns to obtain a maximum coupling consistent with the avoidance of regeneration. Overloading of the detector valve is evidenced by double tuning of the H.F. intervalve couplings, and is corrected by detuning the aerial transformer. The merit of the set is good loud-speaker reception of distant stations without heterodyning or using the set near the oscillating point, so that skillful handling is unnecessary so long as the user understands that the dials are advanced slowly together, keeping them in step by moving from station to station.

TRANSMITTERS' NOTES.

Eindhoven Short-wave Transmissions.

Through the courtesy of Messrs. Philips Lamps, Ltd., we are able to give the following list of special broadcasting transmissions from PCJJ, which supplement the regular weekly transmissions on Tuesdays and Thursdays from 5 to 8 p.m. G.M.T. :—

Thursday, Sept. 22.—1700-2000 G.M.T.
Tuesday, Sept. 27.—1700-2000 G.M.T.
Friday, Sept. 30.—0200-0300 G.M.T.
Tuesday, Oct. 4.—1700-2000 G.M.T.
Thursday, Oct. 5.—1700-2000 G.M.T.
Tuesday, Oct. 11.—1700-2000 G.M.T.
Thursday, Oct. 13.—0000-0300 G.M.T.

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Dutch Receiving Station.

The Dutch receiving station EN-R005, registered by the Dutch section I.A.R.U., and operated by Mr. M. W. H. de Gorter, is regularly standing by for British amateur phone stations on a wavelength of 40-45 metres or lower, and will send full detailed reports about tests noting strength, quality of modulation, fading, etc. Those who want a report from this station have only to drop a line to Mr. de Gorter, Essenburgstraat 120b, Rotterdam, Holland, stating the exact time (G.M.T.) and also exact wavelength.

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KDKA Wavelengths.

Through the courtesy of the Westinghouse Electric and Manufacturing Co., we are able to settle the vexed question of the short waves used by KDKA for experimental work. The wavelengths now used are 26.3, 62.5 and 315 metres. The 14-metre transmitter has now been replaced by the 26-metre set, and the power used is 30 kw. We would, however, state that as the short-wave work is experimental the wavelengths are somewhat frequently changed.

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Nauen Telephony Tests.

A correspondent informs us that the Nauen experimental telephony stations are now testing on 14.9 and 17.38 metres. The stations are presumably AGA and AGC, and the latter wavelength differs slightly from that given in our issue of August 17th.

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American Short-wave Stations.

A correspondent writes that he has experienced considerable interference with his reception of NU 2XAD from a station signing itself HJG. If this is an official call-sign the station should be in Columbia, but we are unable to trace it through the "Berne List." We shall be interested to learn if other readers have heard this short-wave station and if they can give us its QRA.

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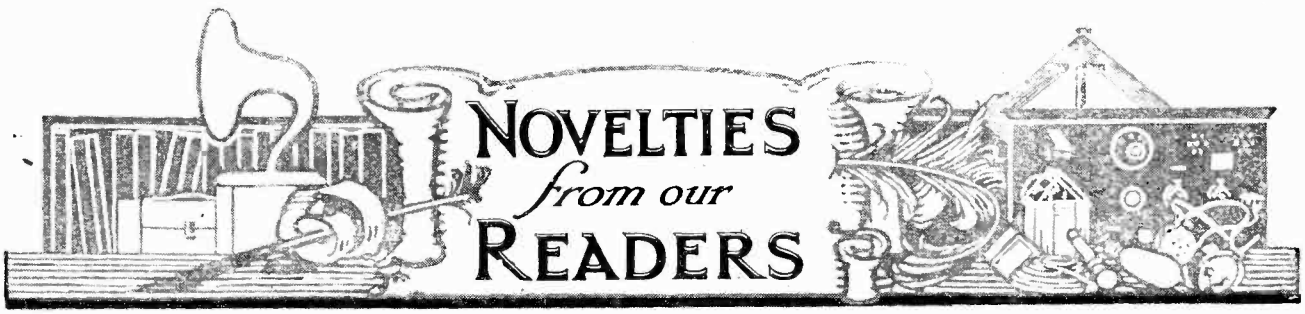
Reception of Australian 2ME.

A correspondent at Brockley informs us that he has succeeded in picking up the Australian station 2ME, Sydney, N.S.W., on a two-valve (0-v-1) modified Reinartz receiver with an indoor aerial 20ft. above ground level and only 1ft. under the ceiling. 2ME was first heard between 1916 and 2100 B.S.T. on September 2nd at a strength of R2 to R5, and still more clearly the following day at 1825-1905 B.S.T. The chiming of a clock at 4 a.m., Sydney time, was very distinct.



A Section Devoted to New Ideas and Practical Devices.

REPAIRING LARGE CONDENSERS.

It may not be generally known that it is quite possible and fairly easy to repair Mansbridge type fixed condensers which have developed a leak or even a short-circuit. The larger types having capacities of one or two microfarads, which cost between three or four shillings each, are well worth the small expense involved.

First of all warm the composition at the top in a small flame, and dig it out with an old penknife or some such implement, taking care not to damage the two contacts, and roll it into a stick while still soft. When most of it has been removed it will be found that there is a strip of fibre about a quarter of an inch from the top of the condenser which supports the contacts to which connections are made from inside.

Now put a few small pieces of paraffin wax in the space at the top and place the condenser over a gas flame, or in a "slow" oven. Care must be taken not to overheat the condenser, otherwise the outer covering of paint will be damaged, or worse still the soldered joints in the case will melt. Add further pieces of wax until no more is absorbed, then pour off any superfluous fat above the level of the fibre strip. Allow to cool, and then test by charging it up and discharging several minutes later. If the leak has not been cured it follows that the wax has not reached the affected part, and the condenser should be warmed again until a cure is effected. The black composition may now be run into the top, the best way being to melt it in a flame like sealing wax.

It may be found that the metal case of the condenser is not air-tight, in which event the wax runs out when molten. If this happens the case must either be re-soldered, or alternatively the whole condenser may be "fried" in a vessel containing molten wax. This latter method is quite as effective as that described above; it is, however, a rather odorous process, and requires at least sixpennyworth of fat to fill a vessel large enough for the job. L. W.

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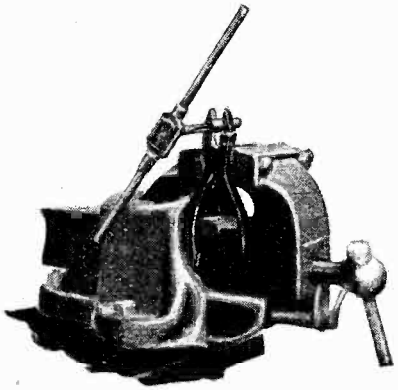
HOLDING SMALL TUBES.

When it is necessary to hold tubing for internal or external threading, a pair of gas or electricians' pliers with a serrated circular grip may be used



Using pliers as temporary pipe vice.

as a pipe vice by gripping in a bench vice as shown. There is no tendency to flatten or distort the tubing, and the method is far better than gripping between lead blocks. F. B.

VALVES FOR IDEAS.

Readers are invited to submit brief details, with rough sketches, where necessary, of devices of experimental interest for inclusion in this section. A dull emitter receiving valve will be despatched to every reader whose idea is accepted for publication.

Letters should be addressed to the Editor, "Wireless World and Radio Review," Dorset House, Tudor Street, London, E.C.4, and marked "Ideas."

ACCUMULATOR REPAIRING HINT.

The necessity frequently arises for repairing the connections between the cells of accumulators which have been joined together by means of lead strips burnt on to the top of the plate lugs. Strictly speaking, the repair should be carried out by the process of lead burning, which gives a joint impervious to the effects of acid.

Soldering is, however, much more convenient, and may be carried out with the resources at the disposal of the average amateur. It remains to protect a soldered joint of this nature from corrosion by the acid, and this may be done by painting the joint with a fairly thick solution of celluloid in amyl acetate. The joint should be well cleaned and dried before applying the solution, which should be allowed to harden before coming into contact with the acid.

H. Y. F.

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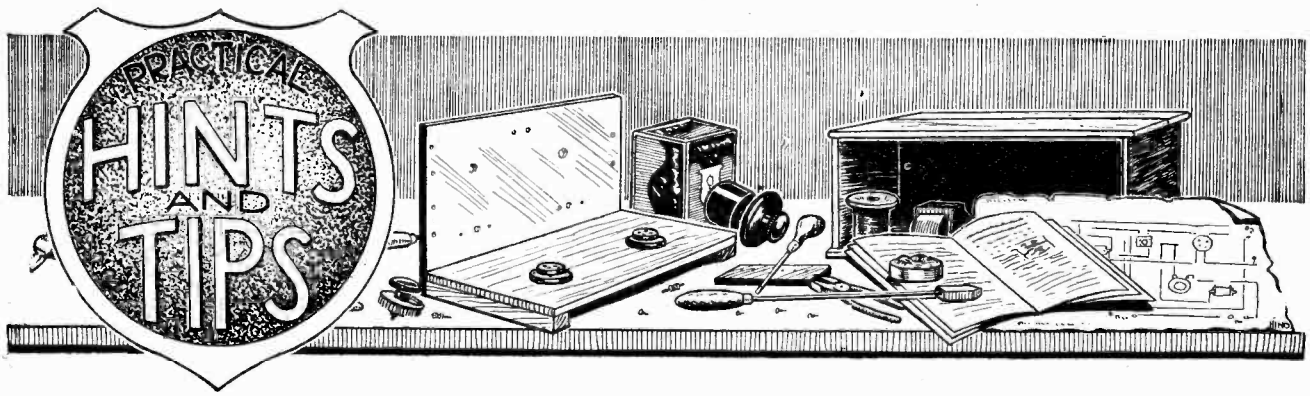
FLASHLAMP FUSES.

As was pointed out in the issue of June 8th, there was complete justification for the insertion of a flashlamp bulb in the negative H.T. lead, in the days of the bright-emitter valve consuming 0.75 amps. Nowadays, however, when few valves consume more than 0.25 amps., reliance on such a device is apt to be dangerous, as the average 3- or 4-volt bulb will often pass as much as 0.5 amp. for a considerable period.

If, however, the bulb be gently touched with a hot iron so as to crack the glass, then the vacuum inside will be destroyed and the "blowing" point of the lamp reduced tenfold. On test it has been found that the average lamp will "blow" at about 50 mA, thus giving an ample margin for liberal H.T. current and complete safety against H.T. burnouts

G. I. W.



A Section Mainly for the New Reader.

AN "EVERYMAN" HINT.

IT is now well known that the "free" detector valve bias device included in the "Everyman Four" receiver is applicable only when using one of the recommended combinations of a two-volt detector with six-volt (or, with modifications, four-volt) valves elsewhere. Strictly speaking, it is not possible to obtain sufficient grid bias from the drop in voltage across one of the filament resistors when six-volt valves are used throughout. However, due to the presence of a high anode resistance, an average specimen of the popular 0.1 amp. six-volt "R.C." valves works well if its heating current is reduced to a figure well below that at which it is rated. Thus, if the holder R_4 is short-circuited, and a 30-ohm resistor is inserted in R_3, it will be found that ample emission is obtainable from the filament, and, moreover, that the bias voltage applied to the grid will be approximately correct.

With many modern valves, some of which have a sharply-defined bottom bend, it is advisable to fit a grid potentiometer, with two dry cells, if maximum sensitivity is required.

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REPLACING THE AERIAL HALYARD.

ONE of the most annoying things which can happen in connection with an aerial is for the halyard to slip right off the pulley at the top of the mast by some mishap. The suggestion of lowering the whole mast is often inevitable and always unwelcome. If, however, the mast is not more than about 30ft. high the simple procedure illustrated in the figure will in many cases enable the halyard to be replaced without letting the mast down. A rod which will reach to the top of the mast is made by lashing a number of lengths of bamboo together and at the top of this is rigidly fixed a horizontal piece of wood four inches long. Two nails are knocked into this piece of wood as shown, and are left with their head ends projecting a quarter of an inch. A stiff, straight piece of 12-gauge wire must be prepared, which should be about 18in. long, one end being bent into a small hook and the other into a small eye for the attachment of a length of string. This should be capable of

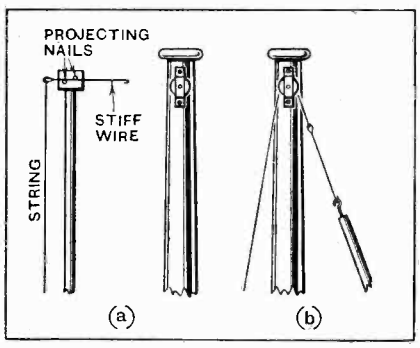

Fig. 1.—Replacing a broken halyard.

passing through the pulley block without difficulty. The wire is held horizontally at the top of the rod between the two nails as shown in the first diagram; a steady downward pull on the string will keep it in position while the rod is raised. When the wire is on the level with the pulley it is pushed through the pulley block and is allowed to fall through the other side. By means of a hook attached to the end of the rod, as shown in the second diagram, the end of the string which has thus been manœuvred over the pulley is pulled down within reaching distance.

Once we have a length of ordinary string over the pulley the rest is easy. In attaching the proper halyard to the string, however, some pains must be taken to avoid a bulky knot which will not go through the pulley block. One of the simplest ways of making the joint is to lay the two ends to be joined alongside each other so that they overlap for about an inch and a half and bind round tightly with thin iron wire.

This method has been used with success in the case of a 25ft. mast, and there is no reason why it should not be applied in the case of somewhat higher masts.

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QUALITY OF REPRODUCTION.

"GOOD quality," "distortionless," and suchlike words are, in the present stage of the wireless art, comparative terms only. There is a tendency even now to accept a standard which is lower than it need be.

One of the most important advances of late has been the development of the coil-driven free edged cone loud-speaker, which is probably more free from pronounced resonances than any other type. After using such an instrument for a few weeks, the experimenter with only a moderately keen ear will notice a number of shortcomings in the reproduction of his friends' sets to which those good people are quite oblivious. The chief amongst these is "blast," caused by notes which are practically inaudible in the output of most horn type loud-speakers.

The notes are, of course, the very low ones of the organ and some drums, and the only cure is to increase the power-handling capabilities

of the last stage in the set by the substitution of a "larger" valve—*i.e.*, a "super-power," or if that is not sufficient, a number of valves in parallel.

There is the vexed question, too, of whether it is the duty of the experimenter to point out the defects in his friends' sets or not. From the point of view of the good of the wireless art, such shortcomings should undoubtedly be indicated and their remedy made clear.

The time has almost come when a new edict is required: "Let no man boast of the musical quality of his set until he has heard the same at normal strength on a coil-driven cone loudspeaker." At least one serious experimenter had to change his views on the subject of crystal detection with 'phone reproduction after such a hearing.

to be the more permanent remains to be seen, since both arrangements do the work required of them. Fig. 2 (*a*) scores heavily if there is any question of unit construction, such as in the "Nucleus" series of receivers, since the constants of the H.F. transformer depend upon the characteristics of the valve connected in its primary circuit and not upon the grid circuit of the valve which follows.

By bringing the grid bias connection back on to the unit containing the valve to be biassed, as shown in Fig. 2 (*a*), all the variables which have to be correctly adjusted to suit a given valve are grouped together.

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OVERLOADING.

EVER since the earliest days of broadcasting the temptation to overload receivers has been with us. In the days of telegraphy, phones were used almost without exception, and the necessity for obtaining the utmost noise did not exist. Loudspeakers became fairly general soon after the commencement of regular broadcast transmissions, and with them came the demand for much greater power than before. At first there were only available "R" valves and small power valves taking very heavy filament current. Nowadays, however, we have an adequate choice of valves, and there is little excuse for any distortion of the type associated with overloaded valves.

It is a remarkable fact that a resistance-capacity coupled amplifier, if overloaded, mutilates the incoming signal much more obviously than does a transformer-coupled set of the same nominal capabilities. This is due to the fact that if the grid of a resistance-coupled valve becomes negative, a certain time must elapse before the charge which inevitably accumulates has time to leak away through the high-resistance grid leak. In a transformer-coupled set the grid current can leak away through the secondary winding with comparative ease.

The foregoing is a possible explanation of the success of such sets as the "Everyman Four," where the first (and therefore lightly loaded) L.F. stage is resistance-coupled to the detector, and the second stage is transformer-coupled. Chronic overloading of this set will, however, produce the same symptoms as in any other set.

The distortion due to overloading may perhaps best be indicated by comparing the tone of a cracked bell with that of a sound one. There is a jarring series of overtones associated with every loud note.

Overloading on a reflex set is not permissible. If the set happens to be of a type with a highly efficient H.F. system, a peculiar croaking noise will be heard on loud notes. This is due to the L.F. causing grid current, which severely damps the H.F. transformer and interferes with the incoming signal. Because of this characteristic reflex sets are instructive, since one learns to associate a certain volume with a certain grid-swing, and can be quite sure that if the set is only just not "croaking" that the grid bias is being used to its full extent. The grid swing will be about twice the value of the bias battery.

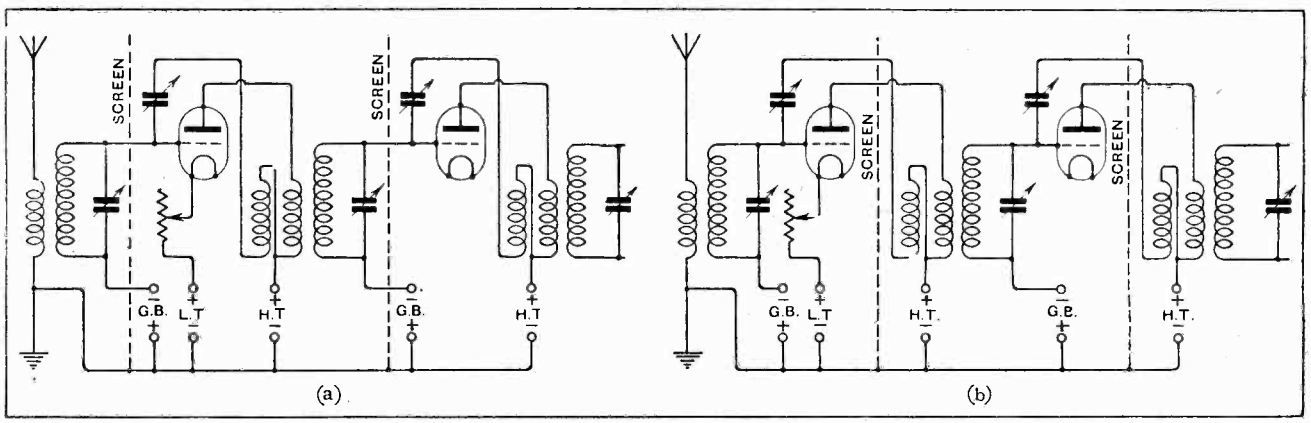


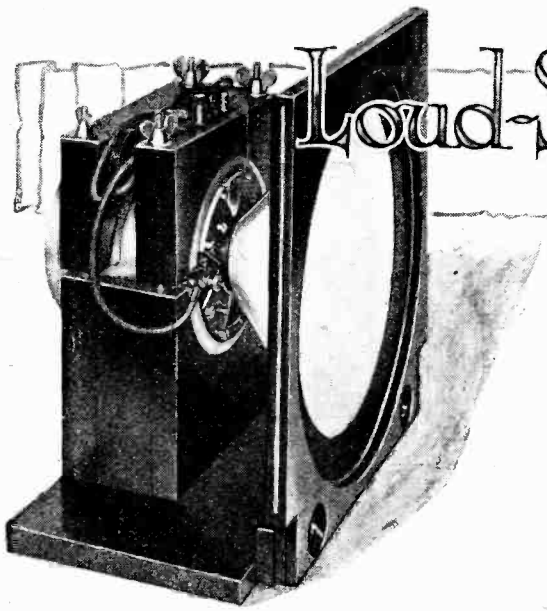
Fig. 2.—Alternative positions for screens in a high-frequency amplifier.

SCREENING.

THE use of sheet aluminium or copper within a receiver as a means of isolating the various H.F. stages is a modern practice which has everything to commend it, and which will undoubtedly become universal in time.

Readers may have noticed a difference in the application of screens as carried out by the several writers who publish complete designs of receivers. Fig. 2 (*a*) and (*b*) demonstrates this difference, which may be summed up by saying that in Fig. 2 (*a*) the valve and the apparatus associated with its anode circuit are included between a pair of screens (or in a complete box), while in Fig. 2 (*b*) the valve and its grid circuit are grouped together.

Just which "school" will prove



Loud-Speaker Diaphragms

Air Pressure and Energy Distribution in the Space Surrounding the Diaphragm.

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

IN the first article of this series[1] we showed that owing to the low velocity of sound in air there was a distinct focussing effect at high frequencies with the average loud-speaker diaphragm. The low velocity means that the time interval between the arrival of waves, from opposite edges, A, B, at a point to the side of the disc, *e.g.*, P in Fig. 1, is comparable with the time taken to execute a half-cycle at high frequencies. We indicated in a very approximate way how to calculate the frequency at which focussing commenced, and saw that it depended on the diameter of the disc and on the velocity of sound in air. The larger the diameter and the less the velocity of sound the lower the frequency at which focussing began to get serious. In the present article our object is to give more exact information concerning the above effect. We shall assume, as before, that the rigid disc is freely suspended in a wall of large extent, so that its two sides are completely isolated. Since, under normal conditions, listeners do not put their heads close up to a diaphragm, we shall deal with the air pressure at a distance of 10 metres or more (see Fig. 2) from this disc.

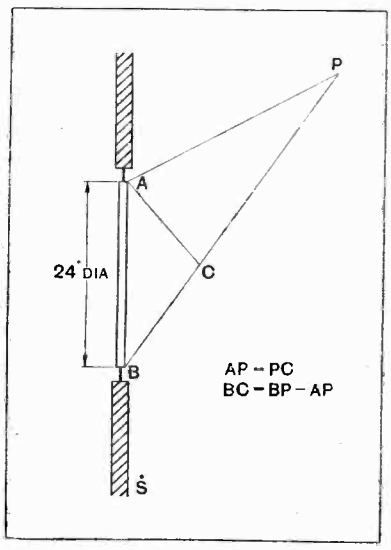


Fig 1.—Diagram showing difference in time of arrival at P of sound from diametrically opposite sides of the diaphragm. When BC = half a wavelength the radiation from A and B will practically cancel out at P.

If the alternating force driving the disc is constant at all frequencies, the alternating air pressure *on the axis* at a distance of 10 metres is greater at high than at low frequencies. The reduction at low frequencies is due to the "accession to inertia," by virtue of the mass of air moved at each side of the disc. This inertia effect is negligible at high frequencies due to the focussing effect, unless the disc is abnormally small. In other words, with a disc of normal diameter, the mass of air affected is materially less at high than at low frequencies, since at high frequencies the disc has little or no control over the air at each side (see Fig. 3). The air pressure on the axis of a disc of 10 cm. radius (8in. diameter) at various frequencies is portrayed in Fig. 4, the alternating force driving the disc being constant throughout the range covered.

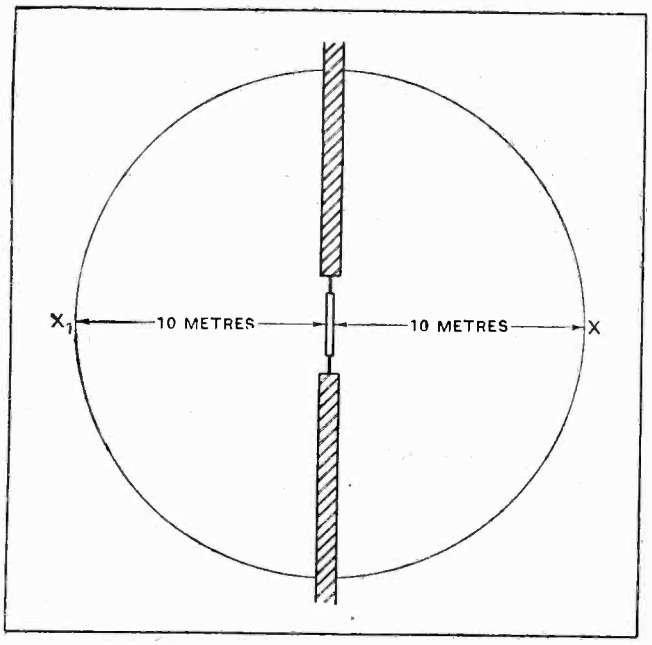


Fig. 2.—Normally the distance of a listener from the loud-speaker diaphragm may be taken as 10 metres.

We have now to discuss the value of the alternating air pressure at the same distance from the centre of the disc, but at points inclined to the axis at any angle ϕ. The air pressure distant 10 metres on a line inclined at ϕ to the axis of the disc is equal to the axial pressure

[1] *The Wireless World*, March 23rd, 1927.

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multiplied by a factor which depends on three things, namely, the diameter of the disc, the frequency, the angle ϕ. The analytical work involved is beyond our present purview, but from the analysis I have computed the curves of Fig. 5. Here we have a factor or function $2G_1$ plotted against the angular distance ϕ for different frequencies. The alternating air pressure at any angle ϕ is equal to axial air pressure $\times 2G_1$. On the axis where $\phi = 0$ it is obvious that $2G_1 = 1$, or $G_1 = 0.5$. Taking the pressure curve of Fig. 4 and the $2G_1$ curves of Fig. 5 it is now possible to find the air pressure 10 metres from the 10 cm. disc for any angle and any frequency. Several typical cases are set forth in Table I and illustrated diagrammatically in Fig. 6. At low frequencies of 64 cycles (two octaves below middle C on the pianoforte) the pressure of the air over a hemisphere whose centre is that of the disc and radius 10 metres is constant, *i.e.*, it is equal at all points on the surface. As the frequency increases the air pressure becomes less on that portion of the hemispherical surface near the wall. When a certain frequency is reached the air pressure on a circle at the wall 10 metres from the disc is zero, *i.e.*, the air is undisturbed and there are no sound waves there. As the frequency is increased still more, the circle of zero pressure gradually veers towards the axis. It leaves in its trail a sort of residue, so that there is a small pressure on the wall. But at a higher frequency the pressure at the wall again becomes zero, and another circle of zero pressure starts on its journey towards the axis. Thus if we pause at a frequency of 4,096 cycles we shall find a series of circles where the pressure is zero, and a zone within which the pressure gradually increases until we reach the axis where it is a maximum. These circles of zero pressure are called "nodal lines." In calm air at any high frequency they extend from regions in the neighbourhood of the disc out into space. These points are illustrated by the diagram of Fig. 6 and 6(a).

TABLE I.

AIR PRESSURE AT VARIOUS ANGULAR DISTANCES FROM AXIS OF DISC.

Air pressure in dynes per square centimetre.

Angular Distance. ϕ^0	Frequency Cycles per Second.		
	64	1,024	4,096
0	2.2	2.5	2.72
10	2.2	2.4	2.12
20	2.2	2.3	+0.95
30	2.2	—	0.0
40	2.2	1.95	−0.35
50	2.2	—	−0.24
60	2.2	1.45	−0.08
70	2.2	—	+0.05
80	2.2	0.9	+0.12
90	2.2	0.6	+0.14

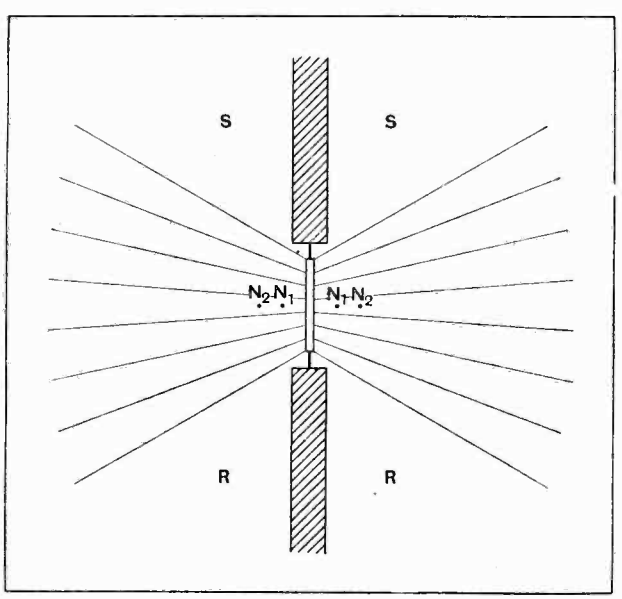

Fig. 3.—Beam or focussing effect at high frequencies due to interference in the regions R and S. N_1, N_2 are nodes, or points of zero pressure.

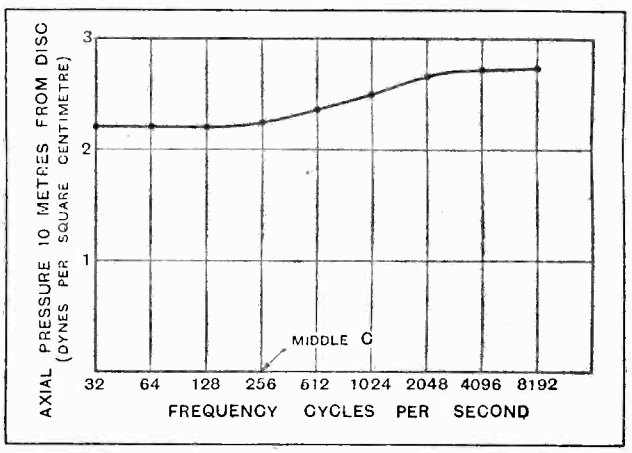

Fig. 4.—Curve showing air pressure on a rigid disc of 10 cm. radius driven by a constant alternating force of 6.32×10^5 dynes (1.42 lb.). Owing to interference a slight oscillation in the curve occurs at high frequencies. This is of the form of the curve in Fig. 5 ($f = 4096$ cycles), from 30° onwards, but has been neglected in this case, the mean line being taken.

First-hand Information.

By means of a variable note oscillator applied to a coil-driven diaphragm, preferably with a thin cardboard disc fitted to the mouth of the cone, the reader can obtain a fair idea of the distribution of air pressure at various frequencies. In carrying out experiments there are several things which may detract from the ideal: (1) resonances in the cardboard disc; (2) reflection from the walls of the room, especially at high frequencies, when standing waves are formed; (3) incomplete isolation of the two sides of the diaphragm; (4) acoustic shadows or interference with the normal spatial distribution of the sound waves due to the observer's body. Probably a small search tube or pipe of suitable length connected to the observer's ear will enable him to study the distribution without introducing his body.

The next point for consideration is the energy distribution in the space outside the disc. As we already know, sound is propagated in the form of waves. At low frequencies the waves sent out by the disc are sensibly hemi-

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spherical in shape. As the frequency increases there is a gradual transition due to the focussing, until ultimately the waves are sensibly plane, *i.e.*, the front of the wave

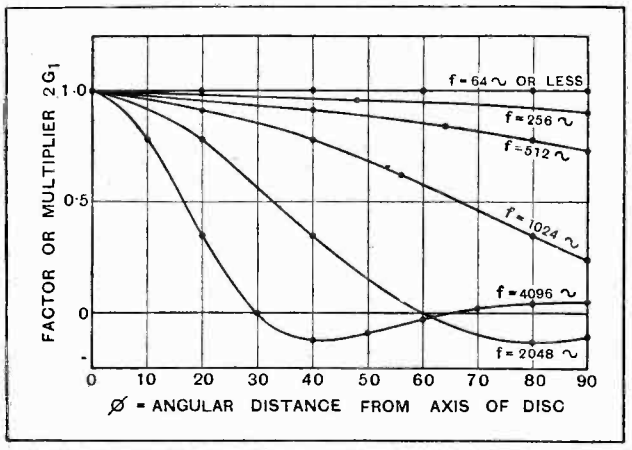

Fig. 5.—Curves showing values of the factor $2G_1$. The pressure at any angular distance ϕ is equal to the axial pressure multiplied by $2G_1$.

is flat instead of being spherical. In fact, the wave front is practically a flat disc whose diameter increases with the distance from the disc.

In the reception of radio telegraphy or telephony we know that a certain amount of energy is collected or transferred from space to the aerial. Also in the reception of sound by our aural organs, energy is transferred from the air waves to these organs, by virtue of which we

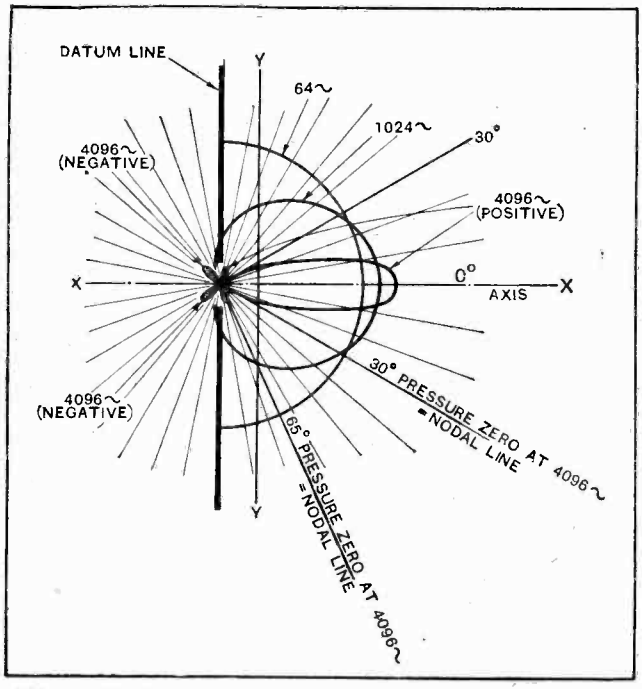

Fig. 6.—Distribution of air pressure 10 metres from one side of vibrating rigid disc at different frequencies. At 4096 cycles the small loops shown at the left of the datum line indicate that the pressure at any instant is opposite in sign to that on the right. The actual distributions lie on surfaces formed by the revolution of the curves about the axis XX.

obtain the sensation of sound. If we take a piston and cylinder and trap a certain amount of air below the piston, work is done, *i.e.*, energy is expended, in compressing the air by depressing the piston. When air is compressed and rarefied by the vibrating disc, a certain amount of energy is required to accomplish the process. Moreover, the energy does not remain in the vicinity of the disc in the same way that it remains in the air beneath the piston. It is radiated from the disc and is carried away at the velocity of sound. Ultimately it is dissipated in heat due to frictional loss. We have, therefore, a progressive system of waves spreading out in various directions from the disc as source. As the distance from the disc increases, the area of the surface covered by the waves also increases. Assuming for simplicity that there is no frictional or other loss due to transmission through the air, the total energy from the disc remains constant as it travels outwards. Since the surface area over which the energy is distributed gradually increases with the distance from the disc, the quantity of energy passing through each square centimetre decreases as we get farther away from the disc. But there is a direct connection between air pressure and energy. Hence, if the latter decreases the air pressure must follow suit. Thus the curves of Fig. 6, showing the relation between air pressure and angular distance ϕ, also show the distribution of energy from the vibrating disc.

In electrical engineering for direct currents we know that watts $= i^2r$ where i = current and r = resistance. But $i = \frac{E}{r}$, where E = E.M.F., and therefore watts $= \left(\frac{E}{r}\right)^2 r = \frac{E^2}{r}$. Now, watts measure power, and energy is power × time, so that energy $= \frac{E^2}{r} \times t$, where t = time.

Thus we see that the energy in an electrical circuit carrying a direct current of constant value depends upon the square of the E.M.F. or electrical pressure.

Coming back to our acoustic problem we could show by a different process that the sound energy also depends upon the *square* of the air pressure. Thus, to get a proper idea of the energy distribution in space from our acoustic source, we must square all the values of air pressure represented in the curves of Fig. 6. The result is to elongate the curves for 1024 and 4096 cycles considerably parallel to the axis. The energy distribution at low frequencies is identical with that of air pressure, but that at high frequencies is considerably more attenuated as the angle ϕ increases. This spatial energy distribution can be readily appreciated qualitatively with a coil-driven cone with large baffle. By standing near the diaphragm and moving the head quickly from the side to the axis, there is a very noticeable augmentation of the high-fre-

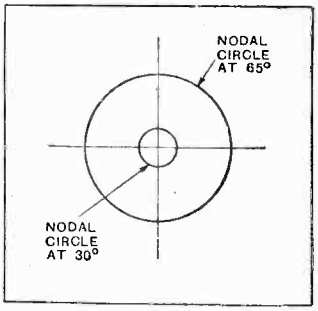

Fig. 6(a).—Section through pressure surface at YY in Fig 6.

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quency energy. Naturally there is a modification due to the head and body of the experimenter disturbing the normal flow of pressure waves. Here again we could with advantage use our search tube.

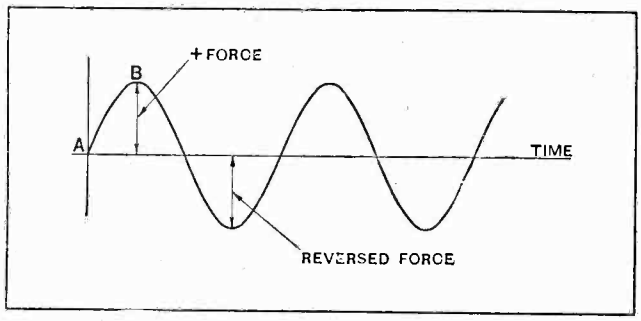


Fig. 7.—Wave form of driving force on disc.

An important aspect of the source has not yet been broached. In general the amplitude or extent of the vibration of the disc is small enough to be overlooked. Since the eye resolves anything above 16 vibrations per second into a continuity, *i.e.*, as in moving or cinematograph pictures there seems to be no interruption, it is impossible to see the vibration unless special means are adopted. We have already seen that the air pressure on a disc due to the generation of sound energy is usually small compared with the mass of the disc and its accession to inertia at low frequencies. Thus we can assume that the disc has a total effective mass equal to its natural or gravitational mass plus the accession to inertia. For a disc of 10 cm. radius weighing 10 grammes the effective mass at various frequencies is given in Table II. From elementary mechanics we know that force = mass × acceleration or $f = ma$. If we take f as being 6.32×10^5 dynes it is a very simple matter to calculate the acceleration. The figures calculated from $a = \frac{f}{m}$ are given in Table III. Now, we have postulated hitherto—as we usually do when dealing with steady state problems—that the force is alternating and of a sine wave characer. That is to say, it has a wave form like that illustrated in Fig. 7. It starts from zero at A and attains a maximum value at B, after which it falls to zero and then reverses in direction, *i.e.*, we have an alternate series of pushes and pulls on the disc which are graduated as shown by the ordinates of the curve.

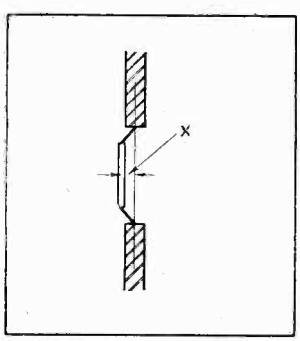


Fig. 8.—Maximum displacement, X, of diaphragm from the mean position.

Another deduction from elementary mechanics is required to cope with the sine wave motion of the disc. This is as follows: Max. acceleration $= (2\pi f)^2 X$, or $a = \omega^2 X$ where f is the frequency in cycles per second, $\omega = 2\pi \times$ frequency, and X = the greatest distance the disc moves on each side of its central position when vibrating, or, in other words, the amplitude of vibration, as shown in Fig. 8.

The maximum acceleration occurs when the disc just leaves the position of Fig. 8 on its journey to the right.

TABLE II.

EFFECTIVE MASS OF RIGID DISC AT VARIOUS FREQUENCIES (GRAMS).

Frequency.	Effective Mass of Disc.
32	13.5
64	13.5
128	13.5
256	13.5
512	12.6
1,024	11.2
2,048	10.1
4,096	10.0

TABLE III.

ACCELERATION OF DISC DRIVEN BY FORCE OF 6.32×10^5 DYNES = 1·42 LB.

Frequency.	Acceleration of Disc. cm. per sec.²
32	4,680
64	4,680
128	4,680
256	4,680
512	5,010
1,024	5,640
2,048	6,260
4,096	6,320

Now when the force acting on the disc varies as shown in Fig. 7 the maximum amplitude is given by $X = \frac{a}{\omega^2}$ Thus we can calculate the value of X corresponding to each frequency. The data pertaining to this case are given in Table IV., and these have been plotted in Fig. 9. The amplitude of the excursion to and fro decreases rapidly as the frequency increases. For example, in the case cited the amplitude at 32 cycles is 1.1 millimetre, and this corresponds to a sound of considerable loudness. At 256 cycles, which is 3 octaves higher in the musical scale, the amplitude is only $\frac{1}{64}$th of the value at 32 cycles. In other words, at the lower frequencies, when the energy radiated from the disc is constant, the amplitude varies

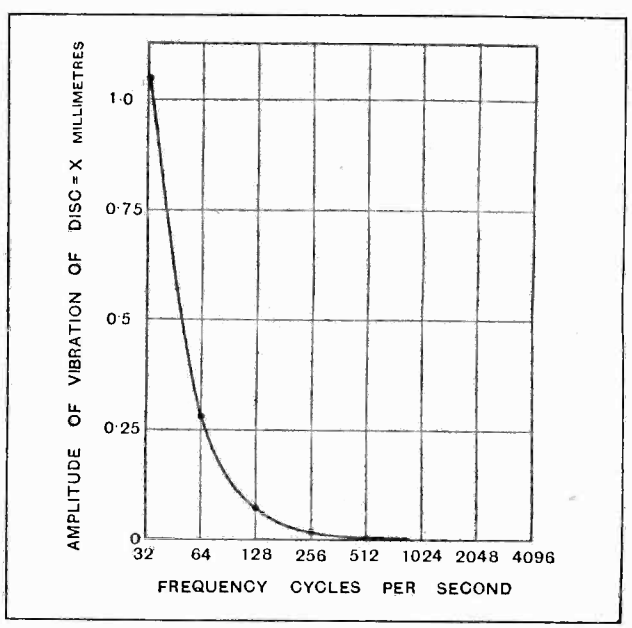


Fig. 9.—Curve of amplitude of vibration of a rigid disc of 10 cm. radius driven by an alternating force of constant magnitude (6.32×10^5 dynes). Amplitudes above 512 cycles can be obtained from Table IV.

Loud-speaker Diaphragms.—

as the inverse square of the frequency. If the effective mass m were constant at all frequencies, and there were no focussing due to interference at high frequencies, the maximum acceleration would be constant, because the maximum force is constant at all frequencies. This would yield hemispherical energy distribution on each side of the disc, and the energy radiated at all frequencies would be constant.

TABLE IV.

AMPLITUDE OF DISC AT VARIOUS FREQUENCIES.

Frequency.	ω^2	Amplitude. $X=\frac{a}{\omega^2}$ (cm.).
32	4.1×10^4	1.1×10^{-1}
64	1.6×10^5	2.8×10^{-2}
128	6.4×10^5	7.0×10^{-3}
256	2.56×10^6	1.75×10^{-3}
512	1.02×10^7	4.9×10^{-4}
1,024	4.08×10^7	1.35×10^{-4}
2,048	1.63×10^8	3.8×10^{-5}
4,096	6.5×10^9	9.7×10^{-6}

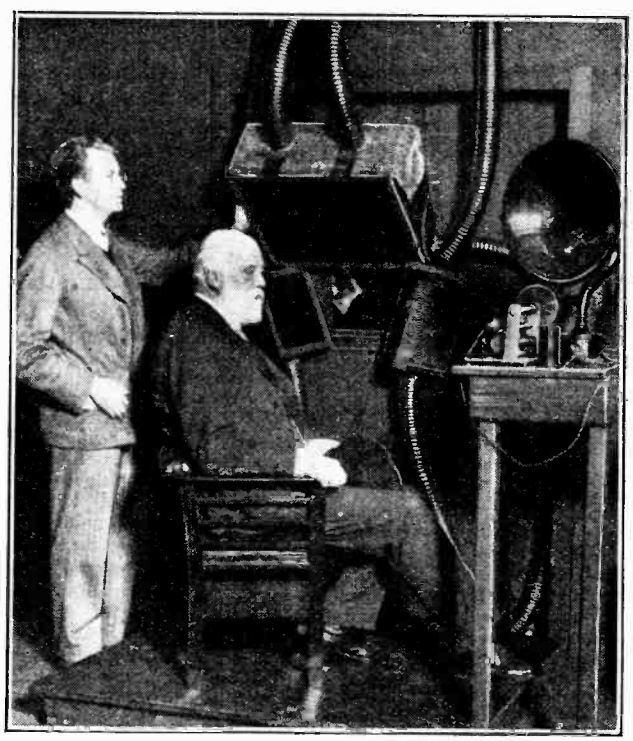
It is interesting to contemplate frequencies below the lower limit of audition. For example, suppose we take a frequency of 4 cycles per second, at which the motion of the disc would be plainly visible. From our law of inverse squares we find $\left(\frac{32}{4}\right)^2 = 64$. Thus the amplitude at 4 cycles would be 64 times the amplitude at 32 cycles. This would mean a disc movement of $64 \times 1.1 = 70.4$ millimetres $= 7.04$ cm., which is relatively enormous. Although for the average residence an amplitude of 1.1 mm. at 32 cycles would in general be too large, the reader will see that to secure the low tones the periphery of the diaphragm should not be subject to considerable constraint. In other words, it should be capable of sensibly free motion over about 1 mm. This obviously applies more rigorously to diaphragms used in public-address loud-speakers, where the amplitude at low frequencies may be several times the above amount.

A point of interest is the velocity of the disc. At low frequencies the amplitude is so large (relatively) that the disc must travel more quickly than at high frequencies to get from one side to the other. The reader can calculate the maximum velocity which occurs when the disc is at the centre of its swing from the formula $V=\omega X$, using the values of X in Table IV. It will be found that the velocity at 32 cycles is eight times that at 256 cycles, and so on.

TELEVISION

At The British Association.

IN connection with the annual meeting of the British Association for the Advancement of Science, which was held at Leeds during the first week of September, an exhibition of scientific apparatus was held. Among the exhibits of special wireless interest was a coil winding machine shown in operation by the Igranic Co., a gramophone fitted with an electric pick-up operating a loud-speaker, also shown by the Igranic Co., who also exhibited their portable superheterodyne set and various accessories. The Mullard Co. had an interesting and instructive exhibit, showing the various stages in the construction of valves; they also showed a complete range of valves, from the smallest receiving valves up to the largest quartz, and glass transmitting valves. A number of instrument-making firms showed resistance boxes, ammeters, voltmeters, etc., and the B.B.C., in a special room showed what could be done in the way of good quality reproduction from the local station. The exhibit which attracted the most attention was that of the Baird Television Development Co., Ltd., to whom were allotted several rooms in a separate building. The programme announced that Television, Noctovision, and the Phonovisor would be demonstrated by Mr. Baird, but this proved too ambitious an undertaking. A very successful demonstration of noctovision between two rooms separated by an intermediate room was given to large numbers of the members, who passed through in batches hour after hour, and left Mr. Baird and his staff little time for anything else. A special demonstration of television and noctovision between London and Leeds



Mr. J. L. Baird demonstrating his "Noctoviser" to Sir Oliver Lodge.

Television.—

was to have been given before twenty selected members of the Association on the evening of Monday, September 5th, but although Mr. Baird himself went to London to superintend the transmitting end, successful transmission was not obtained, and the waiting scientists were dismissed with regrets. We understand that the Phonovisor was not shown in operation, but was explained in principle by Mr. Baird at a conversazione held at the University.

Principle of Noctovision.

For the benefit of those readers who are not familiar with the names given by Mr. Baird to his inventions, we may explain that, whereas in television the subject being transmitted is necessarily brilliantly illuminated, in noctovision the subject is in darkness, but is subjected to a powerful beam of infra-red radiation. Although this gives no sensation of light to the human eye, it affects the light-sensitive cell in the same way that visible radiation affects it, so that, as the revolving lenses sweep across the subject sitting in apparent darkness, the electric current flowing through the cell fluctuates according to the variations of the infra-red radiation reflected from different parts of the subject. If the subject being transmitted is a person's face, this method avoids the inconvenience of the dazzling illumination, but whether the heating effect is any less we do not know; it may have to be greater to obtain the same result. A disadvantage of noctovision is that the various colours in the subject will have different reflecting powers for infra-red radiation to those for visible radiation, but this can only be considered in conjunction with the response of the light-sensitive cell to different wavelengths. It is unnecessary, however, at this early stage of development to worry about such points. At the receiving end the audience is in darkness, whether for television or noctovision, and sees the subject on a screen across which a light sweeps in synchronism with the sweep of the lenses at the transmitter; this light being obtained from a neon lamp is red, and follows in intensity the fluctuation of intensity of brightness of the subject. The impression is somewhat similar to that of a very slow-moving cinema picture. At Leeds, owing to the temporary character of the installation and the absence of concrete foundations for the motors, the speed was exceptionally low, and the flicker effect consequently enhanced. We noticed a peculiar effect which we at first put down to a fading of the picture, but which we found was an optical illusion; if one allowed one's eyes to focus on the red light sweeping across the screen, and followed it across the screen, the picture vanished; it seemed necessary to ignore the sweeping light and look, as it were, beyond it to infinity; the picture then showed clearly. In this way one could clearly detect when the person whose face was being transmitted opened and closed his mouth, or lit a cigarette, the smoke being clearly visible, in spite of the fact that the infra-red rays are supposed to penetrate fog.

Apart from the inconvenience of dazzling the "patient" we do not know what are the relative merits of television and noctovision, but the latter is certainly the greater scientific novelty, and was far and away the most striking application of science to be seen at the Leeds meeting. It reflected great credit on those who were responsible for it. We do not know, however, whether it represented conditions exactly as they would be between two distant stations. At Leeds the sending and receiving rooms were apparently separated by a very short distance, which would greatly simplify the problem of synchronisation, or do away with it entirely if a single motor could be used to drive both transmitter and receiver.

The apparatus which has been called a phonovisor differs from that described above in that the currents from the light-sensitive cell are made to actuate, after amplification, the cutter of a phonograph recorder. By playing this record a sound is obtained which has been called the sound of the person's face, assuming a face to be the subject transmitted. Even the most beautiful face treated in this way sounds somewhat commonplace, and as a method of storing a moving picture it appears to be very far behind the film. Although, to quote Mr. Baird, "if this record is played into a televisor, the original moving scene which caused the sound is reproduced on the screen of the televisor," we doubt whether such a cycle, even with the possibility of having the scene and the voices recorded on the same cylinder or disc, can be improved and simplified sufficiently to be more than a scientific novelty. However, scientific prophesy is a dangerous pastime, and we will close by congratulating Mr. Baird on providing what was undoubtedly the most popular of the scientific exhibits at the Leeds meeting.

BOOKS RECEIVED.

The Shielded Four-electrode Valve, Theory and Practice. By Capt. H. J. Round, M.C., M.I.E.E. Pp. 88, with 54 illustrations and diagrams. Published by Cassell and Co., Ltd., and Bernard Jones Publications, Ltd., London. Price 2s. 6d. net.

The Admiralty List of Wireless Signals, 1927. Including W/T Land Stations of the World and Details of Direction Finding, Fog Signals, Weather Bulletins, Storm and Navigation Warnings, Time Signal Stations, etc., revised and corrected to December 31st, 1926. Issued by the Hydrographic Department, Admiralty, published by H.M. Stationery Office, and sold by J. D. Potter, 145, Minories, E.1. Price 6s. net.

Handbook for Wireless Telegraph Operators. Revised in accordance with the Radiotelegraph Convention of London, 1912, and the Paris, 1925, revision of the International Telegraph Regulations. The official handbook issued by H.M. Postmaster-General and published by H.M. Stationery Office, London, Edinburgh, Manchester, Cardiff, and Belfast. Price 9d. net.

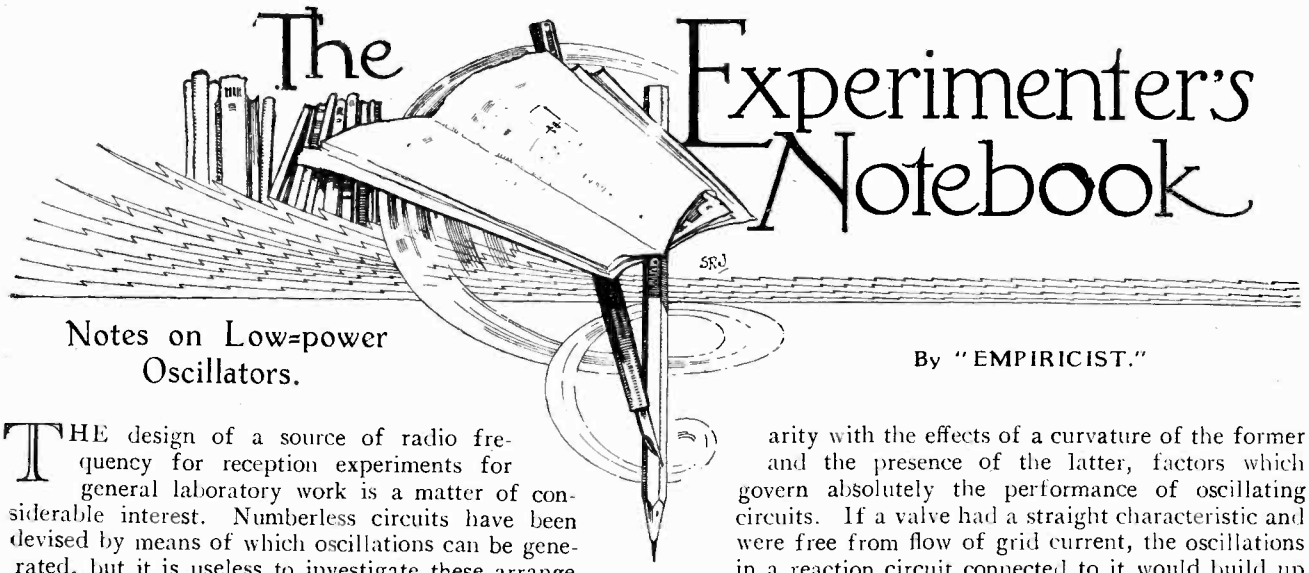
CATALOGUES RECEIVED.

A.F.A. Accumulators, Ltd., 120, Tottenham Court Road, London, W.1. List No. 3 illustrating and describing "Varta" H.T. accumulator monoblocks, type "W.A."

Cantophone Wireless Co., Remo House, 310, Regent Street, London, W.1. Catalogue of Cantophone cabinet and portable wireless receivers.

Unolith, Ltd., 406, Merton Road, London, S.W.18. Leaflet describing Unolith papier-mâché horns for wireless loud-speakers.

The Experimenter's Notebook



Notes on Low-power Oscillators.

By "EMPIRICIST."

THE design of a source of radio frequency for reception experiments for general laboratory work is a matter of considerable interest. Numberless circuits have been devised by means of which oscillations can be generated, but it is useless to investigate these arrangements without having some idea in the first place as to what is wanted, and in the second place as to how the various typical devices can be best made to fit in with practical requirements.

This article does not purport by any means to exhaust all possible varieties of circuit for this purpose, but rather to deal with a few particular cases by way of illustration and to show how certain main principles seem to govern their design.

In the first place, let us consider what are the main requirements of such a generator. Foremost among these we may put constancy of calibration, since in practically all cases it is desired to employ the oscillator as a standard of radio frequency, and naturally enough it is of importance to be able to repeat an adjustment whenever it is required. Next in order of importance we may place purity of wave-form; this is a matter which anyone will appreciate who has had to do with what may be termed "flash-up" oscillators, since, as often as not, these produce harmonics of a strength quite comparable with the fundamental frequency, and it is sometimes quite impossible to judge whether one is tuned-in to one or the other. Occasionally it is desired to set up a generator which produces harmonics in great quantity and strength, but inasmuch as this is something of a special requirement it need not be considered in any great detail in the present article.

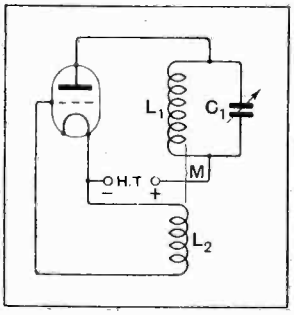


Fig. 1.—Tuned plate circuit oscillator.

Finally, it is desirable that the oscillator should be convenient in use and flexible as regards wavelength range, so that by a simple interchange of coils it can be made to give a continuously variable wavelength within whatever limits may be required for the purposes in hand.

Bearing these requirements in mind, we may next give brief attention to the fundamental properties of valves in so far as they affect the subject under consideration. Valves are so frequently considered on a basis of the assumption that they have straight characteristics which are free from grid current that there is no general familiarity with the effects of a curvature of the former and the presence of the latter, factors which govern absolutely the performance of oscillating circuits. If a valve had a straight characteristic and were free from flow of grid current, the oscillations in a reaction circuit connected to it would build up to an infinite amplitude, and we are thus obliged to deal with curved characteristics and grid current if we wish to face facts.

A Typical Circuit.

The mathematical theory of this subject has been placed on a sound footing by many eminent writers, but it is by no means necessary to go deeply into this aspect of the problem in order to obtain a general appreciation of the main principles. It is easier, as always, to start by the consideration of a particular case, and we will take in the first instance an ordinary plate tuned circuit as shown in Fig. 1. Referring to this figure, L_1 C_1 constitutes the oscillatory circuit, which is situated in the plate circuit of the valve, and the reaction coil L_2 is coupled to L_1, with mutual inductance M. We need not consider the circuit L_1 C_1 as having any losses of its own, since these will be outweighed by the damping effect of the valve which is placed in shunt across it.

We may now consider the characteristic of the valve employed in Fig. 1; this is shown in Fig. 2, which is a graph of plate current against plate voltage for one particular value of steady grid voltage which we will assume to be constant under all conditions, although the instantaneous voltage naturally fluctuates about the mean value when oscillatory currents are flowing in the circuit. This curve represents at every point the instantaneous current that would flow in response to oscillatory voltage across L_1 C_1 if there were no reaction coupling. Inasmuch as the latter is present, however, the instantaneous plate current is modified at every point, and in order to consider what the relationship is between plate voltage and plate current we have to work out and plot a totally different characteristic; the latter is usually called the dynamic characteristic of the circuit, and as opposed to the static characteristic which is that of Fig. 2.

Referring again to Fig. 1, we must consider what the

The Experimenter's Notebook.—

effect of the reaction coupling is, and for the present purposes we will neglect the effect of grid current, though this must necessarily be considered later on. Since we are dealing with generators of oscillations we will at once assume what every experimenter knows, namely, that the sense of the winding of L_2 reckoned from battery to grid must be opposite to L_1 reckoned from battery to plate; the mutual inductance is thus negative, and at any instant the volts on the grid are in opposition of phase to the volts on the plate, the value of grid voltage being actually $-\frac{M}{L_1}$ times the plate voltage.

If, then, we consider an oscillatory voltage to be maintained somehow across L_1, say by inducing a small E.M.F. in the circuit $L_1 C_1$, the current flowing at every

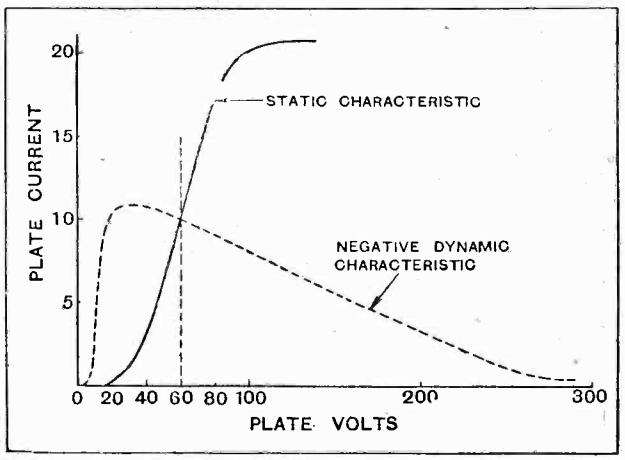


Fig. 2.—Valve characteristics with and without reaction coupling.

instant will not be given by the static curve of Fig. 2 since the grid voltage is variable; it will sometimes be greater and sometimes be less than the figure given by this curve according to whether at the instant under consideration the grid voltage is greater or less than its steady value. But since the voltage across L_2 is negative when that across L_1 is positive, and *vice versa*, we see that when the plate voltage is greater than its steady value the plate current is less than is given by the curve of Fig. 2, and *vice versa*. When the plate voltage is equal to its steady value the plate current will be the same whatever the reaction coupling, since then there is no superimposed voltage either in the plate or grid circuits.

Suppose then we consider the H.T. battery voltage to be 60, the dynamic characteristic of the circuit of Fig. 1 will pass through the point of the curve corresponding to this voltage whatever the reaction coupling, and according to the degree of coupling it will take a form, in the neighbourhood of 60 volts H.T., of a line sloping more gently than the static characteristic or actually in the opposite sense. These latter characteristics correspond to the conditions under which oscillations may be generated in the circuit, and as this is the only case we are considering we shall confine our attention to them. One such characteristic is shown as a dotted line in Fig. 2, from which it will be seen that within certain limits of voltage an increase in plate volts gives rise to a decrease in plate current, and *vice versa*. This effect is, however, obtainable only over a limited extent of the characteristic; the negative slope outside these limits being first of all less, and then actually positive.

If we consider various values of the reaction coupling M we can plot a series of dynamic characteristics, all of which will pass through the same point corresponding to 60 volts H.T., and all of which will also pass through the origin, since at zero plate volts no plate current will flow. It is evident, therefore, that there will be a curve in the dynamic characteristic on the left of the 60 volt H.T. line, and the greater the value of M the sharper this curve will be.

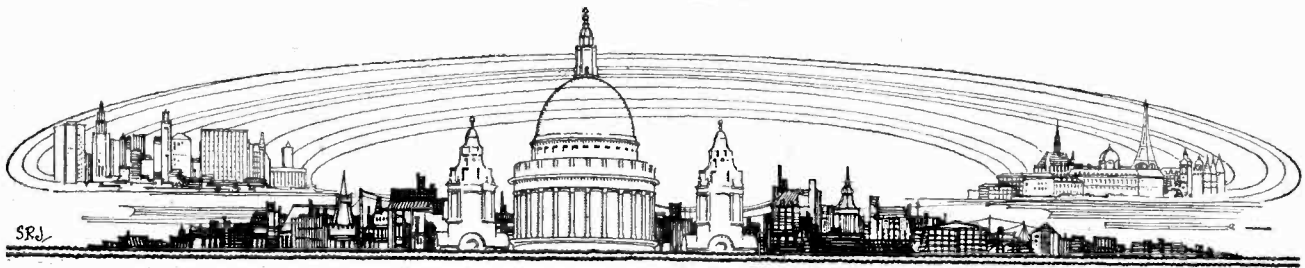
Now, since we have postulated negligible losses in the circuit $L_1 C_1$, oscillations will be generated in it however slight the negative slope, and they will build up until an extent of characteristic is traversed which embraces both positive and negative slopes in such a way that as much power is fed into the circuit as is absorbed from it. It is clear from the figure that the main positive slope in the dynamic characteristic occurs on the left-hand side of the 60-volt line; hence, when the curvature of this portion is great there will be a very sudden change of slope and the feed current will be of very irregular wave-form. In any case, however, the feed current will have a complex wave-form, and harmonics will be generated in the circuit to a greater or less degree.

The object to be borne in mind is, therefore, the adjustment of the reaction coupling to a value which will give oscillations of adequate amplitude without an excess of harmonics. This is found to be readily possible with a good valve at any one wavelength, but the difficulty lies in the arrangement of the circuits in such a manner that there is no excessive reaction over the complete tuning range of the oscillator.

A further practical point to be considered in connection with questions of wave-form is the working point chosen on the valve characteristic. In the figure the centre point of the static characteristic has been selected, and it is at once clear that this is far from being the centre of the dynamic characteristic, a much greater value of negative grid voltage being indicated. In practice it is invariably found that a considerable measure of negative bias is possible, and it is of interest to note how this necessity is indicated by the dynamic characteristic.

So far we have assumed that there is no flow of grid current, and in consequence that the oscillatory grid voltage was in a simple fractional relationship to that on the plate. In practice it is frequently far from being the case and, as a result, we have, in the grid circuit, not only the voltage induced by L_1 in L_2, but also the voltage set up in L_2 as a result of the flow of grid current. This latter voltage, while of highly irregular wave-form, will have a fundamental component in quadrature with the voltage in L_1 which will give rise to an effective increase in the capacity of the latter circuit and thus change its tuning. Since grid current is, in the highest degree, dependent upon the filament brightness of the valve, the detuning effect is correspondingly variable and the result is that the frequency of oscillation of the circuit, if L_2 is large, may be quite unreliable.

(To be continued.)



CURRENT TOPICS

Events of the Week in Brief Review.

AT LAST!

A correspondent, writing to a northern newspaper, describes himself as a "Satisfied Listener." It is understood that the B.B.C. is unable to explain the phenomenon.

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THE OPTIMIST.

A New York "D.X." enthusiast has requested the American Federal Radio Commission to decree that all local stations should remain silent between 12 noon and 3 p.m. to permit of the reception of Pacific stations. The request has not been acceded to.

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FIVE-METRE BROADCAST FROM AUSTRALIA?

A five-metre broadcast transmission from Melbourne may shortly take place for the benefit of British listeners, according to the Colonial Technical Press. The organisers are "Popular Radio Weekly." It is possible that the experiment will be made in two or three weeks' time, and it is understood that, if signals are reasonably strong, the B.B.C. will relay the transmission.

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ROME AND RADIO.

"More Church broadcasting stations" is a slogan of the "Osservatore Romano," the official organ of the Vatican, which decries certain phases of broadcasting as at present practised.

One indictment brought against broadcasting is that it causes waste of time by creating the habit of listening in at all hours of the day. But is this waste of time?

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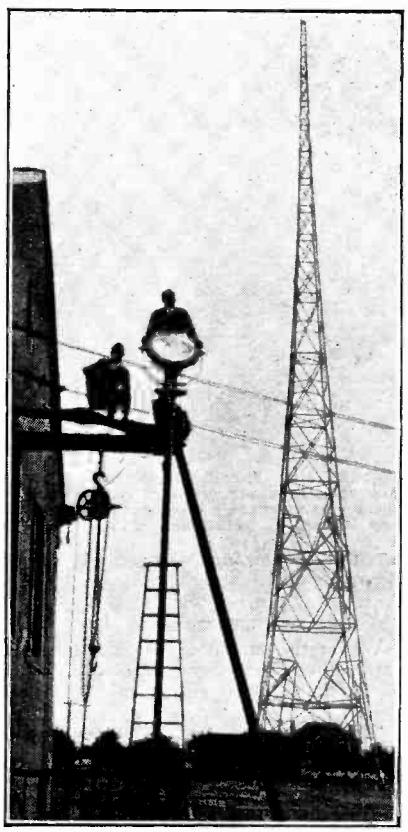
LEAGUE OF NATIONS WIRELESS.

That the League of Nations should possess two wireless stations for disseminating news of international interest is the considered opinion of experts consulted at the present session.

It was agreed that the establishment of a powerful station with a world-wide range was impossible on the ground of expense, but if the additional expense were not very great the transmission of information and debates by wireless might be contemplated. In that case the wireless station should have a range covering the whole of Europe. It was also agreed that a relatively powerful short-wave transmitter would give the required results as regards communication with non-European countries.

POCKET WIRELESS.

It is reported that United States police are to be provided with pocket wireless receiving sets, complete with valve and batteries. Portable set manufacturers, please note!



AN AERIAL PRECAUTION. One of the new 300 feet masts of station WEAF, Bellmore, Long Island. Engineers are seen adjusting one of the 1,500 candle-power searchlights which illumine the masts to prevent airmen from colliding with them.

IN THE ARGENTINE.

Popular enthusiasm for wireless in the Argentine has developed to such an extent that there are now approximately 159,000 holders of receiving licences. The majority possess crystal sets, but valve receivers are coming into favour.

TO CALL THE FAITHFUL.

Calcutta's newest mosque is to be fitted with loud-speakers and valve amplifying equipment.

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IRISH WIRELESS BEACON.

A wireless "beacon" is to be installed at Malin Head, on the north coast of Ireland.

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WORLD'S BUSIEST BROADCASTING STATION?

To station KMOX, situated at St. Louis, Missouri, probably belongs the distinction of being the world's busiest station. It is scheduled to operate nineteen hours per diem.

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MODERNISING INTERNATIONAL WIRELESS LAW.

More than forty countries will be represented at the International Radio Conference which opens at Washington on October 4th. M. Henri Ettienne, director of the Internationale Bureau of the Telegraph Union at Berne, will act as secretary-general.

The principal purpose of the conference is to secure a revision of the International Radiotelegraphic Convention signed in London in 1912, and to prepare new articles which will be applicable to all the new developments in wireless science, including broadcasting.

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EMPIRE BROADCASTING EXPERIMENTS

The general sympathetic regret that Mr. Marcuse was only partially successful in his first full Empire broadcast on Sunday, September 11th, is tempered with the reflection that, but for the burning out of a generator, the whole programme would probably have been heard in the Antipodes. Reports from Sydney and Melbourne go to show that, prior to the breakdown, the speeches by Mr. Marcuse and Captain Fraser were quite discernible. Thereafter practically nothing was picked up.

Mr. Marcuse will continue his experiments, though it is doubtful whether he will secure permission to broadcast "turns" other than gramophone records. As gramophone records are about as common in Australia as in this country, the intrinsic value of the "programmes" will be open to question.

BEAM DEVELOPMENTS.

The mildly exciting rumour which gained ground last week, to the effect that the Marconi Company would shortly inaugurate beam telephone services to North and South America, owed its origin to a newspaper printer's error. The services will be by beam telegraph. Whilst the inauguration date is uncertain, we understand that it will be in the very near future.

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MANCHESTER COLLEGE OF TECHNOLOGY.

The Manchester Municipal College of Technology announces that courses in Electrical and Mechanical Engineering and kindred subjects will open on Monday, October 3rd, enrolment week beginning on Monday, September 26th. Full particulars are obtainable from the Registrar, J. A. Binks, Esq., at the College of Technology, Manchester.

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BRITISH BROADCASTING IN AMERICA.

A British broadcasting programme was radiated over a large area of the United States on Sunday last, September 18th, when the network of 16 stations owned by the Columbia Gramophone Company gave their inaugural programme.

The chain of stations acquired by the British company extends from the Rocky Mountains to the Atlantic coast. The programmes originate at WOR, New York, other stations in the network including WCAU, Philadelphia; WMAK, Buffalo; WFBL, Syracuse; WKRC, Cincinnati; and WMAQ, Chicago.

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A CHANCE TO HEAR CHINA?

With the opening of XOL, the city of Tientsin, China, now has two broadcasting stations. XOL, which is owned by the Chinese Government radio administration, employs a power of 500 watts with a wavelength of 480 metres. The programmes consist of gramophone music and concerts from local cafés, in addition to certain market reports.

The other broadcasting station in Tientsin, writes a correspondent, is owned by the Gisho Electric Company, a Japanese electrical firm. This station is restricted to the modest power of 50 watts.

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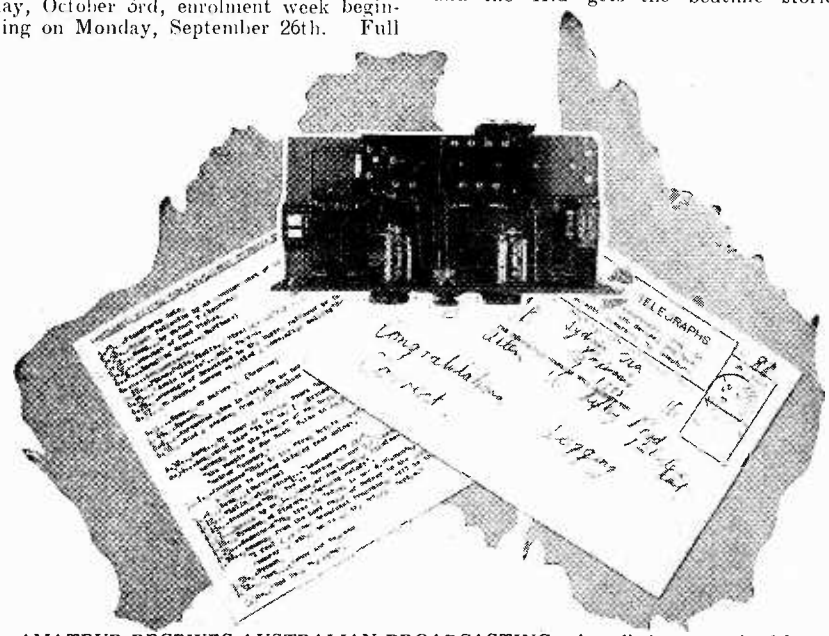
THE "EVERYBODY FIVE."

"What the world needs is not so much a good five-cent. cigar as a five-tube radio set on which Ma can get the Women's Hour on one tube, while Dad gets the political speeches on the second tube, and Sis gets the jazz on the third, Brother the sport news on the fourth and the Kid gets the bedtime stories on the remaining."—*American Radio Journal.*



AMATEUR RECEIVES AUSTRALIAN BROADCASTING. A radiogram received by Mr. Allen, of Belvedere, Kent, confirming his successful reception of short-wave broadcasting from Sydney, Australia. The set—a short-wave superhetodyne—embodies the "superhet" unit produced by Messrs. L. McMichael, Ltd.

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OBITUARY.

We regret to record the death, which occurred on Thursday last, of Mr. Walter Gladstone Fuller, editor of the *Radio Times.*

The late Mr. Fuller, who was born in Dorset 46 years ago, had been connected with journalism for many years. He joined the staff of the British Broadcasting Company on the programme side at the beginning of 1925, taking over editorial duties a year later.

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ELECTRIC LANGUAGE.

Terminal markings, electric symbols, and standard voltages are among the topic being discussed this week at the technical meetings of the International Electro Technical Commission at Bellagio, Lake Como, Italy The Commission is engaged on the unenviable task of unifying electrical language with the object of producing an electrical vocabulary to serve all nations.

NEWS FROM THE CLUBS.

Plans for the Winter.

One of the first societies to prepare a complete syllabus for the winter session is the Stretford and District Radio Society. Of special interest are the arrangements made for a series of classes extending throughout the winter on such subjects as elementary and advanced radio theory, practical working, set construction, and Morse transmission and reception. A superheterodyne demonstration will be given to-morrow evening (Thursday) by Mr. Sheffield. The meetings of the Society take place at 8 p.m. at 6A, Derbyshire Lane, Stretford.

"Memories of a Mast" is the intriguing title of a lecture to be delivered on Wednesday next, September 28th by Mr. Woods (2UA).

Hon. Secretary, Mr. W. Hardingham, 21, Burleigh Road, Stretford, Manchester.

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Wave-traps.

A subject of growing importance—selectivity—was dealt with a a meeting of the Western Postal Radio Society on September 1st. An outline was given of the principles and applications of various forms of wave-trap, including those of the rejector, acceptor, and absorption types. The eager discussion which followed showed how keenly the topic of selectivity interests listeners of to-day.

Hon. Secretary, Mr. E. G. Nurse (2AJR), Western District Office, London, W.1

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Helping Lame Dogs.

This (Wednesday) evening's meeting of the Golders Green and Hendon Radio Society promises to be of unusual interest. It will be devoted to members' wireless troubles. Those in distress have been invited to send their questions to the hon. secretary in advance, and the answers will be given at the meeting, ten minutes being allotted to each question. No names will be divulged. The chairman will be Mr. Maurice Child.

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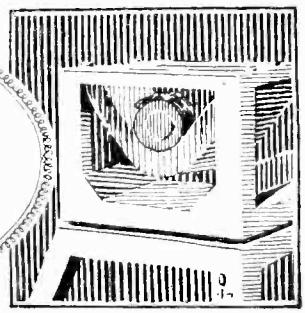
Winter Dances.

As some members have been unable to attend on Thursdays, the Golders Green and Hendon Radio Society has decided to hold meetings on the first Thursday and the third Wednesday of each month at 8 p.m.

Four dances will be held during the coming session, the dates being October 27th, November 24th, December 29th, and January 26th, tickets price 3s. 6d., which may be obtained from Mr. E. E. Marshall, "Wayside," Golders Green Road, N.W.11. The "Georgian Trio" have again been engaged.

Hon. Secretary of the Society: Lt.-Col. H. A. Scarlett, D.S.O., 357A, Finchley Road, N.W.3.

Broadcast Brevities



News from All Quarters: By Our Special Correspondent.

Empire Tests at Chelmsford.—Colonial Enthusiasm.—A Move to Clapham.—"The Silent Fellowship."—5GB to Increase Power.—B.B.C.'s Testing Van.

B.B.C's Short-wave Station.

It is now an open secret that the short-wave Empire broadcasting experiments are to be conducted at the Marconi Company's works at Chelmsford. The fact that the B.B.C. will work in close association with the Marconi engineers augurs well for the Empire scheme, for the Marconi people are experts in the domain of the short wave, with which the B.B.C. is less familiar, while the B.B.C. engineers have little to learn in connection with microphone work. A happy combination.

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A Call from Nairobi.

It is difficult, in this tight little island, where broadcasting pours in upon us directly we turn a knob, to realise the fever-heat of excitement which has been generated in the less-favoured Colonies over the mere possibility of picking up a programme from England.

From Nairobi comes a copy of the *Times of East Africa*—the settlers' Sunday paper—in which columns are devoted to Mr. Marcuse's efforts, and listeners are exhorted to flood 2NM with reports. "Swamp him," says the writer; "he will pass them on to the B.B.C., and it is hoped that they will no longer ignore the claims of the majority—the mighty British Empire of which we are a part."

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Paying the Piper.

On the question of financing an Empire service, the writer resolutely declares that the Empire can and will pay for its own programmes, but adds: "We cannot build a station in Britain to broadcast to ourselves: we must rely upon the home country for that."

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A Note of Irony.

The advertisements, too, reflect enthusiasm for the short wave, but there is a note of irony in the cheerful announcement, "You can now listen in to the excellent concerts, music, latest news, etc., broadcasted from *Holland and America.*" The italics are theirs, **not** mine!

An Economical Scheme.

In the meantime, Nairobi is busy with plans for the erection of its own local broadcasting station to work on a wavelength under 100 metres. The station will have a dual personality, being required for official purposes to work C.W. telegraphy with England. This seems an excellent idea, for presumably the expenses are shared. Hoots, mon!

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"Miss Hook of Holland"

"Miss Hook of Holland," the Dutch musical incident which had a great stage success in London ten years ago, is to be broadcast from 2LO on October 5th. The cast will include Huntley Wright, Norman Williams, Mary Allen, Dorothy Monkman, and Dorothy Shabe.

Research Department Moves.

Capt. West and his little band of followers composing the B.B.C. research department have ventured into fresh fields and pastures new in the neighbourhood of Clapham. Here they have set up their gear in an old house, specially converted, and innocent of the distractions of Savoy Hill.

The surroundings are quiet and free from electrical disturbance, so if some epoch-making discoveries are not made in Clapham very shortly . . . !

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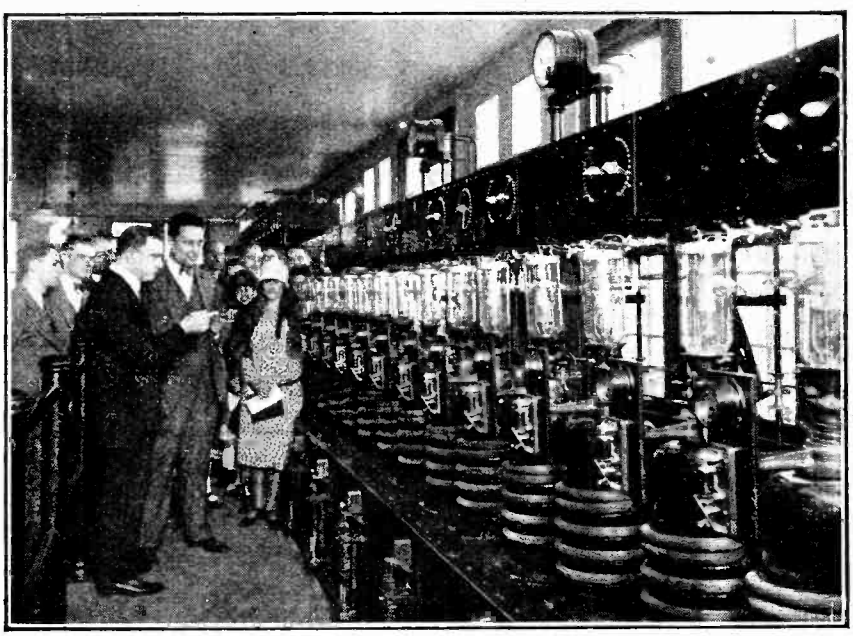
Not World-Beaters.

As a matter of fact, the research department is mainly concerned with improvements in existing apparatus rather than with recondite questions affecting wireless phenomena as a whole. In other words, it is not out to beat the N.P.L.



AMERICA'S NEW 50 kW. BROADCASTING STATION. Dr. A. N. Goldsmith, chief engineer of WEAF, New York, showing visitors a bank of large water-cooled valves employed in the new high power transmitter at Bellmore, Long Island. The new plant supersedes the original 5 kW. station in New York City.

A Complaint.

Correspondents are more sophisticated than they used to be in the early days of broadcasting, hence the Savoy Hill letter bag rarely yields such gems as the following, which came in a few days ago :—

"Please come and take away a Frenchman's two-valve set what has been upsetting all near the Five Bells Public these four months. It's not right these people should come and upset us ladies what was bred and borne here and swears at all our old men who complain. We had no trouble till he started."

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And Another.

More subtle was the following :—

Membership Card No. 5GB.
The Silent Fellowship.
Erdington District.

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Broadcasting and Corpulence.

Does broadcasting encourage corpulence? This question, trivial perhaps to some people, is of very real moment to a number of the Savoy Hill staff. During the past year an undoubted tendency towards "beefiness" has asserted itself in unsuspected quarters, nor is it confined to the educational, dramatic, and research departments.

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Wanted : A Sports Ground.

What one may call inter-studio agility may have served to stave off the monster of obesity in the past, but, now that their numbers are increased the staff no longer find it necessary to engage in a miniature steeplechase from studio to studio between "turns" in order to maintain a continuous programme. I am not surprised, therefore, that they are seeking a new sports ground. Somewhere in the south-east of London has been suggested, but the question of locality seems a small matter beside this growing accretion of large matter.

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5GB to Increase Power.

Signal strength throughout the Birmingham area is at least equal to that in the East End of London, according to careful tests made by the B.B.C. engineers in their celebrated "Green Maria." However, there is undoubtedly a spirit of discontent in this area, due to the prodigious strength at which the old 5IT used to be received, and listeners will not be sorry when 5GB increases its power in about three weeks' time, when the new aerial will also go up.

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Work of the Testing Van.

Talking of the "Green Maria," it is interesting to note that this particular van has covered a distance of over 6,000 miles in making similar reception tests in different parts of the country.

The apparatus carried consists of a seven-valve superheterodyne and a frame aerial. In the plate circuit of the detector valve is a microammeter which gives a reading depending upon the strength of the received signal. The method is to adjust the sensitiveness of the receiver so as to obtain a suitable reading on the ammeter. The frame aerial is then turned through 90 degrees until the signals from the station which it is desired to measure are no longer received. The operator then employs a local signal from a carefully screened oscillator of variable output, inducing an E.M.F. in the frame aerial to give the same reading in the ammeter as that obtained from the distant station. Direct measurement by means of an A.C. milliammeter then gives, by a simple calculation, the amount of E.M.F. which is induced in the aerial. This is, of course, equal to the E.M.F. induced in the aerial by the signal from the distant station.

In the course of its 6,000-miles tour the van has delved into most districts, including Scotland. The tests are made during the day-time, when signals are normally at their weakest.

FUTURE FEATURES.

London & Daventry.

SEPTEMBER 25TH.—Brass Band Concert.
SEPTEMBER 26TH.—"The Pied Piper of Hamelin," a cantata for tenor, bass, chorus, and orchestra.
SEPTEMBER 27TH.—Variety Programme.
SEPTEMBER 28TH.—"Il Trovatore," an opera by Verdi.
SEPTEMBER 29TH.—Wireless Military Band Concert.
SEPTEMBER 30TH.—Symphony Concert.
OCTOBER 1ST.—"On with the Show of 1927."

Daventry experimental.

SEPTEMBER 25TH.—Albert Sandler and the Grand Hotel, Eastbourne, Orchestra.
SEPTEMBER 26TH.—A Charles Dickens Concert.
SEPTEMBER 27TH.—"Il Trovatore," an opera by Verdi.
SEPTEMBER 28TH.—Orchestral and Vocal Concert.
SEPTEMBER 29TH.—Symphony Concert.
SEPTEMBER 30TH.—"The Vauxhall Belles," a light romantic opera.
OCTOBER 1ST.—Orchestral Concert.

Bournemouth.

SEPTEMBER 25TH.—Sweet Tuneful Musick, a programme of old and new favourites.

Cardiff.

SEPTEMBER 27TH.—"The Ghost Ship," a play in one act.

Manchester.

OCTOBER 1ST.—Violin Recital by Daisy Kennedy.

Newcastle.

SEPTEMBER 27TH.—The Electric Sparks Concert Party.

Glasgow.

OCTOBER 1ST.—Two Highland Plays.

Aberdeen.

SEPTEMBER 29TH.—Scottish Programme.

Belfast.

SEPTEMBER 26TH.—French Composers.

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Dundee Leads.

When the Duchess of York broadcasts this morning (Wednesday) from the Glasgow, Dundee, and Edinburgh stations, it will not be the first occasion on which Her Royal Highness has addressed the microphone. On August 26th, 1926, the Duchess spoke at a Dundee flower show, the proceedings being broadcast from 2DE.

This morning's proceedings will begin at 11.30 o'clock, when Her Royal Highness will be presented with the freedom of the city of Glasgow at St. Andrew's Hall.

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End of the "Proms."

The Promenade Concert season comes to an end on Saturday next, September 24th.

The B.B.C. will be the first to admit that in some respects there has been room for improvement in this year's "Proms." Perhaps next year it may be possible to have a longer season. The reason for limiting the period this year to six weeks was the protracted negotiations with the Queen's Hall people. The concerts were undertaken at very short notice—in fact, the normal time taken in preparation was cut down by two months.

The 1927 season stands out both on account of the attendances and the enthusiasm displayed, leaving with us the moral that broadcasting does not affect a series of concerts with a big tradition behind them.

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Morning Transmissions.

Important changes are to be made in the hours of morning transmissions from 2LO and 5XX from September 26th onwards. On Saturdays London and Daventry will broadcast from 1 p.m. to 2 p.m., thus giving thousands of listeners who are not able to spare time for tuning-in on other afternoons of the week an opportunity of hearing lunch-time music. From Mondays to Fridays inclusive 5XX will transmit from 11 a.m. to 2 p.m., while 2LO transmissions are to take place from 12 noon to 2 p.m.

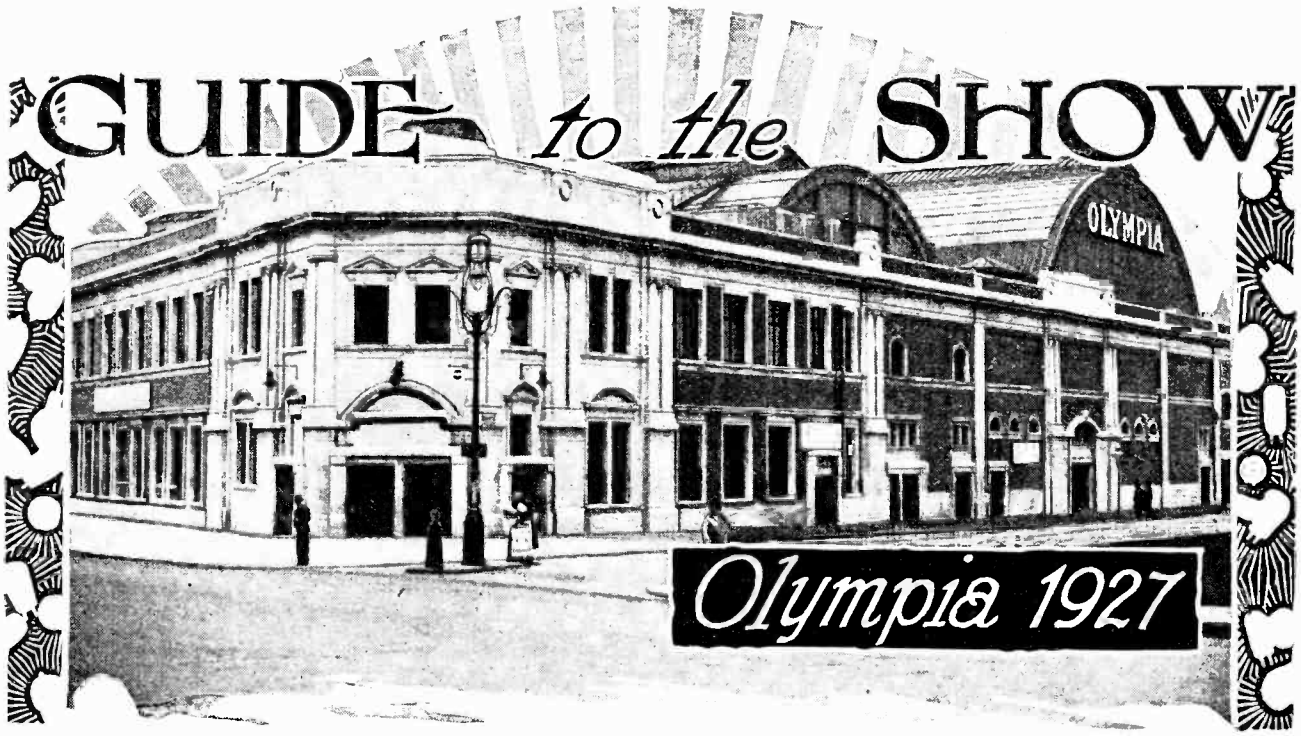
oooo

Man with Three Voices.

A singer with a double voice will be heard by 5GB listeners on September 30th. He is Mr. Strath MacKay, whose peculiar vocal gift was discovered a few years ago by Sir William Milligan, the eminent throat specialist. Mr. MacKay's natural voice is tenor, but he can also sing bass at the same time, due to one vocal chord vibrating at a faster rate than the other. In 1925 Prof. James Brown, Mus.Bac., Cantab, discovered a further register, and in some of Mr. MacKay's songs this third voice is heard, his singing resembling that of a small choir.

May I suggest that Mr. MacKay should charge the B.B.C. triple fees for this rare entertainment?

GUIDE to the SHOW



September 24th to October 1st.

Things to Look For at the Show—A Forecast of Some of the Exhibits.

SOMEWHERE the suggestion was made recently that science should take a ten years' rest and that humanity would profit rather than suffer thereby; but, fortunately perhaps, it is contrary to human nature to endeavour to curb enterprise. Wireless, one of the youngest of the world's inventions, is progressing at a prodigious rate and, no doubt, the enormous publicity which the subject has received through broadcasting is largely responsible for accelerating progress in development. Were it not for such events as the annual Exhibition of wireless apparatus by British radio manufacturers now about to take place at Olympia, it would be very difficult for the public to attempt to keep pace with the ever-increasing number of new things, all of which in some way or another indicate progress either in the direction of greater efficiency or simplicity in receiving sets. The progress made on the transmitting side is largely instrumental in setting the pace for receiver development and such innovations as the regional scheme of broadcasting and the proposed short-wave Empire stations take a prominent part in guiding the technique of receiver design. Although we in England took up broadcasting considerably later than some other countries, we shall find plenty of evidence at Olympia that British manufacturers have been able to make up whatever time they may have lost as the result of a belated entry into competition with other nations.

Examples of Progress.

Whilst we may safely say that in almost every detail substantial progress has been made since last year, there will nevertheless quite naturally be certain innovations of outstanding importance. Those who may have said that the three-electrode valve had reached finality will realise that the introduction of the new screened valve will compel them to modify their point of view. This is probably the outstanding novelty of the Exhibition and it opens up new lines of research both for the professional engineer and the amateur experimenter.

Valves of the more usual types but having a very high magnification factor have served to turn the attention of manufacturers to the subject of resistance-capacity coupling which hitherto has been regarded as a somewhat uneconomical arrangement, because the earlier valves were not suitable for the purpose. It will not be surprising, therefore, to find that a very large number of the manufacturers are marketing resistance-capacity coupling units complete in themselves including the valve-holder.

Attention to Quality.

As the public has been educated to an appreciation of better quality in reproduction, the necessity for comparatively high anode voltages has been recognised, and many of the sets incorporate battery eliminators working from the mains, thereby simplifying the question of current supply at the necessary voltages. It will, of course, be a very long while before the majority of listeners are in the fortunate position of having electric current supply available for their sets, and therefore designers of H.T. batteries, both secondary and primary, have also been busy improving their products. Indirectly heated filament valves for working direct from mains supplies were introduced recently and will be shown at the Exhibition in standard form and incorporated in receivers.

Simplification of Sets.

A great deal of attention has been paid to simplifying the control and tuning of receivers, and the logarithmic condenser plays an important part in assisting to bring about this simplification. The number of controls on the panels of sets is fast reaching the minimum, for, in addition to simplified tuning, the temperature at which the filaments of valves should operate is no longer so critical as formerly and for this reason variable rheostats with panel dials are being replaced by fixed or semi-fixed resistors incorporated within the sets.

It is difficult to attempt in advance of the Exhibition to forecast the novelties in any detail. In the pages which follow we comment on a number of interesting exhibits which the visitor should not miss, but it must be realised that many manufacturers are guarding zealously the secret of their innovations until the opening of the Exhibition, and the information we are able to give in advance is limited to what manufacturers have been prepared to disclose at this stage.

Guide to the Show.—

AMPLION (137).

Since the inception of broadcasting the Company have shown themselves to be pioneers in developing loud-speakers. At their stand this year the well-known horn type models will be shown, notably the A.R.19 with wooden flare and non-resonant sound conduit, and the smaller edition the A.R.65.0. Of later design are the "Radiolux" cabinet hornless loud-speakers with large metal grilles; these are shown in two sizes and in various finishes. A range of cone loud-speakers is exhibited; the characteristics of this latest type are roundness and depth of tone and better reproduction of the lower frequencies; the Amplion cone series do not require special output circuits and can be connected to an ordinary power valve.

The cabinet cone types with wooden grilles are beautifully finished in Jacobean or Chippendale styles and are of artistic design. Two examples of open cone loud-speakers will be shown, one arranged with a conventional wooden stand and the other fitted with an adjustable hook to allow of attachment to a picture rail.

There are now available no less than 23 different models of Amplion loud-speakers.

Graham Amplion, Ltd., 25-26, *Savile Row, Regent Street, London, W.*1.

ATLAS (83).

Besides the well-known general purpose Atlas coils, a new series of tapped coils have been introduced. One range of coils tapped at their electrical centres will be found most useful for neutralised circuits, and another range tapped at two suitable points can be used for auto-coupling of aerial or for Reinartz circuits.

A resistance-capacity coupler will be shown containing a coupling condenser and anode and grid resistances suitable for use with valves having a high amplification factor and high impedance.

Pirtoid tubing which provides a good material for coil formers will be shown in several sizes.

No less than nine H.T. battery eliminators for various inputs and outputs are being shown. Three are for D.C., and six for A.C. An L.T. battery charger with battery floated across it for use with A.C. lighting mains should be of interest.

The Atlas Neutrofour receiver (I.v.2) will be shown; the H.F. coupling consists of a neutralised transformer wound on Pirtoid with the primary placed laterally to the secondary and with provision for variable regeneration within the former. The H.F. transformer and an aerial coupling coil also wound on Pirtoid are sold as separate units.

H. Clarke and Co. (Manchester), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

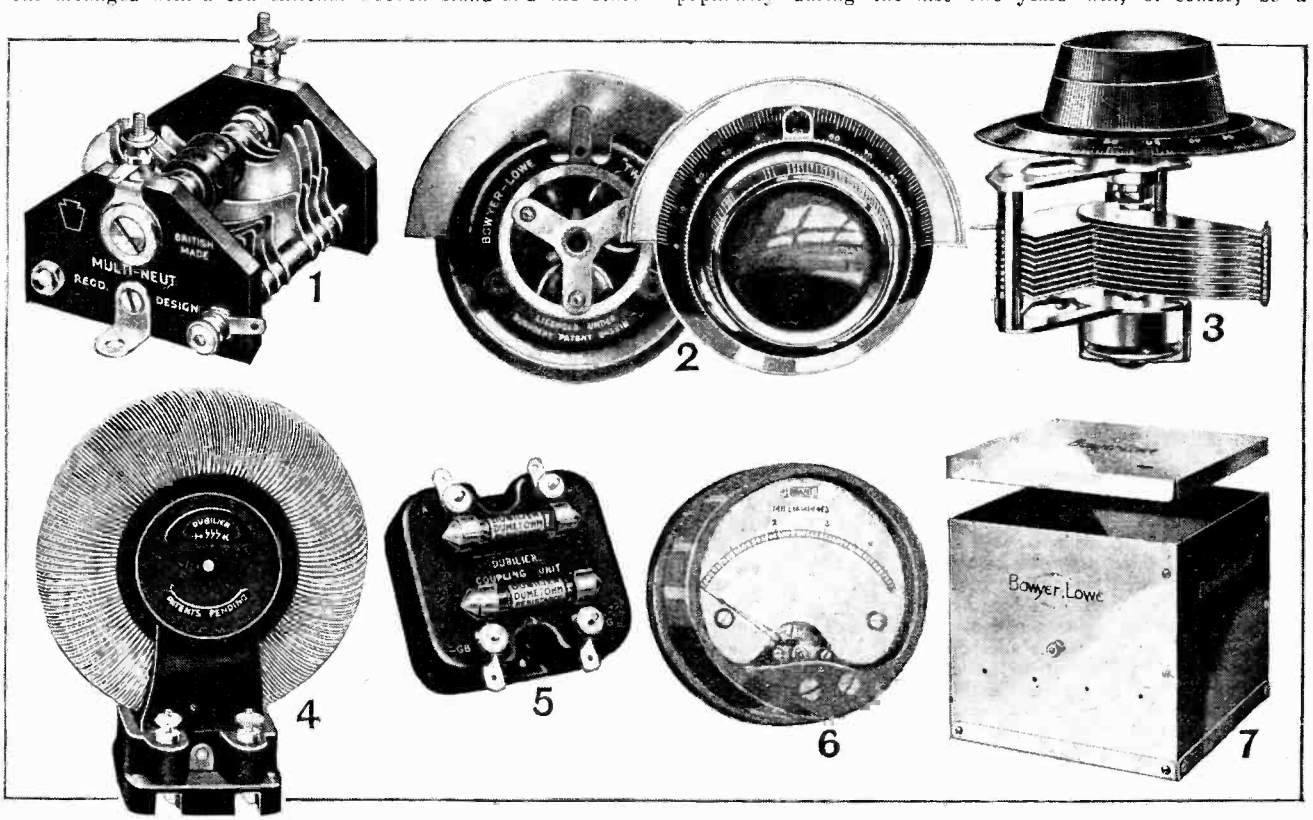
BENJAMIN (79).

The antimicrophonic valve holder which has gained such popularity during the last two years will, of course, be a feature of this stand. A good panel mounting battery switch with positive on and off action, also the self-contained rheostat in three different maximum resistances will be shown. A new development is an efficient earthing device consisting of two strips of corrugated metal riveted together at right angles so as to expose as great a surface as possible. A new H.T. battery eliminator for 220-240 volt A.C. mains is provided with smoothing chokes with liberal cores to prevent saturation and a further good feature is the incorporation of a wide range of voltage controls; it is claimed that absolute silence is obtained with this unit.

*Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.*17.

BOWYER-LOWE (124).

New components will include an anti-microphonic valve holder constructed of "Whiteline." It is claimed that the dielectric values of this substance are particularly constant so that the



1. Peto-Scott dual neutralising condenser. 2. Bowyer-Lowe two-speed epicyclic dial with renewable scale. 3. Dubilier K.C. (Kilocycle) condenser with 200 to 1 reduction gear. 4. Dubilier fieldless Toroid coil. 5. Dubilier resistance-capacity coupler with interchangeable units. 6. Ferranti moving-coil meter containing protecting fuse. 7. Bowyer-Lowe collapsible aluminium screening box.

Guide to the Show.—

valve holder may be used with success in superheterodyne and short-wave receivers. Another component which should be of considerable interest to amateurs is a well-finished matt aluminium collapsible screening box.

A very neat geared two-speed condenser dial giving direct drive or a reduction of 18 to 1 by a concealed epicyclic gear is another new product of this Company. There is no backlash and the moving parts are self-compensating for wear; an added refinement is the provision of a station recorder with renewable scales.

For baseboard mounting inside a receiver a useful variable resistor is being manufactured in which from time to time new settings to compensate for voltage drop, etc., can be made. These resistors (5 ohms and 30 ohms maximum) are graduated so that settings may be repeated. This means of controlling filament temperature would appear to be an advance on panel rheostats and permanently fixed resistors.

A high-class buzzer wavemeter and multi-ratio L.F. transformer will also be exhibited.

The Bowyer-Lowe Co., Ltd., Radio Works, Letchworth, Herts.

BRANDES (161).

The well-known "Brandola" and "Table Talker" loud-speakers and matched tone headphones will be shown; the "Table Cone" marks the introduction of a cone loud-speaker at a popular price. S.L.F. condensers and two different ratio L.F. transformers and three complete sets in which great attention has been paid to good quality of reproduction will be exhibited.

Brandes, Ltd., 2 and 3, Norfolk Street, Strand, London, W.C.

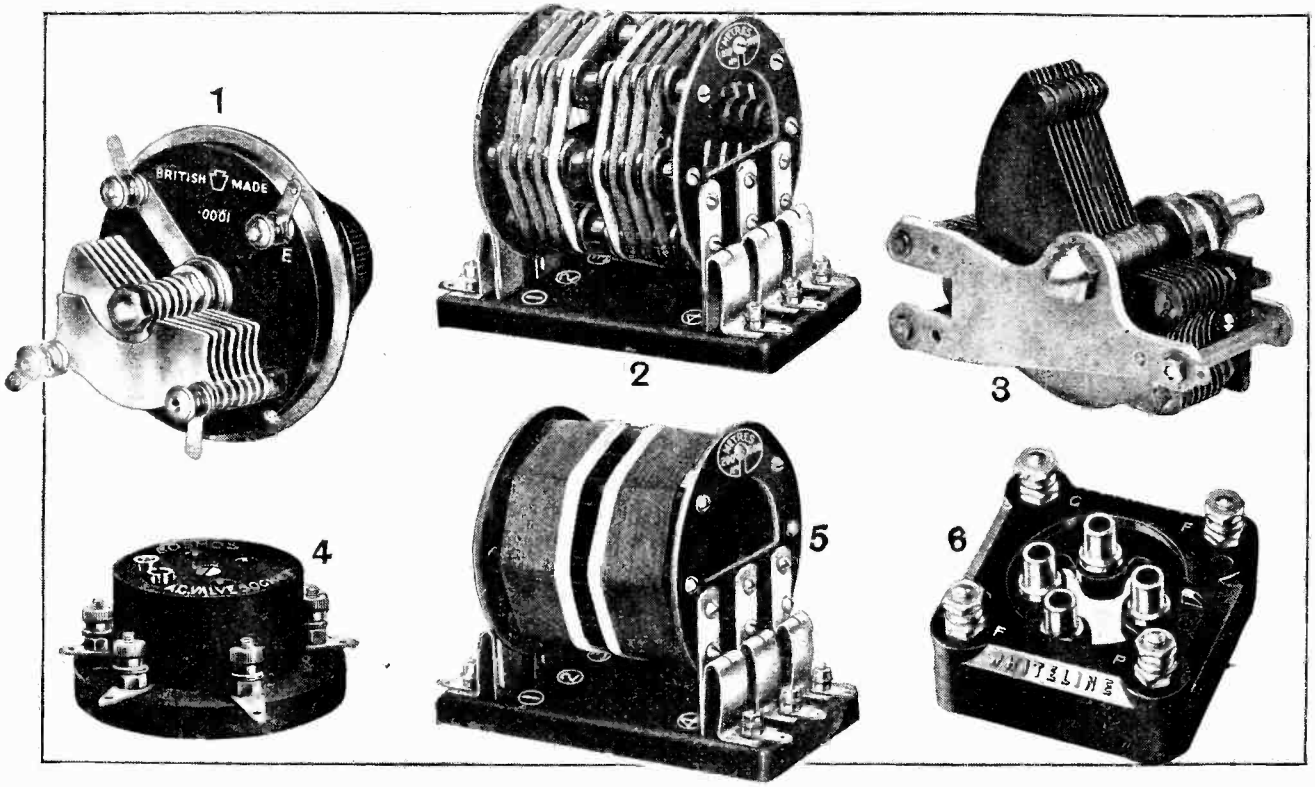
S. G. BROWN (122).

This firm has for long specialised in the manufacture of loud-speakers and telephones; their exhibit this year will create a widespread interest as a number of new types of disc speakers will be seen. The "Sphinx" disc loud-speaker, as the name implies, is a wooden cabinet model shaped like the head of a sphinx, the workmanship and finish are excellent, and for those who require a high-grade instrument this model should appeal.

The new Brown "Disc" loud-speaker is made in two distinct finishes, oxidised silver and black and gold. The disc is contained within a circular metal case provided with an artistic grille. The "Mascot" brings the disc type loud-speaker within the range of all pockets, the disc itself is exposed in front and is supported at the back by a handsome wooden frame. No less than seven horn type loud-speakers, from the baby H.4 to the large 23-inch "Q" type, are still manufactured.

For those who wish to construct their own cone loud-speaker at a very low price, a set of parts known as the C.T.S. unit can be purchased if desired. This unit can be adapted for use as a gramophone attachment. Two receivers will be shown incorporating the Brown valveless mechanical amplifier connected to a crystal receiver. Besides the well-known Brown headphones, a gramophone pick-up device and a public address unit will be exhibited.

S. G. Brown, Ltd., Western Avenue, North Acton, London, W.3.



1. Peto-Scott midget condenser. 2. Cosmos A.N.P. (astatic non-parasitic) coil with limited external field; a few turns of resistance wire are wound on each half of coil to prevent parasitic oscillation. 3. Igranic condenser. 4. Cosmos holder for indirectly heated cathode valves. 5. Cosmos A.N.P. short-wave coil. 6. Bowyer-Lowe "Whiteline" low-capacity valve-holder.

B.T.H. (138, 139, [illegible]).

A very compact resistance capacity coupling unit is a new product of this company: it contains a valve-holder mounted on absorbent rubber, a coupling condenser and anode and grid resistances of suitable values to function in connection with the B.T.H. B.8 valve, which has the extremely high amplification factor of 50. The base of the moulding is cut away so as to give access to the removable components.

A new anti-microphonic valve-holder will be exhibited in which absorption of vibration is effected by rubber rather than by metallic springs; it is claimed that the latter are inclined to cause and prolong vibration.

A new series of 2-volt valves will be of special interest; the B.21 has an amplification factor of 16, an A.C. resistance of 32,000 ohms, and can, therefore, be used as an H.F. amplifier or as a detector followed by an anode resistance of about 150,000

Guide to the Show.—

ohms. Type B.22 is a general-purpose valve having an amplification factor of 7.5 and an A.C. resistance of 14,000 ohms. Type B.23 has been specially designed for the last L.F. stage, where moderately strong loud-speaker signals are required. The amplification factor is 6 and the A.C. resistance 8,000 ohms; it might be pointed out that the mutual conductance of this valve is nearly as high as the well-known B.4, although the filament wattage is only 0.4. Type B.8 has an amplification factor of 50 and an A.C. resistance of 180,000 ohms; it is designed for use in L.F. resistance coupled stages. The filament consumption of this 2-volt series is one-tenth of an ampere (except the B.23, which is one-fifth ampere), which renders them specially suitable for portable sets.

A three-valve "Resistor" receiver will be exhibited containing a detector and two L.F. stages, the valves used being two B.8's, followed by a B.23. A push-pull switch is provided to change over from short to long waves.

British Thomson Houston Co., Ltd., Crown House, Aldwych, London, W.C.

CAMCO (12).

A very comprehensive range of cabinets, from a small box to contain a crystal set to a large piece of beautifully finished furniture in Chippendale style, will be shown. Besides supplying cabinets complete with panels in every conceivable shape and type and into which constructors can build their own sets, this company specialises in the standardisation of boxes and cabinets for sets described in the various wireless journals. Ready-made cabinets with properly fitting panels are a great boon to the wireless amateur who is not expert in cabinet-making and polishing and to whom such work is monotonous.

Right-angle aluminium brackets for holding panel and baseboard together also guaranteed ebonite panels in matt, polished and mahogany finish cut to standard sizes will be shown. It should be noted that this company undertakes engraving of panels to individual requirements.

Carrington Manufacturing Co., Ltd., Camco Works, Sanderstead Road, South Croydon.

C.D.M. (MELHUISH) (231).

An ingenious vernier dial having three speeds will attract attention. A fixed vernier cam, having two slopes which provide two different ratios of movement for fine tuning, is so arranged that it can be set to any angle by means of a set screw; ratios up to 500 to 1 can be obtained. The dial, which is well finished, is 4 in. in diameter, is moulded in ebonite and is divided into 180 degrees.

A range of fixed mica dielectric condensers in very clean brown bakelite mouldings will be shown, the capacities are guaranteed to 5 per cent. and one-hole baseboard fixing is arranged by the inclusion of a metal bush in the centre of the condenser; both terminals and solder tags are provided. Difficulty is sometimes experienced in removing plug-in coils from their holders, but the "C.D.M." plug-in coil adaptor levers the coil at the proper point and prevents damage to windings. A high-frequency choke and variable condenser will be shown.

C. D. Melhuish, 8, Great Sutton Street, Goswell Road, London, E.C.1.

COSMOS (155, 156).

A new range of components and sets of considerable interest will be exhibited by this company.

A range of A.C. short-path valves in which the cathode is indirectly heated will be a new feature. By means of a suitable step-down transformer which the company manufacture, the low-tension supply for a set can be derived directly from A.C. lighting mains, thus dispensing altogether with the L.T. accumulator. The heater is in the form of a hair-pin wire disposed within a porcelain insulator on the outside of which is a metal tube coated with the oxides of various rare metals. This tube becomes red hot when current is passed through the heater wire and emits the necessary stream of electrons. It is claimed that hum due to complex wave-forms in the A.C. lighting supply is eliminated as the heater is non-inductive and the cathode has an equipotential surface. The A.C. valves have five-pin bases, but a special adaptor renders them suitable for ordinary valve-holders. The A.C./G and A.C./R valves have respectively amplification factors of 35 and 10 and A.C. resistances of 14,000 and 2,500 ohms, and they can safely be used with 180 volts H.T. It must be conceded that a valve that will handle an input of about 24 volts grid swing, that has an amplification factor of 10, an A.C. resistance of 2,500 ohms and a mutual conductance of 4 mA. per volt, exhibits a high standard of efficiency.

The "Cosmos" L.T. battery eliminator for use with these valves has an output of 5 amperes at 4 volts and is designed so that no rheostats are required, but a potentiometer is fitted to eliminate all traces of hum from specially noisy mains.

The "Cosmos" A.N.P. centre-tapped and quarter-tapped coils should be of great interest to constructors, for it is claimed by the makers that the usual inherent defects in stabilised high-frequency amplification are reduced to a minimum. The coils are astatically wound so that there is a limited external field with resultant lack of magnetic coupling between adjacent coils. This avoids the use of close-fitting screens which considerably increase high-frequency resistance. A few turns of insulated resistance wire are wound on each half of these coils, thereby eliminating the tendency for parasitic oscillations at high frequency. The coils are wound on skeleton formers and are interchangeable, a baseboard mounting with spring clips being provided.

Other products of the company are a high tension and grid bias eliminator, two short-path rectifying valves, one for half-wave and the other for full-wave rectification and a few additions to the range of the well-known Cosmos short-path valves.

A five-valve set (2.v.2) has been specially developed for the advent of the regional broadcasting scheme to give a liberal output of undistorted signals from alternative stations. The H.F. couplings are neutralised and include A.N.P. coils described above. Capacity reaction is employed and the L.F. stages are resistance-coupled. The controls are calibrated in metres, a feature which is likely to become standard on all sets in future; compartments are provided for batteries or battery eliminators.

Metro-Vick Supplies, Ltd., 155, Charing Cross Road, London, W.C.

DUBILIER (162).

A new 0.0005 mfd. true S.L.F. condenser known as the K.C. is a fine example of modern radio design. It has been manufactured essentially to work in conjunction with the new Toroid coils, but any inductance may be employed with equal success provided the effective shunted capacity across the condenser is kept at 10 micro-microfarads. The rotary vanes are connected to the end plates, and the fixed vanes are held by bakelite pillars in compression. The spindle runs on ball bearings and a slow motion drive gives a ratio of 200 to 1. A factor which militates against the success of H.F. amplification is the interaction of the magnetic field of the H.F. transformer with that of other inductances. Dubilier toroidal coils, therefore, will be a feature of interest, as their external fields are practically nil. Long- and short-wave toroid transformers suitably tapped for balanced circuits will be shown. There are three types of Dubilier H.T. eliminators, two are for D.C. mains and the third is an A.C. rectifying unit for use after either of the D.C. units; the smoothed outputs by means of suitable potential dividers have fixed as well as variable tappings. The popular sizes of the Dubilier-Mansbridge condenser now have a beautifully finished maroon-coloured bakelite moulding as a containing case in place of the metal case; the advantages are better insulation resistance to case, imperviousness to moisture and temperature change, and reduced possibility of short circuit to case. These condensers are made in fourteen different values between 0.01 and 2 mfd., and are tested at 350 volts D.C., but the normal working voltage should not exceed 150. The "Duvarileek" variable grid leak and "Duvolcon" volume control are variable high resistances in which it is claimed that constancy of the resistance element is maintained under varying temperature conditions. The well-known fixed mica dielectric condensers and "Dumetohm" metallised grid leaks need no description; however, mica condensers of the order of 0.1 mfd. are now made for L.F. resistance coupling and ensure by their perfect insulation that the H.F. potential is not impressed on the grid of the succeeding valve. Among

Guide to the Show.—

the other accessories shown, low-capacity switches and wire-wound anode resistances will be of some interest.

Dubilier Condenser Co. (1925), *Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.*

EBONART (84).

Redfern's Ebonart panels, cut to standard sizes and so well known to amateurs, will be the chief feature of this stand; there will be a number of new and useful sizes shown, and the same standard of all-round efficiency is exhibited.

A very useful ebonite H.F. choke former having six slots ¼in. deep by ⅛in. in width and screwed to a suitable base with two terminals will particularly appeal to the constructor who wishes to wind his own choke to satisfy specific conditions. Should two or three chokes be wound to different values for experimental purposes it will be found convenient to remove their bases and to screw two terminals into the end holes provided and suspend the chokes between grid leak clips.

An anti-microphonic valve holder moulded entirely of rubber, with stranded connectors from the terminals to the valve sockets will undoubtedly appeal where insulation from shock has to be of the highest order.

The anchoring to suitable terminals of the ends of various windings on a coil former has presented a number of difficulties to the amateur, it will be, therefore, of considerable interest to see a new coil former on this stand in which there are seven nickel-plated pins projecting vertically downwards from seven ribs, each having a suitable terminal at the end of the winding face of the former. An ebonite base is provided with seven sockets so that coils are interchangeable. The former has eight ribs, the overall diameter is 2⅞in. and the winding length about 3½in. This should be a valuable component where a number of windings are to be accommodated (e.g., primary, secondary, reaction, and tappings, etc.).

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

ELECTONE (28).

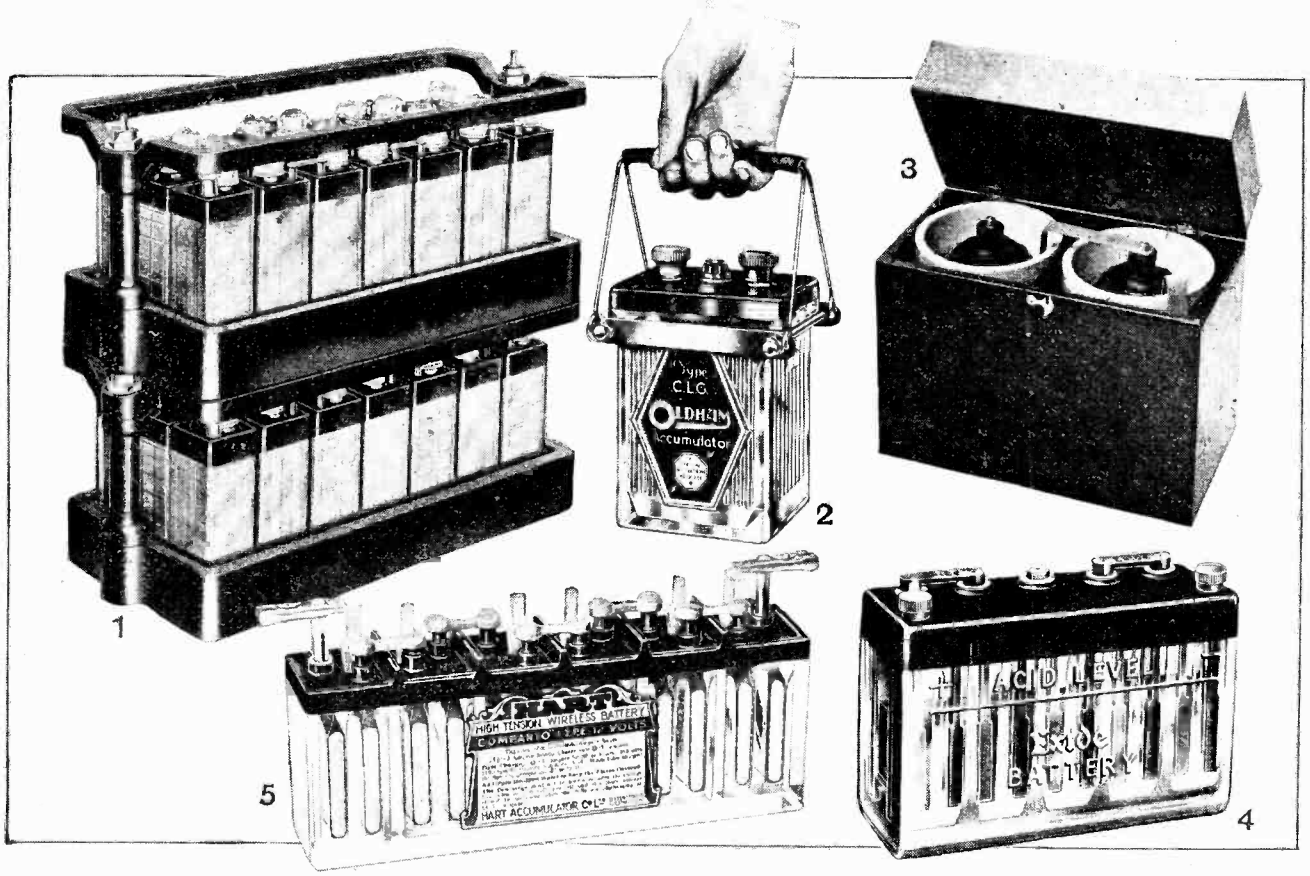
The Electone automatic programme selector is an ingenious device which will attract attention. It consists of a clock in a mahogany case having 24 holes around the face into which metal plugs can be pushed for the selection of one or more periods of half an hour's broadcasting; the clock has two leads so that it can be interposed in series in the L.T. battery circuit. By means of this programme selector it can be prearranged which items are to be heard and at the end of the programme the receiver will be automatically switched off for the night.

The Gordon radio charger for D.C. mains consists of an indicating ammeter with a connecting plug and socket, and has the advantage that having been plugged into an ordinary lamp socket the source of light is still retained.

F. J. Gordon & Co., Ltd., 92, Charlotte Street, London, W.1.

EVER READY (154).

This company, being one of the pioneers in producing wireless batteries, naturally has a very comprehensive range of H.T. and L.T. and grid bias units. The H.T. range includes super capacity dry batteries capable of discharging at 20 milli-amperes, Sac type Leclanché cells which can be made up to any voltage required, and H.T. accumulators in various sizes. The L.T. range contains accumulators and dry cells, the latter being of sufficient capacity for sets with three or four valves of the new and popular 0.1 amp. class and provide a source of current with avoidance of acid fumes—a consideration where portable sets are concerned. Grid bias batteries tapped at every 1½ volts are now made up to 16 volts; in view of the increasing



1. C.A.V. heavy duty H.T. accumulator unit. 2. Oldham accumulator in glass container shaped to take carrier. 3. L.T. Leclanché unit made by the Wet High Tension Battery Company. 4. Exide "Mass" type 10-volt H.T. accumulator. 5. Hart 12-volt H.T. accumulator; note the spring-clip connectors.

Guide to the Show.—

use of power valves having an impedance of about 4,000 ohms the use of a single 16-volt unit is more handy than two smaller units wired in series.

Ever Ready Co. (Gt. Britain), Ltd., Hercules Place, Holloway, London, N.7.

EXIDE (167, 233).

This company's well-known products will be examined with keen interest by the amateur. L.T. batteries will be shown in a great variety of capacities, and cells with glass containers are a predominant factor. The Exide D.T.G., D.F.G., and D.H.G. in glass, and known as the "Mass" type cell, with heavy plates have capacities of 20, 45, and 100 ampere hours respectively; the special feature of these cells is that they will hold their charge for extremely long periods without sulphation or other detriment, and are of great value for use with low-consumption valves where the total rate of discharge is under 1 ampere. Type C accumulators in celluloid or glass have a capacity range from 6 to 120 ampere hours, and are the standard popular type suitable for heavier discharges than the "Mass" type.

With the increasing popularity of portable sets and the advent of really efficient 0.1 ampere 2-volt valves it is natural to find that special attention has been given to the production of a wide range of Exide unspillable celluloid batteries. The special acid trap will survive the test of complete inversion, and, having tortuous passages, is likely to minimise the risk of acid-laden fumes being emitted. High-tension accumulators often suffer from self-discharge by surface leakage, but attention has been paid to this defect, and all Exide H.T. accumulators have well-designed cell tops in which creeping is impossible.

Made up in 10-volt glass units and having a capacity of 2,500 milliampere hours, the W.J. H.T. "Mass" battery is recommended for discharges up to 20 milliamperes. The W.T.G. is similar to the W.J., but has 2-volt tappings for grid bias use; the value of employing a small grid bias accumulator which will hold its charge for a long period should not be overlooked. The W.H. 24-volt H.T. battery is recommended for discharges of over 20 milliamperes, and is a stoutly built glass unit which will withstand rough handling.

An illustrated catalogue is issued by this firm giving a fund of information concerning valve characteristics, wavelengths of broadcasting stations, etc., and should be most helpful to the amateur to best apply his battery power.

The Chloride Electrical Storage Co., Ltd., 217-229, Shaftesbury Avenue, London, W.C.

FERRANTI (142).

Those who have installed either the A.F.3 or A.F.4 L.F. transformer and who have appreciated their excellent performance will be interested to see that the Ferranti Co. are producing a further series of transformers and other radio equipment.

The O.P.1 output transformer has a core of ample dimensions and is not likely to saturate with the current from the ordinary super-power valve, the ratio is 1 to 1 and is suitable for use with a 2,000 ohm loud-speaker. The company claims that this transformer affords a better means of keeping the D.C. component out of the loud-speaker than the choke method owing to the absence of the time factor which a condenser introduces. The O.P.2 output transformer has a ratio of 25 to 1, and is specially designed for use with moving coil loud-speakers. The new A.F.5 L.F. transformer has the remarkable primary inductance of over 120 henries, and it is claimed that using a valve with a magnification factor of 14 an overall amplification of 46 between 50 and 8,000 cycles is obtained. The primary to secondary ratio is 1 to 3.5. No fewer than six push-pull inter-valve and output transformers are being shown; the Ferranti Co. have decided to develop this method of coupling as it is undoubtedly a means of handling big inputs without the use of excessive H.T. These transformers have similar characteristics to the A.F. and O.P. series already described above.

A range of extremely well-finished moving-coil meters is exhibited; they are designed either for flush or projecting panel mounting, or can also be obtained as portable models; an accuracy of 1 per cent. is guaranteed. Non-metallic cases are provided to prevent the accidental shorting of leads, and the voltmeters are wound to either 200 or 1,000 ohms per volt, thus ensuring an extremely small consumption. Milliammeters, ammeters, and voltmeters of every possible range which are likely to fulfil the requirements of any wireless set are either being shown or are in the course of production. A valuable feature is the provision in every instrument of a fuse to prevent damage to the coil winding when an overload is accidentally applied.

The Ferranti trickle charger for A.C. mains consists of a Westinghouse metal rectifier in a metal container, which gives 0.5 ampere output for either 2-, 4-, or 6-volt batteries. The average filament consumption of three- and four-valve sets is about 0.5 ampere, so that the charger may conveniently be left on for approximately the same period that the set is used.

In view of this company's long experience in transformers and choke design, wireless enthusiasts will welcome the introduction of a Ferranti D.C. and A.C. eliminator; the former, it is claimed, will deliver 95 mA. plate current without hum, while the latter employs the D.C. filter followed by a Westinghouse metal rectifier.

For those who wish to construct their own smoothing circuits three new chokes are provided, having inductances of 40, 10, and 48 henries and respectively passing safely 50, 100 and 6 mA.

Ferranti, Ltd., Hollinwood, Lancashire.

FORMO (81).

The Formo-Densor will interest those who require a small compact variable condenser with mica dielectric which can be varied between certain specified limits; there are many uses for this component, and mention may be made of tone control, series aerial condenser, grid condenser, by-pass across anode resistance, etc. The Formo logarithmic condenser is of robust design, and is provided with a framework so that it can be screwed to a baseboard or fitted to a panel. Logarithmic condensers provide the only proper means of simultaneously tuning two or more circuits, and so as to arrange for the ganging of separate condensers a small universal joint giving slight flexibility to the drive is supplied; this is considerably cheaper than purchasing a built-up ganged condenser. A new idea is an illuminated condenser dial which deserves attention. A flash lamp bulb is fixed behind the panel so as to illuminate a semi-transparent ivorine scale which is read through a small window. The lamp is fed from the L.T. battery and is operated by a push-pull switch. The close metal screening of coils carrying H.F. currents leads to the production of eddy currents and consequent loss; the Formo Company, appreciating this, will be showing a collapsible aluminium screening box large enough to take a whole H.F. stage, the sides are lapped, and a close-fitting lid is supplied. A large range of interesting components and a catalogue giving a vast amount of information to the constructor will be available.

The Formo Company, Crown Works, Cricklewood Lane, London, N.W.

G.E.C. (50, 140).

In view of the excellent quality of reproduction which is now obtainable from electrically-cut gramophone records, it is of great interest to note that nearly all new Gecophone wireless sets will be provided with a socket into which can be plugged the company's new gramophone pick-up device, thus utilising the low-frequency portion of the set to amplify the gramophone signals and reproduce them on one or more loud-speakers. The G.E.C. are bringing out a series of diagrams so that the amateur who has purchased a pick-up device can construct an amplifier best suited to its needs. The company points out to the constructor the necessity of rearranging the wiring of a complete receiver so that the pick-up jack is inserted at the input of the first L.F. stage, and not at a point that includes a part of the detector circuit. With each pick-up are supplied eight Tungstyle needles each capable of being used some dozen times, and adaptors can be purchased so that the tone-arm of practically all well-known makes of gramophone can be fitted.

Among the accessories to be shown, mention must be made of a high-resistance potentiometer (1 megohm) with an extremely smooth control, seventeen contacts are provided, and the component is arranged for one-hole fixing, only a small

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knob appearing on the front of the panel; for volume control this should be extremely popular. A new rheostat, the body of which is moulded in Bakelite, is to be shown. It can be used as a semipermanently set resistor for baseboard mounting or as an ordinary panel mounting variable rheostat; good contact is obtained on the internal periphery of the resistance winding by a spring-loaded plunger, the spring being soldered to the spindle to ensure reliable contact.

A variable twin coil holder for plug-in coils, employing fine adjustment for panel or baseboard mounting, exhibits the same excellent workmanship that characterises the other products of this company.

A full range of Osram valves is shown, the latest additions to which are the S.625 or screened grid valve and the K.H.I., which is a new indirectly heated cathode valve having an impedance of 30,000 ohms and an amplification factor of 40. For heating the filaments of the "K" type of valves from A.C. mains, a step-down transformer is supplied which gives a constant output voltage of 3.5 for one to four valves, and without employing any regulating resistance.

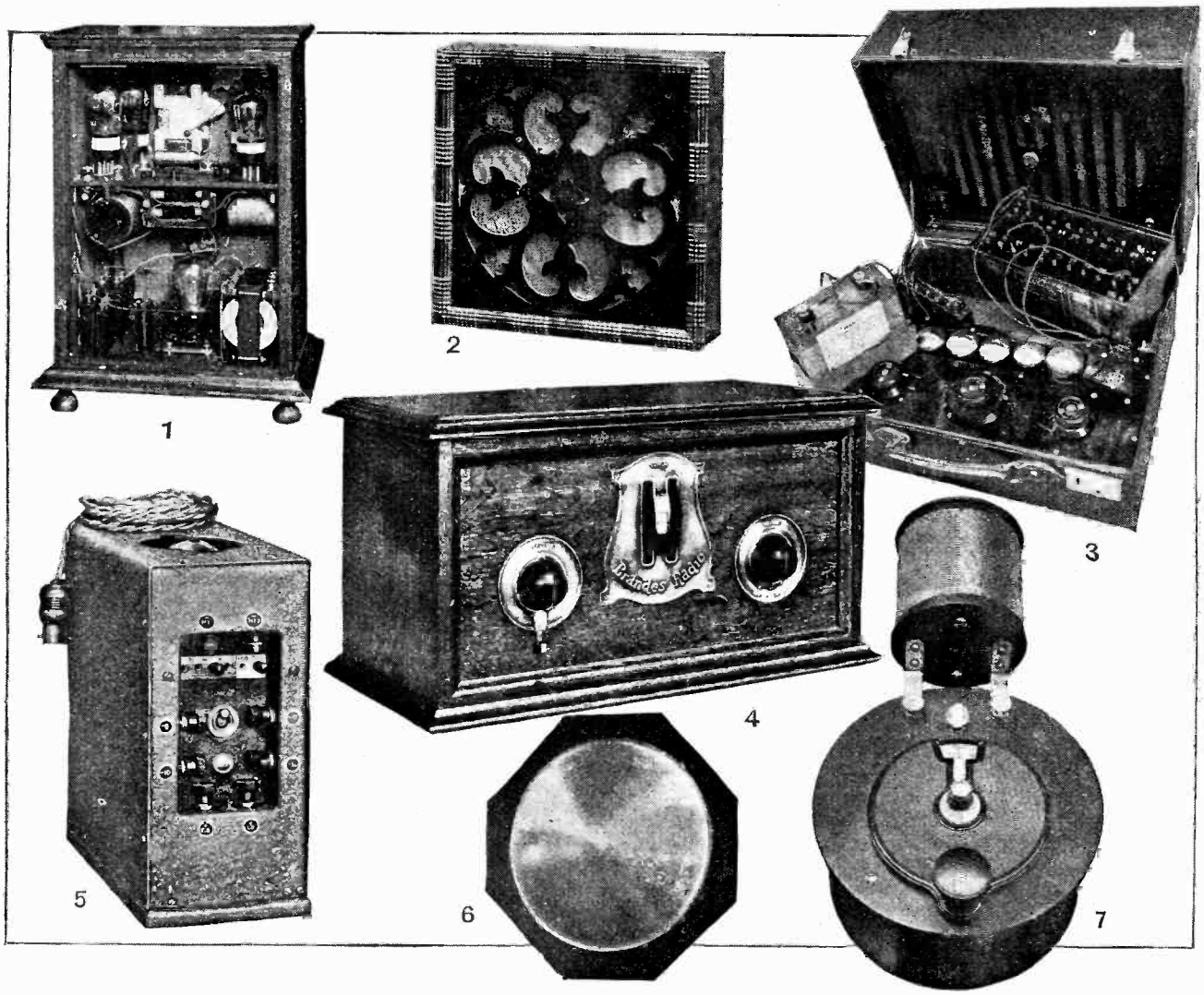
A large range of sets will be exhibited, also a new open cone loud-speaker, which can either be supplied with a stand or with means for attaching to the wall.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

HART (112).

This company will show an attractive series of accumulators with glass containers. Amateurs have already begun to realise the many advantages of glass over both ebonite and celluloid, and the slight disadvantage of weight is more than counterbalanced by cheapness, rigidity, and ready visibility of the condition of the plates and electrolyte. The R.M.E. is a 2-volt cell with glass container so constructed that other cells can be connected on the unit basis by means of non-corroding connectors. A number of celluloid L.T. batteries are being shown, one series of which are unspillable and are essentially made for portable sets.

The popular R.A.O. type H.T. accumulator, with a capacity of 2,500 mA. hours, is still retained; it is a noteworthy feature that both positive and negative plates are enveloped with sheets of perforated ebonite, thus preventing the dislodging of active material from the grid structures. A large type H.T. accumu-



1. Princeps concert receiver with mains unit; a trigger circuit with battery-coupled valve is employed. 2. M.P.A. table cabinet loud-speaker. 3. McMichael portable set with built-in loud-speaker. 4. Brandes 3-A receiver. 5. Cosmos H.T. and grid bias battery eliminator for A.C. mains. 6. M.P.A. plaque loud-speaker. 7. Igranic absorption wavemeter with Litz-wound single-layer coil.

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lator is shown which has a capacity of 6,000 mA. hours, and should therefore provide the anode current needed for the largest set. A new 12-volt H.T. unit Comparto, with spring clip terminals, is so designed that large voltage batteries can easily be built up. The capacity is 1,500 mA. hours.

Other exhibits include hydrometers and various accumulator carrying crates.

*Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, London, E.*15.

IGRANIC (148, 149).

A number of new components and sets of general appeal will be exhibited. The Phonovox gramophone pick-up device is a neat, compact unit entirely enclosed in a metal case provided with an adjustable clip within which is a rubber ring for attachment to the tone-arm of a gramophone; ordinary needles can be used. A special plug adaptor for insertion into the detector valve holder in place of the detector valve connects the pick-up device at a point where the impulses are applied to the input of the L.F. transformer, a volume control device is necessary, and is supplied in cases where this is not already fitted to the L.F. portion of the receiver.

As the two-foot rule is to the carpenter, so should the wavemeter be to the wireless student. It will be, therefore, of interest to find the simplest type of absorption wavemeter exhibited. The receiver to be calibrated may be made to oscillate feebly, and the wavemeter adjusted until oscillation ceases. The wavemeter can be used as a wavetrap, and consists of a completely enclosed precision condenser in parallel with a low loss coil wound with Litz wire, each coil is separately calibrated and a curve is supplied; a waveband of 15 and 2,000 metres being covered.

The new baseboard mounting Igranic H.F. choke is exceptionally neat and compact, being about the same size as a watch; the single deep and narrow waveform winding is attached to a bakelite moulding is provided with a cover and is suitable for wavelengths up to 3,000 metres. The well-known Igranic high-resistance potentiometer has been redesigned and is more constant. For volume control or as a variable grid leak this component should be valuable, and is obtainable in models of values of 1 meg. or 5 megs.

A good feature is a wire-wound anode resistance shielded to prevent interaction.

Such an enormous range of components and sets will be shown that space will not allow of detailed descriptions, but constructors will be well advised to examine the 20 to 80 metres short-wave receiver outfit of parts incorporating a stage of screened high-frequency amplification, using transformer coupling, also a new seven-valve superheterodyne kit supplied at a very modest price.

Igranic Electric Co., Ltd., 147, *Queen Victoria Street, London, E.C.*4.

LEWCOS (113).

The efficient Litz-wound Lewcos plug-in coils are retained, and an additional series of centre- and double-tapped coils added. The centre-tapped variety are for balance circuits such as the neutralised tuned anode, and the double-tapped are useful for aerial auto-coupling or Reinartz reaction. The connection to the tappings is by a spring plug, so that the interchanging of coils is made extremely simple. A range of binocular coils with external fields sufficiently limited to render unnecessary the employment of screens is a new feature; these coils are provided with six pins to plug into the standard six-socket base.

The Lewcos dual screened coil is an innovation whereby a series of short-wave screened coils may be changed over to a similar series of long-wave screened coils in one movement by the rotation of a small panel control knob. As so much attention is now being directed to screening H.F. stages, the constructor will find a large number of coils and screening boxes which will inevitably be of interest. Research work has shown that if proper attention is given to the length-diameter ratio of a single layer tuning coil a minimum H.F. resistance can only be obtained by using Litz wire; it is therefore important to note that a very comprehensive range of standard conductors will be available in 36, 38, 40, 42, and 44 gauge, a choice of either 9, 27 or 81 strands being possible. Glazite and stranded frame aerial wire will be shown in six colours, and a new multiple-membered battery cable complete with wander plugs and spade tags will appeal where tidiness is a first consideration.

*London Electric Wire Co. and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.*1.

LIBERTY (3).

The Liberty eight-valve portable superheterodyne receiver presents a neat appearance. The lower portion contains a built-in cone loud-speaker and the upper portion is provided with a hinged lid behind which the two usual controls are fitted. It is claimed that at least thirty-two stations can be received at loud-speaker strength. An internal frame aerial, H.T. battery, and a chargeable L.T. battery are contained within the set. An added refinement is the provision of a compass. Made in the same design and similar in general layout, two straight-circuit self-contained portable sets are to be shown, in which provision is made for the frame aerial to be moved independently of the receiver when the latter is used in a confined space.

Two high-tension battery eliminators are exhibited, one for A.C. and one for D.C.; both of these are capable of delivering 50 mA. of smoothed current, and both have ten voltage tappings, a feature of no small importance where a multi-valve set with various anode potential requirements are concerned. The A.C. eliminator employs full-wave rectification.

The Liberty two-stage resistance capacity coupler in the form of a single unit should appeal by reason of the space which it saves in a set.

Other components of interest are a comprehensive tester fitted with a double-reading voltmeter and neon lamp for battery-voltage measurement and continuity test, and a series of electric soldering irons with hinged bits consuming from 55 to 150 watts.

Radi-Arc Electric Co. (1927), *Ltd., Bennett Street, Chiswick, London, W.*4.

LOTUS (93).

The Lotus remote control relay for house-wiring will be of considerable interest; reception is obtainable from any number of points simultaneously, and the receiving set is controlled from any one point; the last person to withdraw the jack-plug cuts off the set. The relay is suitable for sets using 2-, 4- or 6-volt accumulators, and a separate battery is not required to operate the relay. An innovation in the form of a relay to control the L.T. and the H.T. when the latter is obtained from the mains by an eliminator will appeal to the amateur. This Company will be showing a series of well-finished coil holders, anti-microphonic valve holders, jacks and switches.

Garnett, Whiteley and Co., Ltd., "Lotus" Works, Broadgreen Road, Liverpool.

MARCONIPHONE (54, 128-135).

Of the various sets exhibited, great interest will undoubtedly be taken in the eight-valve superheterodyne, in which provision is made for short- or long-wave tuning by the incorporation of switches and by arranging two separate windings at right angles to one another on the frame aerial. By this means interference between the two frames and dead-end effects are avoided. A single control for tuning simplifies control; the frame aerial condenser and the control of the oscillator are arranged on one axis, and two concentric dials are made to rotate together with the refinement that, should slight differential movement be required, a clutch is provided to release one dial temporarily. It is often convenient to be able to control volume and switch off a set from a comfortable chair a few yards away; this is effected by means of a small unit with 10 ft. of three-member flexible cable; volume is controlled by the dimming of the I.F. valve filaments and the L.T. circuit is broken as a means of putting the set out of action.

The Marconiphone Company has evolved a very comprehensive range of eliminators from small D.C. and A.C. units suitable for two-valve sets to "All-Power" units with H.T., L.T. and bias outputs for five-valve sets. In the D.C.1 unit the smoothing chokes, which have liberal iron cores, are placed together with condensers of 4 and 6 mfds., and the necessary reducing resistances in a metal container having a bakelite panel. Two controls are provided; one is a potentiometer giving a variable smoothed H.T. supply for H.F. and detector

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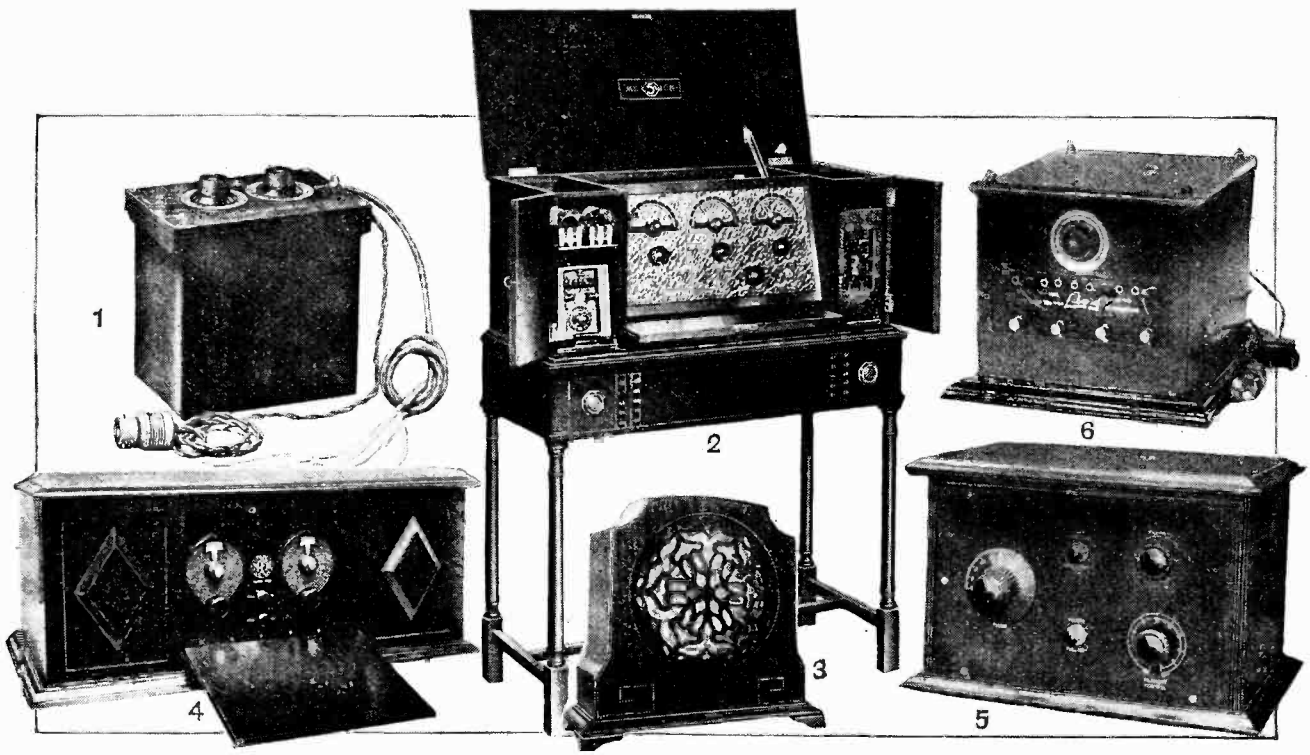
anodes and the other is a variable 200 ohms rheostat in circuit with an ammeter which gives warning when 0.1 amps is exceeded by the filaments of the valves, which must be connected in series. Either 2-volt, 4-volt or 6-volt 0.1 amp. valves may be used in this circuit, and for the plates of the L.F. and power valves up to 20 milliamps can be taken; six values of grid bias are obtainable.

Among the components the well-known Ideal transformers and chokes are to be shown. Two variable high resistances, 0 to 40,000 ohms and 0 to 500,000 ohms, are very useful for volume control, and the smoothness of their action is a noteworthy feature. A number of constructors' sets are on view, in which prominence is given to smoothing and rectifying equipment for A.C. and D.C. eliminators, a choke with large core and capable of carrying 150 mA, also a 200 ohms filament rheostat and various smoothing condensers are provided for D.C. work, whilst for A.C. mains, chokes, transformers, half-wave and full-wave rectifying valves can be supplied. Of outstanding interest is the S.625 valve, in which the plate-grid capacity is practically neutralised within the valve by the interposition of an electrostatic screen which is connected to a point of positive potential on the H.T. battery; the amplification factor of this valve is of the order of 110 and the impedance about 175,000 ohms, a fact which makes it desirable to use low loss coils wound with Litz wire in the associated tuning circuit. As copper screening is necessary, the Marconiphone Company advises the use of astatic or fieldless coils to reduce eddy current and reaction effects. It is claimed that if proper attention is paid to screening and coil construction, an overall amplification of 35 to 50 per .H.F. stage with absolute stability can be obtained. The S.625 valve will probably attract more attention at the Exhibition than any other component.

Marconiphone Co., Ltd., 210-212, *Tottenham Court Road, London, W.1.*



1. Dubilier H.T. eliminator. 2. Cosmos five-valve set in which the controls are calibrated in metres. 3. Amplion Chippendale model loud-speaker. 4. Automobile Accessories Mark XVII receiver. 5. B.T.H. three-valve (0.v.2.) receiver; L.F. resistance-capacity coupling is used. 6. Liberty battery eliminator.

McMICHAEL (120).

Many new components have been evolved since the last Exhibition. The McMichael L.F. choke has a similar external appearance to the M.H. L.F. transformer, and has an inductance of 25 henries; the winding is split up into a number of sections which are well separated to reduce risk of breakdown.

The general tendency in receivers is to cut down the number of controls on the panel. Keeping this in view, Messrs. McMichael are putting out a range of semi-fixed resistors for baseboard mounting with the value in ohms engraved at suitable points on the circumference of the resistor; repetition of settings is thus made simple. A range of semi-aperiodic H.F. transformers not requiring to be tuned with a variable condenser and giving with two stages, it is claimed, a good degree of amplification with absolute stability should interest those who require a set with the very minimum of controls.

The well-known Dimic and Unimic coils are retained, and a screening box for them (5in. × 3¾in. × 4¼in. high) is now made in polished tinned copper; suitable holes are drilled near the base for entrance wires, and a tight-fitting lid is provided. This box can also be supplied with a valve base for use with the new screened valve.

In conjunction with Messrs. Ferranti, a metal-shrouded L.F. transformer is being put on the market and will be incorporated in all complete and home assembly sets. In view of the growing importance of short-wave reception, the 1928 M.H. Dimic Three receiver should create interest, as it is capable of reception on wavelengths from 15 to 10,000 metres; this set is also sold in parts for home assembly.

The new M.H. four-valve portable receiver is entirely self-contained in a leather case with Celestion loud-speaker built in, is very compact, measuring only 15in. × 12½in. × 8½in., and weighs but 28 lb. Tuning is effected by means of one dial only, and reaction control is by variometer. Provision for reception from an open aerial is made. A five-valve portable set of the same design as that just described has two stages of H.F. amplification and an increased range. A six-valve superheterodyne home assembly set specially designed for short-wave reception will be shown.

L. McMichael, Ltd., Hastings House, Norfolk Street, Strand, London, W.C.2.

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M.P.A. (57).

This company has for some time concentrated its energies on marketing self-contained portable sets giving high quality of reproduction.

The M.P.A. "Transportable Three" and the "Transportable Five" contain many features of interest, and the circuits and layouts follow sound and well-tried practice. The cabinet-making is extremely well done, and the appearance of the sets is most pleasing and artistic. The three-valve set comprises a detector and two L.F. stages; the first L.F. stage is resistance coupled and the second transformer coupled; the avoidance of a condenser in the grid circuit of the output valve is a good point. The five-valve set contains two H.F. stages (the L.F. portion of the set is the same in principle as the three-valve set), which are stabilised and screened by brass shields, and the panel is made of aluminium. To change over to long waves it is necessary to plug in a suitable five-pin transformer. The self-contained loud-speaker has its sound conduits so arranged that signals are emitted from both sides of the receiver, so that when the set is placed in the centre of a room a more uniform and natural effect is claimed to be produced. The loud-speakers are sold separately and should be of considerable interest.

M.P.A. Wireless, 62, *Conduit Street, Regent Street, London, W.*1.

OLDHAM (71).

This company, having had long association with the electrical industry, naturally provides exhibits the merits of which are based on sound practical experience. The superiority of batteries with glass containers is becoming evident to wireless enthusiasts, who will find a large selection of this type of battery shown. There are also slow discharge cells which can be charged at normal rates; these are useful for small sets containing one or two dull emitters. The firm has paid a good deal of attention to carrier crates for accumulators; these welcome means of lessening the burden of transport to the local charging station will be examined with interest.

The popular Oldham high-tension battery, which can be built up on the expanding bookcase principle, starting with 60 volts, is an interesting exhibit. There will be a good range of accumulators in celluloid cases, also a well-designed, unspillable type for portable sets.

Oldham and Son, Ltd., Denton, Manchester.

ORMOND (72, 73).

New components include a range of logarithmic condensers which are fast becoming popular in view of the convenient scale they provide between square law and straight line frequency; they give the only logical means of gang-controlling two or more tuned circuits. A receiver can be calibrated irrespective of the inductive value of a coil with which the condenser is used, in fact the logarithmic condenser can be fairly well calibrated with a wavelength scale, which can be set to suit the coil with which it is associated. These condensers are of the same general design as the Ormond S.L.F., and are supplied with an earthing shield and friction control is optional. The "Neutracondenser" for balanced circuits or capacity controlled reaction will be of interest as it has the exceptionally low minimum of 1.5 micro-microfarads, the maximum capacity being approximately 50 micro-microfarads. It is constructed for baseboard or panel mounting and the electrodes are wholly enclosed within a dustproof ebonite container mounted on a cleanly moulded base.

A new anti-capacity valve holder for baseboard mounting with nickel plated parts and sold at a popular price deserves attention. The well-known Ormond S.L.F. condenser has undergone modifications, the frame has been reduced and the end plates are of highly finished bakelite; attention has been paid to a low minimum capacity and one hole fixing is provided; the control is either by a plain 4-in. bakelite dial or a 55 to 1 slow motion dial.

A dual indicator dial of very attractive appearance will be shown and is now fitted with a slow motion drive with a reduction ratio of 16 to 1. Accurate reading of the dial is effected by a fine hair line and a convenient feature is that the direction of rotation of the control knob is the same as that of the cursor; the dial is provided with a terminal and can thus be used as an earthed shield.

A new series of well finished jacks and plugs with nickel plated fittings, also a range of fixed resistors will be shown. Three complete receivers are being manufactured this year with two, three and five valves respectively, all employing straight circuits. The five-valve set is a self-contained portable set with Celestion loud-speaker built in and it is claimed that 1½ kilowatt stations give good loud-speaker reception up to 40 miles, while Daventry can be heard satisfactorily up to 400 miles.

Ormond Engineering Co., Ltd., 199-205, *Pentonville Road, London, N.*1.

R.I.-VARLEY (5, 143).

A number of new products of interest will be found on this stand. The multi-cellular H.F. choke wound by the patented bi-duplex system consists of a skeleton former containing the very minimum of dielectric; the winding is divided into seven sections, the centre sections having a higher inductance than the outer sections. This method conforms to the latest practice in choke winding, and tends to reduce self-capacity and to prevent choke resonance. A moulded bakelite base is fitted, and the choke itself is protected by a transparent cover. Two L.F. resistance-capacity units will be shown. Type A has components with suitable constants for valves with A.C. resistances between 15,000 and 40,000 ohms. Type B is suitable for use after valves of 30,000 to 100,000 ohms resistance. The units consist of two tubular containers, one holding the bi-duplex, wire-wound anode resistance, the other holding a vacuum type grid leak; within the lid is the coupling condenser. The values of the components in Type A are: approximate anode resistance 200,000 ohms, grid leak 1 meg., coupling condenser 0.01 mfd. Anode resistances called upon to carry a milliampere or more are liable to become noisy in operation and to undergo change in value unless they are wire-wound; it will, therefore, be interesting to examine the fine range of R.I. Varley bi-duplex resistances, which are now made in values from 10,000 to 500,000 ohms. A series of tapped resistances give a satisfactory means of controlling volume. A neat moulding with clips to take the resistances provides for horizontal or vertical mounting, and will be available at the exhibition. Various panel mounting tuners will be shown, the latest addition to this series being a neutrodyne centre-tapped retroactive unit.

R. I. and Varley, Ltd., 103, *Kingsway, London, W.C.*2.

SIEMENS (150).

Siemens Bros. have an enviable name in the electrical world for the excellence of their dry batteries. The "Super-Radio" extra large capacity H.T. battery with spring clip connectors is capable of giving up to 20 mA. discharge, being sufficient for the largest receivers. It contains thirty-six cells, and is nominally rated at 50 volts. Next in capacity is the "Power" type H.T. battery with a normal discharge rate of 5 mA. and a maximum economical discharge rate of 10 mA., while the smaller ordinary capacity H.T. batteries are still supplied for those who have sets with one or two valves with a total plate current of not more than 2.5 to 5 mA.

Only impromptu methods have been used up to now for securing grid bias batteries to panels and baseboards; a proper fixing flap attached to Siemens bias batteries so that they can be held in position by screws is, therefore, an important improvement. A section of this stand will be devoted to ebonite, which is turned out in very large quantities at the company's works at Woolwich.

*Siemens Bros. and Co., Ltd., Woolwich, London, S.E.*18.

T.C.C. (115).

This company having specialised in condensers for many years, it is naturally expected that the exhibits will include a comprehensive range to cover all uses in receivers, eliminators, etc. Besides the well-known small type condensers in green cases up to 0.01 mfd. a series of seven mica condensers from 0.01 to 0.3 mfd., tested to 300 volts D.C., are now made chiefly for L.F. resistance capacity coupling where insulation resistance is of utmost importance. It has been shown that anode battery resistance is a prevalent cause of L.F. oscillation and that the standard reservoir condenser of 2 mfd. is often too small; T.C.C. Mansbridge condensers are made in the usual capacities up to 2 mfd., and a further range tested to 300 volts D.C., including 3, 4, 5, 6, 8 and 10 mfd. are now available at reasonable prices. For battery eliminators and smoothing circuits

Guide to the Show.—

where the maximum peak value of voltage does not exceed 400 (tested to 600 D.C.) a number of Mansbridge type up to 10 mfd. will be shown. A small book is issued giving the fullest possible details as to how to use T.C.C. condensers to the best advantage when building A.C. and D.C. eliminators.

Telegraph Condenser Co., Ltd., Wales Farm Road, North Acton, London, W.3.

UTILITY (95).

A condenser following a logarithmic scale has been added to the range of Utility condensers, and embodies ball bearings, a pig-tail connector, a single-bearing mounting for the shaft, and a special form of support for the fixed plates arranged to eliminate dielectric loss.

A new Micro-Dial having an aluminium face which is surveyed by a hair line and cursor should facilitate the taking of fine readings which can be made in a clockwise or anti-clockwise direction. The popular anti-capacity self-cleaning change-over switches in twelve patterns will be among the exhibits.

Wilkins & Wright, Ltd., Kenyon Street, Birmingham.

LIST OF EXHIBITORS.

ARTANDIA, Ltd., (126)
38, Bedford St., W.C.2.

Atkinson, C. Creswick, (55)
35, High St., Bedford.

Auto Sundries, Ltd., (237)
10a, Lower Grosvenor Place, S.W.1.

Automatic Coil Winder and Elec. Equipment Co., Ltd., (38)
Winder House, Rochester Row, S.W.1.

Automobile Accessories (Bristol), Ltd., (260)
93-95, Victoria St., Bristol.

B.S.A. Radio, Ltd., (10 & 64)
Small Heath, Birmingham.

Batteries, Ltd., (53)
Crabbs Cross, Redditch.

Bedford Electrical and Radio Co., (52)
22, Campbell Rd., Bedford.

Belling and Lee, Ltd., (207)
Queensway Works, Ponders End, Middlesex.

Benjamin Electric, Ltd., (79)
Brantwood Works, Tariff Rd., Tottenham, N.17.

Bird and Sons, Sydney S., (121)
Sarnesfield Rd., Enfield Town.

Bowerman, Ltd., George, (205)
10-12, Ludgate Hill, E.C.

Bowyer-Lowe Co., Ltd., (124)
Radio Works, Letchworth, Herts.

Brandes, Ltd., (161)
2 and 3, Norfolk St., W.C.2.

British Curtis Radio, Ltd., (60)
11, Red Lion Sq., E.C.1.

British Ebonite Co., Ltd., (76)
Nightingale Rd., Hanwell, W.7.

British General Mfg. Co., Ltd., (111)
Brockley Works, Brockley, S.E.4.

British Radio Corporation, Ltd., (59)
Elm Grove Rd., Weybridge, Surrey.

British Thomson-Houston Co., Ltd., (138, 139 & 56)
Crown House, Aldwych, W.C.2.

Brown Bros., Ltd., (25 & 26)
20, Great Eastern St., E.C.2.

Brown, Ltd., S. G., (122)
Western Av., North Acton, W.3.

Brownie Wireless Co. of Great Britain, Ltd., (145)
Nelson St. Works, Mornington Crescent, N.W.1.

Bulgin and Co., A.F., (236)
9-11, Cursitor St., Chancery Lane, E.C.4.

Bullen, William, (152)
38, Holywell Lane, Great Eastern St., E.C.

Burndept Wireless, Ltd., (127)
Eastnor House, Blackheath, S.E.3.

Burne-Jones and Co., Ltd., (123)
288, Borough High St., S.E.1.

Burton, C. F. and H., (37)
Progress Works, Bernard St., Walsall.

CAHILL and Co., Ltd., (101)
64, Newman St., W.1.

Camden Engineering Co., Ltd., (96)
Bayham Place, Camden Town, N.W.1.

Campbell and Addison, (90)
40, Howland St., Tottenham Court Rd., W.1.

Carborundum Co., Ltd., (125)
Trafford Park, Manchester.

Carrington Mfg. Co., Ltd., (12)
Camco Works, Sanderstead Rd., S. Croydon.

Celestion Radio Co., (151)
29-31, High St., Hampton Wick, Kingston-on-Thames.

Champion Accumulator Co., (18)
2, Prebend St., Leicester.

Chloride Electrical Storage Co., Ltd., (167 & 233)
217-229, Shaftesbury Avenue, W.C.

City and General Radio Co., Ltd., (202)
79, Cannon St., E.C.

Clarke and Co., H. (M/c), Ltd., (83)
Atlas Works, Eastnor St., Old Trafford, Manchester.

Climax Radio Electric, Ltd., (88 & 89)
Quill Lane, Putney, S.W.15.

Cole, Ltd., E. K., (11)
Ekco Works, London Rd., Leigh-on-Sea.

Collett Mfg. Co., S. H., (255)
60, Pentonville Rd., N.1.

Collinson's Precision Screw Co., Ltd., (80)
Provost Works, Macdonald Rd., E.17.

Cossor, Ltd., A. C., (86 & 87)
Cossor House, Highbury Grove, N.5.

D.A.R., Ltd., (104)
522-525, Australia House, Strand, W.C.

D.X. Coils, Ltd., (213)
4 and 5, Glebe Rd., Dalston, E.8.

Damard Lacquer Co., (119)
68, Victoria St., S.W.1.

De La Rue and Co., Ltd., T., (222)
90, Shernhall St., Walthamstow, E.17.

Detex Distributors, Ltd., (2)
125-129, Rosebery Avenue, E.C.

Dew and Co., A. J., (21 & 22)
33-34, Rathbone Place, W.1.

Dibben and Sons, Wm., (63)
80, St. Mary's Rd., Southampton.

Dionoid Battery Co., Ltd., (107)
Victoria Works, Prince of Wales Rd., Darnall, Sheffield.

Donotone Loud Speakers, (206)
40, Furnival St., E.C.4.

Dubilier Condenser Co. (1925), Ltd., (162)
Ducon Works, Victoria Rd., North Acton, W.3.

EAGLE ENGINEERING Co., Ltd., (58)
Eagle Works, Warwick.

East London Rubber Co., (29 & 30)
29-33, Great Eastern St., E.C.2.

Eastick and Sons, J. J., (245)
Eelex House, Bunhill Row, E.C.1.

Edison Bell, Ltd., (153)
Edison Bell Works, Glengall Rd., S.E.15.

Edison Swan Electric Co., Ltd., (144 & 146)
123, Queen Victoria St., E.C.4.

Electron Co., Ltd., (141)
122-124, Charing Cross Rd., W.C.2.

Ellison and Hillman, (33)
123-125, Albion St., Leeds.

Empire Elec. Co., (244)
303, Euston Rd., N.W.1.

Empress Radio and Elec. Co., (118)
105, Union St., Stonehouse, Plymouth.

Engineering Wks. (Elec. and General), Ltd., (42)
7 and 8, Gt. Winchester St., E.C.2.

Enterprise Mfg. Co., Ltd., (259)
Grape St., Shaftesbury Avenue, W.C.2.

Ever Ready Co. (Gt. Britain), Ltd., (154)
Hercules Place, Holloway, N.7.

FALK STADELMANN and Co., Ltd., (147)
83-93, Farringdon Rd., E.C.1.

Fellows Mfg. Co., Ltd., (116)
Cumberland Avenue, Park Royal, Willesden, N.W.10.

Ferranti, Ltd., (142)
Hollinwood, Lancashire.

Formo Co., The, (81)
Crown Works, Cricklewood Lane, N.W.

GAMAGE, Ltd., A. W., (69)
Holborn, E.C.1.

Gambrell Bros., Ltd., (66)
Merton Rd., Southfields, S.W.18.

Garnett, Whiteley and Co., Ltd., (93)
"Lotus" Works, Broadgreen Rd., Liverpool.

General Electric Co., Ltd., (50 & 140)
Magnet House, Kingsway, W.C.2.

General Radio Co., Ltd., (45, 46, 47 & 48)
235, Regent St., W.1.

Gillan Radio-Electric, Ltd., (235)
64, High Holborn, W.C.

Gordon and Co., Ltd., F. J., (28)
92, Charlotte St., W.1.

Graham Amplion, Ltd., (137)
25-26, Savile Row, Regent St., W.

Guide to the Show.—

Graham and Co., R. F., (201)
Norbiton Eng. Works, 101, Gloucester Rd., Kingston-on-Thames.
Graham-Farish Mfg. Co., (218)
17, Masons Hill, Bromley, Kent.
Grosvenor Battery Co., Ltd., (41)
Grosvenor Works, Lower High St., Watford.

H.T.C. Electrical Co., Ltd., (258)
2a, Boundaries Rd., Balham, S.W.12.
Halcyon Wireless Supply Co., Ltd. (168)
110, Knightsbridge, S.W.1.
Hart Accumulator Co., Ltd., (112)
Marshgate Lane, Stratford, E.15.
Hart Collins, Ltd., (114)
38a, Bessborough St., S.W.1.
Henderson and Co., Ltd., W. J., (254)
351, Fulham Rd., S.W.10.
Hoare and Jagels, (14)
28-29, Great Sutton St., Clerkenwell, E.C.1.
Hobday Bros., Ltd., (19 & 20)
21-27, Great Eastern St., E.C.2.
Houghton-Butcher (G.B.), Ltd., (61)
88-89, High Holborn, W.C.1.

IGRANIC Electric Co., Ltd., (148 & 149)
147, Queen Victoria St., E.C.4.
Iliffe and Sons Ltd., (109)
Dorset House, Tudor St., E.C.4.
Incorporated Radio Society of (226
Great Britain,
53, Victoria St., S.W.1.
Indurite, Ltd., (49)
430, New Stone Bldgs., 62, Chancery Lane, W.C.2.

J.R. Wireless Co., (229)
6 and 8, Rosebery Av., Clerkenwell, E.C.1.
Jackson Bros., (85)
8, Poland St., Oxford St., W.1.
Jewel Pen Co., Ltd., (210)
21, Great Sutton St., E.C.1.
Junit Mfg. Co., Ltd., (230)
Napier House, 24-27, High Holborn, W.C.1.

K.T.B. Manufacturing Co., Ltd., (238)
210, Hammersmith Rd., W.6.

LAMPLUGH, Ltd., S.A., (117)
King's Rd., Tyseley, Birmingham.
Langham Radio, (105 & 106)
9-11, Albion House, New Oxford St., W.C.
Lectro Linx, Ltd., (227)
254, Vauxhall Bridge Rd., S.W.1.
Lewis and Co., Ltd., S. W., (242)
39, Victoria St., S.W.1.
Lissen, Ltd., (158 & 160)
18-22, Friars Lane, Richmond, Surrey.
Lithanode Co., Ltd., (204)
190, Queen's Rd., S.W.8.
Lock, W. and T., (220)
St. Peter's Works, Bath.
London Electric Stores, Ltd., (221)
9, St. Martin's St., Leicester Sq., W.C.2.
London Elec. Wire Co. and (113)
Smiths, Ltd.
7, Playhouse Yard, Golden Lane, E.C.1.
London Metal Warehouses, Ltd., (13)
Hill St., Pocock St., Blackfriars Rd., S.E.1.
London Radio Mfg. Co., Ltd., (261)
Station Rd., Merton Abbey, S.W.19.

M.P.A. Wireless, (57)
62, Conduit St., Regent St., W.1.
Manufacturers Accessories Co., Ltd., (219)
85, Great Eastern St., E.C.2.
Marconiphone Co., Ltd.,
(54, 128, 129, 130, 131, 132, 133, 134 & 135)
210-212, Tottenham Court Rd., W.1.
McMichael, Ltd., L., (120)
Hastings House, Norfolk St., W.C.2.
Melhuish, C. D., (231)
8, Great Sutton St., Goswell Rd., E.C.1.
Metro-Vick Supplies, Ltd., (155 & 156)
155, Charing Cross Rd., W.C.
Mic Wireless Co., (246)
White Horse Pl., Market St., Wellingborough.
Mullard Radio Valve Co., Ltd.,
(40, 44, 164, 165 & 166)
Nightingale La., Balham, S.W.12.

NEUTRON (1927), Ltd., (63)
13, Swan La., Cannon St., E.C.
New London Electron Works, Ltd., (70)
East Ham, E.6.

OLDHAM and Son, Ltd., (71)
Denton, Manchester.
Ormond Engineering Co., Ltd., (72 & 73)
199-205, Pentonville Rd., N.1.

PELHAMS, Ltd., (23)
5, Banner St., E.C.1.
Peto and Radford, (62)
50, Grosvenor Gardens, S.W.1.
Peto Scott Co., Ltd., (163)
77, City Road, E.C.
Pettigrew and Merriman (1925), Ltd., (7)
2 & 4, Bucknall St., W.C.2.
Pohu, G. E., (216)
16, Colville Rd., Bayswater, W.11.
Portable Utilities Co., Ltd., (94)
Eureka House, Fisher St., W.C.
Princeps Wireless, (65)
Columbia Av., Edgware, Middlesex.
Pye and Co., W. G., (136)
Granta Works, Montague Rd., Cambridge.

QUARTZ Oscillators, Ltd., (214)
1, Lechmere Rd., N.W.2.

R.I. and Varley, Ltd., (5 & 143)
103, Kingsway, W.C.2.
Radi-Arc Electrical Co. (1927), Ltd., (3)
Bennett St., Chiswick, W.4.
Radio Service (London), Ltd., (203)
105, Torriano Av., Camden Town, N.W.5.
Rathbourne Elec. and Eng. Co., (9)
18, Sylvester Rd., East Finchley, N.2.
Redfern's Rubber Works, Ltd., (84)
Hyde, Cheshire.
Rees, Mace Mfg. Co., Ltd., (249 & 250)
39A, Welbeck St., W.1.
Regent Radio Supply Co., (257)
45, Fleet St., E.C.4.
Reid and Co., L. H., (211)
32, Victoria St., S.W.1.
Rooke Bros., Ltd., (215)
55, Cardington St., Euston, N.W.1.

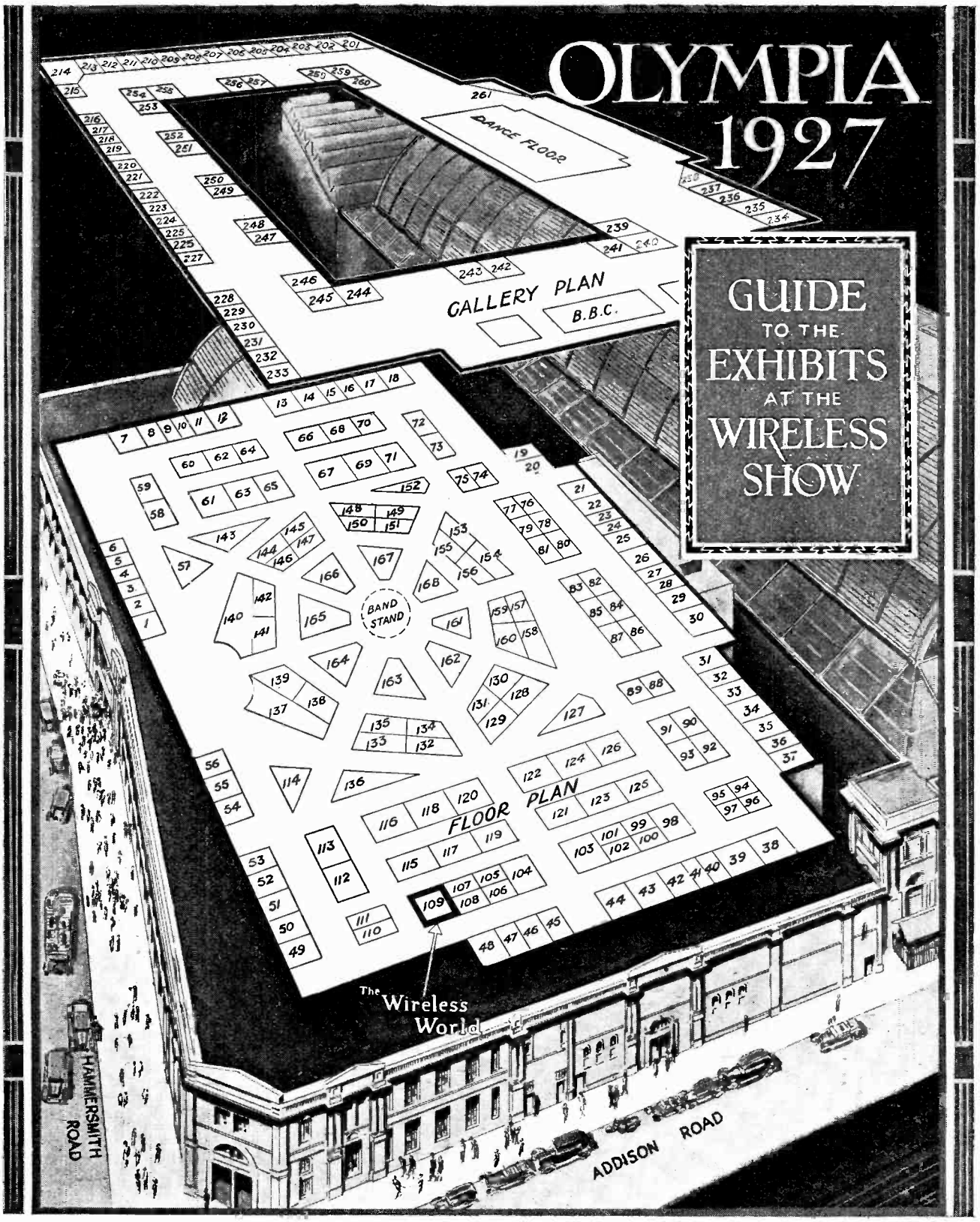
SELECTORS, Ltd., (110)
1, Dover St., W.1.
Sel-Ezi Wireless Supply Co., Ltd., (17)
6, Greek St., W.1.
Selfridge and Co., Ltd., (239 & 240)
400, Oxford St., W.1.
Sharp, Cecil, (243)
188, Blyth Rd., W.14.
Shore, G. C., (15)
28, Newman St., Oxford St., London, W.1.
Siemens Bros. and Co., Ltd., (150)
Woolwich, S.E.18.
Solidite Synthetic Mouldings, Ltd., (39)
Albion Works, North St., Clapham, S.W.4.
Stapleton, A. W., (225)
19A, Lorrimore Buildings, Lorrimore St., S.E.17.
Stevens and Co. (1914), Ltd., (27 & 159)
Walsall St., Wolverhampton.
Stratton and Co., Ltd., (77)
Balmoral Works, Bromsgrove St., Birmingham.
Stuart Laird, Ltd., (4)
8A, Great Chapel St., W.1.
Sun Electrical Co., Ltd., (31 & 32)
118, Charing Cross Rd., W.C.2.
Sylvex, Ltd., (228)
144, Theobalds Rd., W.C.1.

TELEGRAPH Condenser Co., (115)
Ltd.,
Wales Farm Rd., North Acton, W.3.
Telsen Electric Co., Ltd., (108)
207, Aston Rd., Birmingham.
Trader Publishing Co., Ltd., (8)
139, Fleet St., E.C.4.
Trelleborg Ebonite Works, Ltd., (91)
Audrey House, Ely Pl., Holborn Circus, E.C.
Truphonic Wireless Co., (82)
189, Regent St., W.1.
Tungstone Accumulator Co., Ltd., (98)
3, St. Bride's House, Salisbury Sq., E.C.
Turner and Co., (224)
54, Station Rd., New Southgate, N.11.

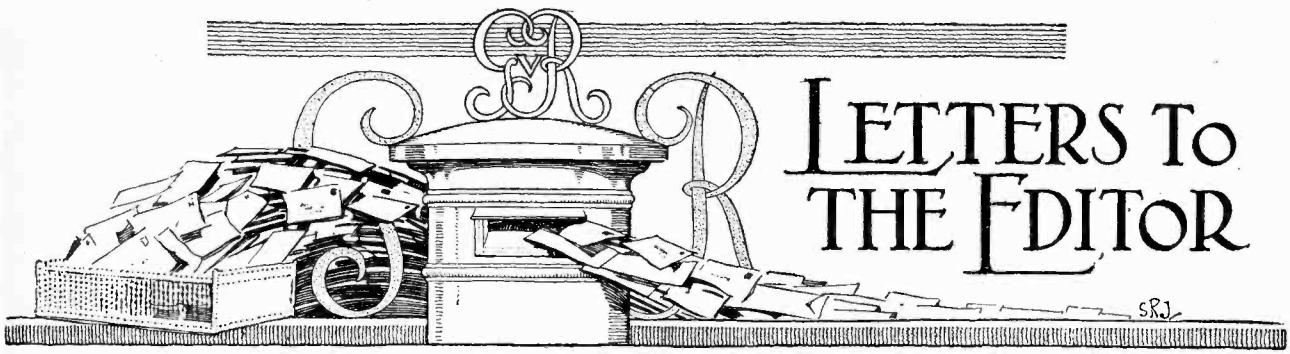
UNIVERSAL Bracket Co., (209)
Alpine Steelworks, East Molesey, Surrey.

VANDERVELL and Co., (157 & 212)
Ltd., C. A.,
Warple Way, Acton, W.3.

WALKER Bros., (99)
St. Joseph's Works, Bramley, Guildford.
Watmel Wireless Co., Ltd., (1)
Imperial Works, High St., Edgware, Middlesex.
Webb Condenser Co., (217)
24, Hatton Garden, E.C.1.
Wet H.T. Battery Co., (115)
12, Brownlow St., Holborn, W.C.
Whiteley, Ltd., William, (241)
Westbourne Grove, W.2.
Whiteley, Boneham and Co., Ltd., (256)
Duke St., Mansfield, Notts.
Whittingham, Smith and Co., (97)
110, Kew Green, Kew.
Wholesale Components and G. Z. (6)
Auckland and Son,
8 & 8A, Cross St., Islington, N.
Wilkins and Wright, Ltd., (95)
Kenyon St., Birmingham.
Wingrove and Rogers, Ltd., (67)
Arundel Chambers, W.C.2.
Wireless World, (109)
Dorset House, Tudor St., E.C.4.
Wright and Weaire, Ltd., (253)
740, High Rd., Tottenham, N.17.



Stand numbers accompany the complete alphabetical list of exhibitors.



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.

WIRELESS SETS AND THE B.B.C.

Sir,—In recent issues you have pointed out the need for cheap and reliable valve sets to replace the crystal receivers which you justly say can never give the same satisfaction as the valve set with a loud-speaker.

It seems to me that so long as each of the many manufacturers of valve sets continues to design his sets independently there will never be a sufficient demand for any one type to justify mass-production in this country and so provide the cheap set.

It is for this reason that I put forward the suggestion that there is a way in which the demand for the cheap valve set can be met. The B.B.C. is responsible for broadcasting both on the programme side and also on the technical side so far as the transmissions are concerned. As the result, the B.B.C. engineers are in the best position to decide on the types of receivers most suitable for the requirements of the listeners. Is there anything to prevent the B.B.C. from undertaking the design and manufacture of mass-production receivers, which, with their unrivalled facilities for recommending and explaining the sets to the public, would be sure of a ready sale? By standardising receivers in this way most of the technical troubles of the listener would disappear because spare parts and service would be available in any part of the Kingdom.

London, N.W.6, August 22nd, 1927. C. R. H. STEWART.

Sir,—Thank you for the opportunity of commenting on Mr. Stewart's letter to you of August 22nd.

For the B.B.C. to enter into the field of marketing and selling wireless receivers would not be appropriate. One of the results of such a new departure in policy would be probably to paralyse a great industry and throw many thousands out of work. It might well be argued as unfair competition.

Nevertheless, the B.B.C. recognises that the present unevenness and inadequate standard of receiving apparatus are a serious obstacle in the way of the progress of broadcasting. It has, therefore, indicated at exhibitions and in its publications the sound general principles upon which various types of receivers may be efficiently constructed. It is felt that this lead has already stimulated both the trade and the buying public.

THE BRITISH BROADCASTING CORPORATION,
P. P. Eckersley, Chief Engineer.

London, W.C.2, September 9th, 1927.

THE PROBLEM OF H.T. UPKEEP.

Sir,—Apparently the Show novelty this year is to be, so far as valves are concerned, the 0.075 valve.

May I congratulate our manufacturers in producing valves which, in point of L.T. consumption and in quality, beat the world. I would, however, point out that, if they bring out a 2-volt series of 0.075 valves, they will save me exactly 2½d. a month, 2s. 6d. a year, and, at the most, five journeys to the charging station per annum. In other words they leave me colder than their valves.

Now, if by the production of first-class four-electrode valves at the price of the 0.075 valve, or in some other way, they could multiply my H.T. bill by 0.75, I would sit up and take notice, for my H.T. bill, by dint of much care, has been reduced to just twelve times that of my L.T. Here they would save me 2s. 6d. a month, or 30s. a year, something to write advertisements about!

Are not our valve manufacturers frantically chasing each other down the wrong street—L.T. Street, instead of H.T. Street? In the opinion of the average "man under the aerial," the L.T. consumption of the modern 3-valve set is utterly negligible, while the provision of H.T. for his loud-speaker valve is, for him, the *only* problem in wireless matters.

Trusting that they will adopt my suggestion for their Exhibition in 1928, if not earlier. WILLIAM B. WEST.

Deal, September 10th, 1927.

EMPIRE BROADCASTING.

Sir,—I was pleased to read Mr. G. Leslie Morrow's letter *re* "Empire Broadcasting" in your issue of August 24th, and particularly his reply to Capt. Eckersley's statement and the question he asks the B.B.C.

The question can only be answered in one way, which would be tantamount to an admission that Empire broadcasting *via* short waves is as feasible as domestic broadcasting on medium waves.

I first listened to American broadcasting in December, 1922, on a wavelength of about 430 metres, which was at that time regarded as a remarkable achievement. I have since repeated the performance at rare intervals, but it is quite a different matter to receive 2XAF on 37 metres. I can receive this station regularly every Tuesday and Saturday night on two valves, detector and L.F., at very good strength, and on several occasions have put it on the loud-speaker (using only one stage of L.F.).

On the occasion of the visit of H.R.H. The Prince of Wales to Ottawa I heard quite clearly every word of his speech from the Canadian beam station, and continued to listen to the programme from this station an hour after the B.B.C. ceased to relay it.

Why should Capt. Eckersley worry about the reception side of the business? If the B.B.C. will transmit on short waves for the benefit of overseas listeners the colonies will take care of the reception side.

If British amateurs can receive American programmes, surely Britishers abroad will be capable of receiving British programmes.

Bravo, 2NM. If the B.B.C. cannot or will not do it, there are amateurs who can and will.

Presuming the B.B.C. wish to ignore the splendid work already accomplished by amateurs on short-wave transmissions, let us hope that as a result of the Empire transmissions, due to commence from 2NM on September 1st, the B.B.C. will realise that an Empire service on short waves is possible now.

Menston, Yorks. J. W. RIDDIOUGH.
September 2nd, 1927 G 5SZ.

READERS' PROBLEMS ANSWERED

Questions should be concisely worded, written on one side of the paper, and headed "Information Department." One question only should be sent at a time, and must be accompanied by a stamped, addressed envelope for postal reply. Any diagram accompanying the question should be drawn on a separate sheet. No responsibility will be accepted for questions sent in which do not comply with these rules.

"The Wireless World" Information Department Conducts a Free Service of Replies to Readers' Queries.

Ohm's Law Again.

I intend to run a 3-volt 0.06 amp. type of valve from a four-volt accumulator. What value of filament resistance must be used? L. H.

Working from Ohm's Law, and using the formula resistance required $= \frac{E}{C}$, which by substitution becomes $R = \frac{1}{0.06}$ we find that the resistance required to safeguard the filament is 16.6 ohms. In the formula, of course, 1 represents the number of volts to be dropped, for obviously if you have a three-volt valve and a four-volt accumulator, one volt must be dropped in the resistance, whilst 0.06 represents the normal current consumption of the valve. You should then either use a fixed resistor having a value as near as possible to that which we have already mentioned, or, alternatively, use a 30-ohm variable wire wound resistance, and adjust it to a point slightly less than the half-way position.

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H.F. Amplification and the Tropodyne.

On page 160 of "The Wireless World" of August 3rd last you gave a reader a circuit showing the method of adding a stage of high-frequency amplification before the first detector valve of a superheterodyne receiver. This, however, employs a separate oscillator, and I am not quite clear in my mind how this addition can be made to a superhet. of the "Tropodyne" type. C. A. S.

The addition of a high frequency amplifying valve to a supersonic heterodyne receiver embodying a combined oscillator-detector valve should be made as shown in Fig. 1 on this page. The H.F. transformer, T_1, should be constructed on the lines of either the "All Wave Four" H.F. transformer or the one used in the "Regional Receiver." The high potential end of the secondary winding should be connected to the centre point of the oscillator grid coils $L_1 - L_2$. It is interesting to note that an improvement in the performance of this type of oscillator can be made by constructing the oscillator grid coil in two parts and locating the plate or reaction coil between these two coils. A further addition, which is to be recommended, is the inclusion of a small variable condenser, N.C.2 (neutrodyne type), between the low potential end of the oscillator grid coil and L.T.—. This is to enable a balance between the H.F. tuned circuit and the oscillator circuit to be obtained and thus overcome mutual interference in tuning between these circuits. When H.F. amplification at signal frequency is included in a supersonic heterodyne receiver, it is very difficult to prevent this circuit from coupling magnetically with the frame circuit. The presence of a coupling of this nature is indicated by the stability of the H.F. amplifier being affected on orientating the frame. This difficulty can be overcome by totally enclosing the portions of the H.F. circuit within the dotted line, in a copper screening box and connecting this box to L.T.— as shown. The circuit given should function quite satisfactorily with a valve in the H.F. position having an A.C. resistance of about 20,000 to 30,000 ohms, and an amplification factor of about 20. The oscillator-detector circuit will perform best with a moderately low impedance valve, and it is suggested that one having an A.C. resistance of about 8,000 ohms, with the highest amplification factor obtainable with this resistance.

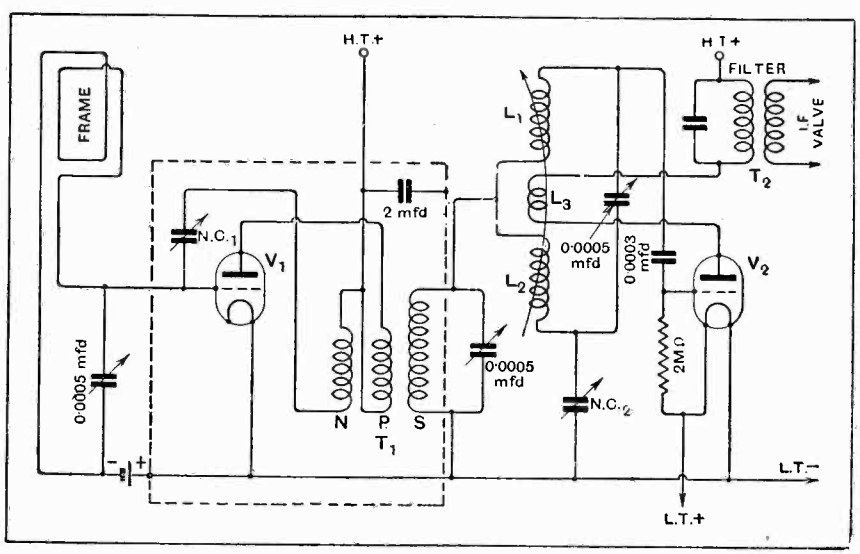

Fig. 1.—Adding a stage of high-frequency amplification to a superheterodyne receiver.

Power Amplification.

I recently attended a demonstration in a large hall and noted that three large valves were used for operating the loud-speaker, and the plate voltage applied to each of them was 400 volts, grid bias being 80 volts. Can you tell me what type of valves these would be, and how they were coupled? I might state that the volume and quality were most excellent. D. G. R. A.

Undoubtedly these valves were of the L.S.5A type, and the method of connection was merely that of paralleling three valves by connecting their filaments in parallel, joining all three grids together, and also joining all three anodes together. Exactly the same method was used in the case of the "Wireless World Demonstration Receiver," which was described with full constructional details in our issue of February 16th, 1927.

Is Home Charging False Economy?

I have a 6-volt 50-ampere-hour accumulator, which I use for my wireless set, taking it to the local garage for charging purposes. Would it be more economical for me to charge it myself from my lighting mains, which are 240-volt D.C.? If so, please give me the instructions how to do this. I pay 6d. per unit for my electricity. R. S. A. B.

Since you do not give us any indication of the price which you are at present paying for your accumulator to be charged, it is obvious that we cannot give you a definite answer to your question, but we will indicate to you how much it would cost you at home, and from this you will yourself be able to make comparison with the charges made by your local garage.

Now the normal charging rate of your accumulator will be 5 amps., and a current of 5 amps. will have to be kept flowing through the accumulator for a period of ten hours in order to fully charge the accumulator. The charging current, therefore, is 5 amps., and the mains voltage which is pushing the 5 amps. through the accumulator is 240 volts. Since volts multiplied by amperes gives us watts, it is obvious that you will be using 960 watts, or nearly one kilowatt to charge your accumulator. Naturally, of course, since the accumulator is a 6-volt one, and your mains are 240 volts, there are roughly 230 volts which must be wasted by dropping them across a lamp or electric heater, and actually, only about 40 watts out of the total 960 are being used to charge the accumulator, there being over 900 watts which we are compelled to deliberately waste in heating up series lamps or an electric heater.

To charge your accumulator, then, we only use (in very rough figures) 40 watts for a period of 10 hours, and thus consume 400 watt-hours. Now the Board of Trade unit for which you pay 6d. equals a 1,000 watt-hours, or as we more usually put it, one kilowatt-hour. It is obvious, therefore, that you are using less than half a unit to charge your accumulator, and the cost to charge the accumulator would be less than 3d. Actually, however, you are taking 960 watts from the mains for a period of 10 hours. This gives us 9,600 watt-hours, or in other words, 9.6 units. The cost of which is roughly, in your case, 4s. 9d. You can safely assume, therefore, that it would cost you 5s. in round figures, to charge your accumulator at home, and we do not suppose that your local garage would make this charge.

On the face of it, it looks uneconomical for any commercial concern to undertake to charge your accumulator, but actually, of course, they pay, not on the lighting, but on the heating rate for energy consumed, and this rate will be about 1½d. per unit in districts where 6d. per unit is charged for lighting. The cost of their charging your accumulator alone, therefore, would be only 1s. 3d. You will realise, that if you had, we will say for the sake of example, twenty 6-volt accumulators of the same capacity as yours, it would cost you no more to charge them than it would to charge your one accumulator, because you would only have a comparatively small amount of volts to drop across lamps, most of your energy being used for charging the accumulator. The same 5 amp. charging current which had to pass through one accumulator would pass through sixty accumulators, and charge them without extra cost. In the case of people on D.C. mains, therefore, who have no special facilities in the way of heater circuits, etc., we should advise that they place their accumulator in the hands of a reliable charging station, who at the same time will undertake to see that it is in order in other respects, and renew the electrolyte where necessary.

Trickle Charger Troubles.

I am building the H.T. Trickle Charger described in your issue of August 3rd, but there are one or two points which are doubtful to me. I have purchased a suitable transformer which has two terminals marked 220 to 240 volts on one side, and three terminals on the other. Between one of the outer terminals of these three and the centre terminal, is the figure 3, and between the other outer and the centre terminal, is the figure 5, while over the top is the figure 8. I do not quite understand the meaning of these symbols, and should be glad if you can make them clear. Also, referring to Fig. 1 of the article, a connection is shown joining one end of the primary and one end of the secondary. Is this already done in the transformer, or is it an external connection which I must make myself? T. G.

You must obviously connect the two terminals marked 200 to 240 volts to your mains. They can be connected from a lamp socket by means of a length of "flex" and an ordinary adapter. With regard to the other three terminals, these are connected to the secondary winding of the transformer. This winding consists of a single winding which terminates at either end in the two outer terminals of your group of three terminals, the difference of potential between these two outer terminals being 8 volts. If a tapping is made on this winding at the electrical centre and brought out to the centre terminal of the group of three, it is obvious that the difference of potential between the centre terminals and the outer terminals will be 4 volts, but actually a tapping is not made at the electrical centre of the winding, so that the difference of potential between the centre terminal and one outer terminal is 3 volts, and between the centre and the other outer terminal is 5 volts, the difference of potential across the whole winding being, of course, 8 volts.

If you have a rectifying valve, such, for instance, as the Burndept U.695, which takes 6 volts, it is obvious that neither the 3-volt nor the 5-volt tappings would be enough, and you must connect the valve across the whole 8 volts and insert a resistance in series with the filament to drop the unwanted 2 volts, the value of this resistance being given by Ohm's Law. In the case of this particular valve it would be 2 ohms. In the case of a rectifying valve operating on 4 volts it would be possible to connect it across the 5-volt section, inserting a 1 ohm resistance to drop the odd volt. Most single-wave rectifying valves take a filament current of 1 ampere, and practically all the "bell-ringing" type of transformers are designed to give an output of 1 ampere at 3, 5, or 8 volts, and are sold with various primary windings to suit various mains voltages. It is quite unnecessary, therefore, to use any particular make of transformer.

We would point out also that in the case of many valves, such, for instance, as the Mullard D.U.10, which was used by the author in his original instrument, a pamphlet will be found in the valve carton giving the value of resistance necessary to use in the plate circuit of the valve to safeguard the valve. The author actually made use of a lamp for resistance, but it will be realised that the value of resistance depends, among other things, upon the voltage of the accumulator to be put on charge, and this data is also given on the pamphlet.

With regard to your query concerning the wire joining the primary and secondary, this is *not* done in the original instrument and must be made externally when building the charger.

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Wet or Dry?

Will you kindly inform me if it would be possible to use a small 10-volt accumulator battery, with tappings to each cell, as a grid bias battery? W. H. L.

There is no objection to the use of a small accumulator of the H.T. type for obtaining grid bias, but we should like to point out that the current taken from this battery, under working conditions, will be very small. It is, therefore, recommended that you make it a rule to discharge and re-charge your grid bias accumulator at least once a month, otherwise the plates may show signs of sulphating and thus seriously curtail the life of the battery.

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OUR SHOW NUMBER.

ALTHOUGH all those who possibly can do so will, no doubt, make a point of visiting the Wireless Show, there will, of course, be a large number of our readers who will find it impossible, owing to distance or lack of time, to avail themselves of the opportunity which this annual Exhibition provides for seeing all the latest products of the wireless manufacturing industry.

Review of the Exhibits.

In this issue we attempt to review the Exhibition as a whole, and deal as far as possible with all the items of outstanding interest. We hope in this way to give to our readers who may be unable to attend the Exhibition at least a very comprehensive idea of what is to be seen this year, whilst the issue should also prove very valuable to those who visit the Exhibition, but who naturally will not find it possible to see everything nor to carry away with them impressions of more than a limited number of the exhibits. The pages in this issue devoted to the Exhibition will serve as a reminder after the Exhibition as well as a guide to what to look for when visiting the Show.

In our last issue we gave a forecast of some of the exhibits, but as that issue was prepared prior to the date of the Exhibition it was not possible to comment on more than a limited number of the products, and our attention had necessarily to be confined to those exhibits concerning which information was available in advance, but it will be seen from our report in this issue what a multitude of new things have been evolved since the corresponding exhibition was held last year.

Stabilisation.

Wireless has developed at a very high rate, and in the past receivers and components became obsolete all too quickly. The position has now stabilised, however, to a very large extent, and a good receiver of to-day is likely to remain a good receiver for some time to come. A year or two ago it was certainly not possible to make such a statement concerning the apparatus of that date. Improvements will, of course, continue to be made all the time, but we have now reached a standard where reception is very close to the ideal when a very careful choice is made of the type of receiver and the loud-speaker to use. A year or two ago one might certainly have been justified in hesitating to make a purchase in the anticipation that a vast improvement might be expected at an early date, but the position is very different to-day.

The Essentials of a Good Receiver.

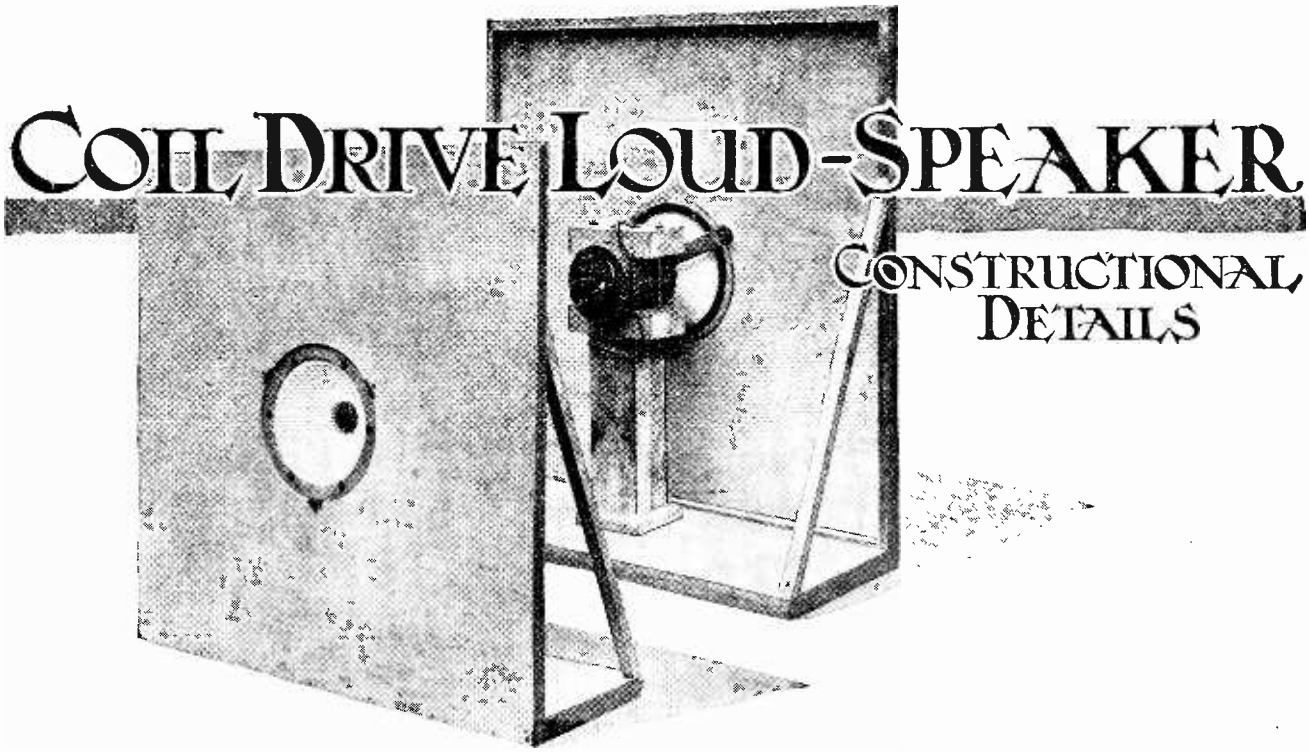
There are points, however, which we must still bear in mind when we choose a set to build for ourselves or when we buy a manufactured receiver for our own use, or are asked to recommend one to a friend. As time goes on the importance of selectivity is becoming more and more apparent. Therefore we should see to it that the receiver of our choice has a reasonable degree of selectivity. The other essential is, of course, quality, and provided we make sure of both these essentials, robustness, durability, and appearance are the only factors remaining to determine our choice of the receiver.

On the question of accessories the time has now arrived, we think, when anyone who has electric light mains available in the house should very seriously consider the advantages of having a mains eliminator at least for the supply of the plate current to the valves, even if he does not go so far as to dispense with the filament battery as well; but batteries, both primary and secondary, have also been improved so much that they need not be regarded as such a perpetual source of worry as earlier types unfortunately proved themselves to be.

In our issue of next week we hope to deal more in detail with a number of the exhibits, and special attention will be paid to those components or sets which, from one point of view or another, constitute a substantial improvement on the apparatus of last year.

COIL DRIVE LOUD-SPEAKER

CONSTRUCTIONAL DETAILS



A Home-built Loud-speaker for High Quality Reproduction.

By F. H. HAYNES.

EXPERIMENTAL interest in home receiver construction lies always in the direction of achieving better quality of reproduction. The importance which the amateur attaches to this aim is evidenced by the careful consideration given to such points as the avoidance of regeneration and excessive selectivity in H.F. amplifier design, the decline in the use of leaky grid detection coupled with attention to the possibilities of overloading the detector valve, the growing popularity of resistance coupling, particularly for a first L.F. stage, and the significant demand for low-frequency power amplifying valves operated with high anode voltages. Receiver design having reached a high degree of perfection, energies have recently been turned to a careful study of those principles which govern quality in loud-speaker construction. The loud-speaker has recently become just as much an object of interest to the experimenter and home constructor as the receiving set. Cone and paper diaphragm loud-speakers have afforded those possessing perhaps limited circuit knowledge, yet having mechanical skill, with a hobby coincident with better broadcast reception.

Enthusiasm was aroused in January of last year when Dr. N. W. McLachlan demonstrated a moving coil loud-speaker at a meeting of the Radio Society of Great Britain. The remarkable quality then obtained was a revelation to those present, and for the benefit of readers Dr. McLachlan has fully discussed the underlying principles both in a series of articles which have appeared in this journal [1] and in his recent book written for the broadcast listener.[2] The paper read before the American Institute of Electrical Engineers [3] by C. W. Rice and E. W. Kellogg marked the commercial introduction of the moving coil loud-speaker, and instruments built to their design are manufactured in this country by the British Thomson-Houston Company.

In order that readers may avail themselves of the information advanced by Dr. McLachlan and to cater for the demand to put the points which he has advanced into practice, a design has been developed based on his theoretical articles, and illustrates the considerations which he has advanced.

Leading Dimensions.

Having studied the requirements of the moving coil loud-speaker design, the amateur perhaps hesitates in deciding upon several of the dimensions. Starting with a diameter of 1¾in. for the centre pole and the necessity of employing some 10 to 30 watts to establish the field, the size of the field coil can be readily arrived at. It should be noted, however, that the space required for a mains voltage winding is appreciably greater than that required for a coil operating from a 6-volt battery, owing to the greater ratio of insulation to conductor, though for uniformity one size of spool has been adopted giving ample field strength across the gap for all voltages. The electro-magnet in this instance embodies the core as a one-piece casting, although this entails some difficulty in

[1] *The Wireless World*, March 30th, April 13th, and September 21st, 1927.

[2] "Wireless Loud-speakers." Iliffe and Sons Ltd.

[3] American I.E.E. Journal, April, 1925, pp. 461-480, Vol. XLIV.

Coil Drive Loud-speaker.—

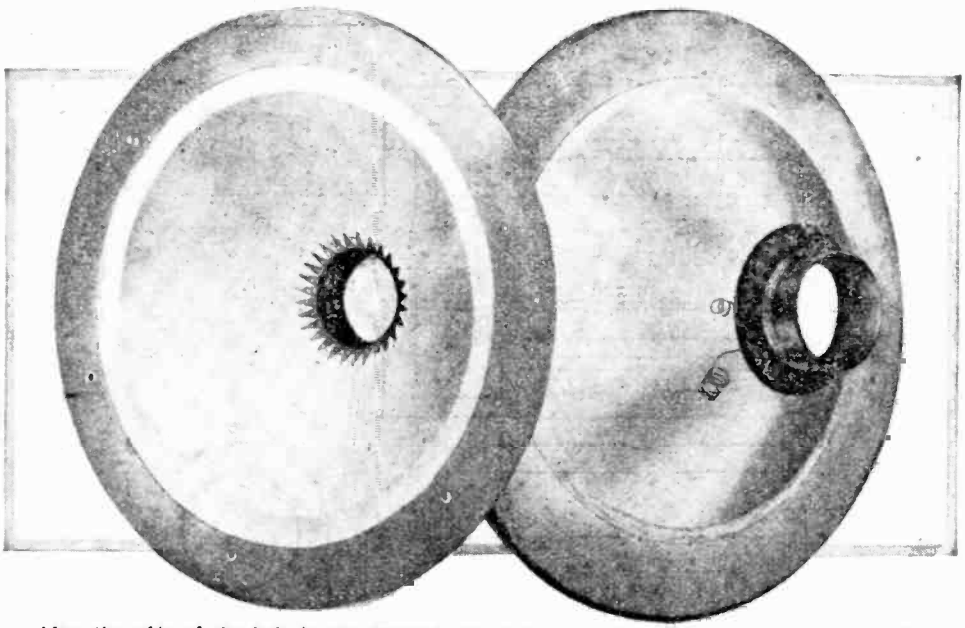
boring when facing up the inside of the cylinder and the pole particularly as an appreciable taper must be provided when casting to allow for a satisfactory "draw." It was rather to ensure perfect centring of the pole that this one-piece construction was adopted, though to simplify internal machining the pole may be separately bolted in place to a stepped machined face in the manner employed in the parts produced by the Star Engineering Company, of Didsbury, Manchester.[1]

With the front flange is incorporated radial supports to hold the turned ring to which the diaphragm is attached. This greatly simplifies the setting up of the diaphragm and its subsequent fixing to the baffle. Only three bars support the ring in order that the back of the diaphragm may be well ventilated, the bars being ribbed as cast-iron so readily fractures.

The outer rim is made just strong enough to withstand turning, and is provided with three lugs for gripping the ring, with extensions which may be used for bolting to a substantial baffle for supporting the entire loud-speaker, if necessary, without other fixing.

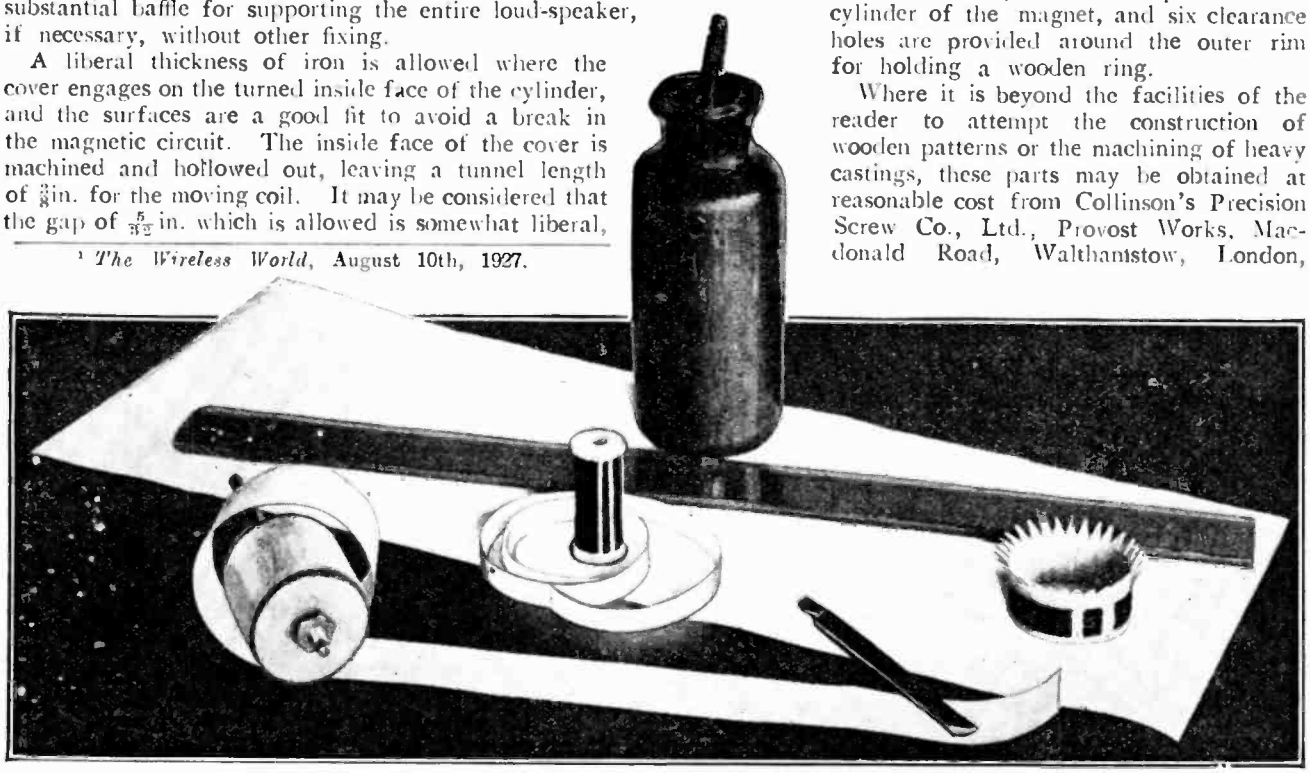
A liberal thickness of iron is allowed where the cover engages on the turned inside face of the cylinder, and the surfaces are a good fit to avoid a break in the magnetic circuit. The inside face of the cover is machined and hollowed out, leaving a tunnel length of $\frac{3}{16}$in. for the moving coil. It may be considered that the gap of $\frac{5}{32}$in. which is allowed is somewhat liberal, yet continual difficulty may be experienced with a smaller gap even if a centring device is incorporated by the moving coil after use becoming slightly distorted in shape or its movement not remaining absolutely parallel with the axis owing to changes in the condition of the flexible material supporting the rim of the diaphragm. Six hexagon-headed screws clamp the cover plate to the cylinder of the magnet, and six clearance holes are provided around the outer rim for holding a wooden ring.

Where it is beyond the facilities of the reader to attempt the construction of wooden patterns or the machining of heavy castings, these parts may be obtained at reasonable cost from Collinson's Precision Screw Co., Ltd., Provost Works, Macdonald Road, Walthamstow, London,

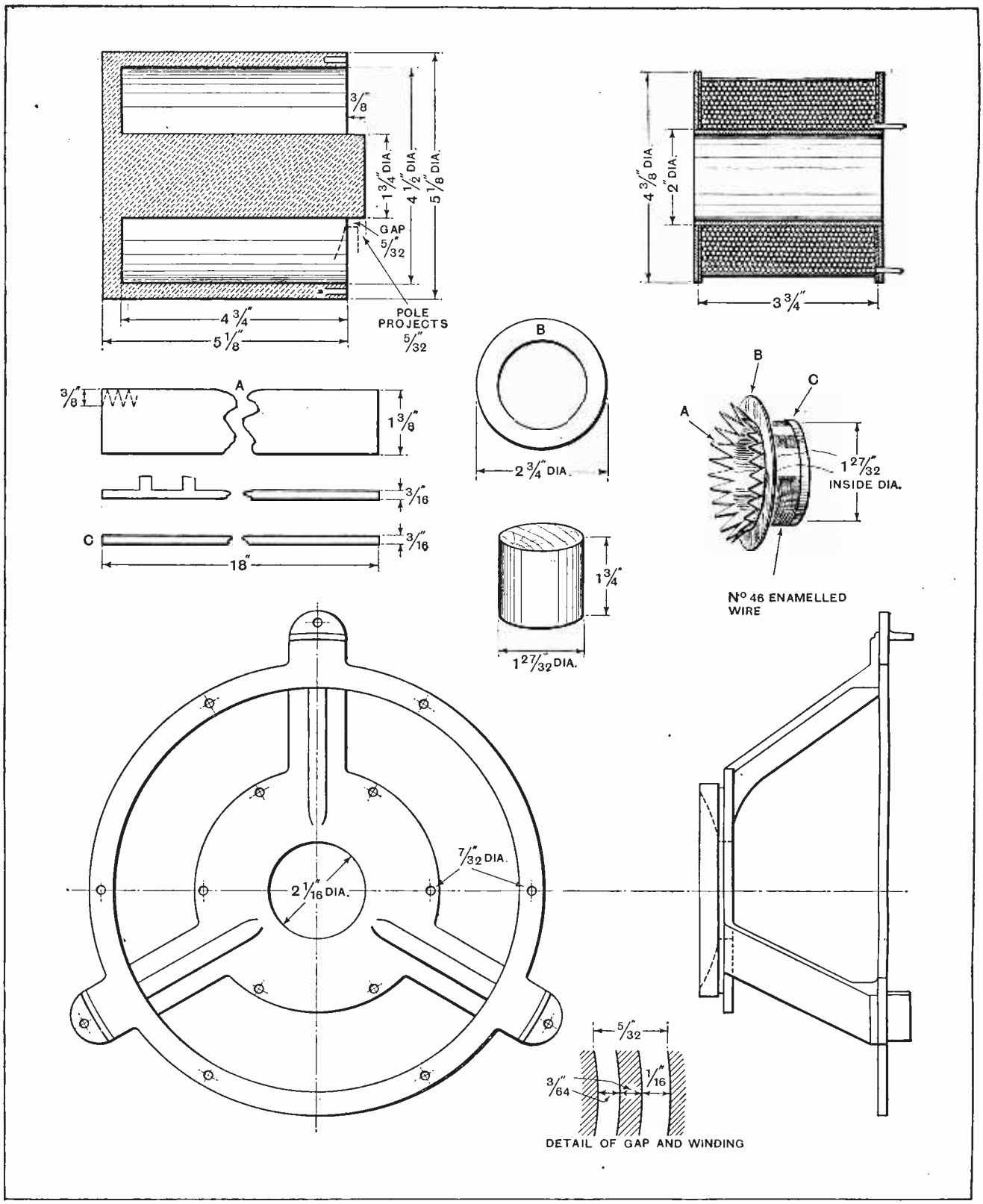


After the edge of the hole in the buckskin has been securely attached to the diaphragm the skin is fixed to the plywood ring, taking care that the circles as viewed from the front are concentric and that the axis of the coil is at exact right-angles to the face of the ring.

[1] *The Wireless World*, August 10th, 1927.



Materials for making up the coil. Good shellac varnish is used as the adhesive.



Dimensional drawings for constructing electro-magnet, flange, bobbin and magnet winding, and moving coil with former.

Coil Drive Loud-speaker.—

E.17, together with a brass bobbin where required, for carrying the field as well as a plywood ring for holding the diaphragm.

The brass bobbin is made by soldering a pair of flanges made from No. 16 brass sheet to a brass tube of 2in. external diameter and $\frac{1}{16}$in. wall thickness. With a thin paper packing this brass tube will slide tightly on the pole. For winding with the heavier wires a lathe is not essential and the bobbin can be rotated by hand in a like manner to winding inductance coils. For winding with finer gauge wires a winder can easily be set up with bearings and crank, the turns being run on with no great care except that of keeping the surface of the turns level and spool a thin fibre or brown paper ring should be slipped over the pole, and insulating rings must cover the ends of the windings.

Reference to the accompanying table of windings for different voltages shows that the watts dissipated vary. Appreciable heating may be permitted, though except where otherwise stated in the table no observable temperature rise will occur and the magnet can be kept on circuit for prolonged periods. In view of the weaker field strengths obtained on the higher voltages the reader can safely wind with the next larger even gauge without risk. He can, for instance, take the 100-volt winding of No. 34 S.S.C. for use on a 200-volt supply, though No. 36 S.S.C. would be recommended, giving a slight temperature rise.

Volts.	S.W.G.	Lbs.	Layers.	Turns.	Yards.	Ohms.	Current Rating, 1,000 amps. to 1 sq. in.	I.E.E. Rating.	Current.	Amp. Turns.	Watts.
4 (*a*)	14 DCC	$6\frac{1}{4}$	11	500	106	0.5	5.0	19.0	8.0	4,000	32.0
6 (*b*)	16 DCC	5	12	600	130	0.96	3.2	12.9	6.3	3,780	38.0
6	18 DCC	$4\frac{1}{2}$	15	1,000	215	2.9	1.8	7.2	2.1	2,100	12.6
8	18 DCC	$4\frac{1}{2}$	15	1,000	215	2.9	1.8	7.2	2.7	2,700	21.6
8	20 DCC	$4\frac{1}{4}$	20	1,700	355	8.4	1.0	4.0	0.95	1,615	7.6
10	20 DCC	$4\frac{1}{4}$	20	1,700	355	8.4	1.0	4.0	1.2	2,040	12.0
12	20 DCC	$4\frac{1}{4}$	20	1,700	355	8.4	1.0	4.0	1.4	2,400	17.0
18 (*c*)	22 DCC	4	25	2,600	550	22	0.6	2.5	0.8	2,080	14.4
24 (*d*)	24 DCC	$3\frac{1}{2}$	29	3,600	770	48.5	0.38	—	0.5	1,810	12.0
36 (*e*)	26 DCC	$3\frac{1}{4}$	34	4,900	1,050	98	0.25	—	0.37	1,824	13.0
50 (*f*)	28 DCC	$2\frac{3}{4}$	38	6,200	1,300	182	0.17	—	0.27	1,700	13.5
50	30 DCC	$2\frac{3}{4}$	42	7,500	1,570	315	0.12	—	0.16	1,200	8.0
100 (*g*)	34 SSC	$3\frac{1}{4}$	67	19,000	4,100	1,500	0.07	—	0.067	1,200	6.7
200 (*h*)	38 SSC	$2\frac{3}{4}$	92	37,000	7,700	6,500	0.028	—	0.03	1,100	6.0

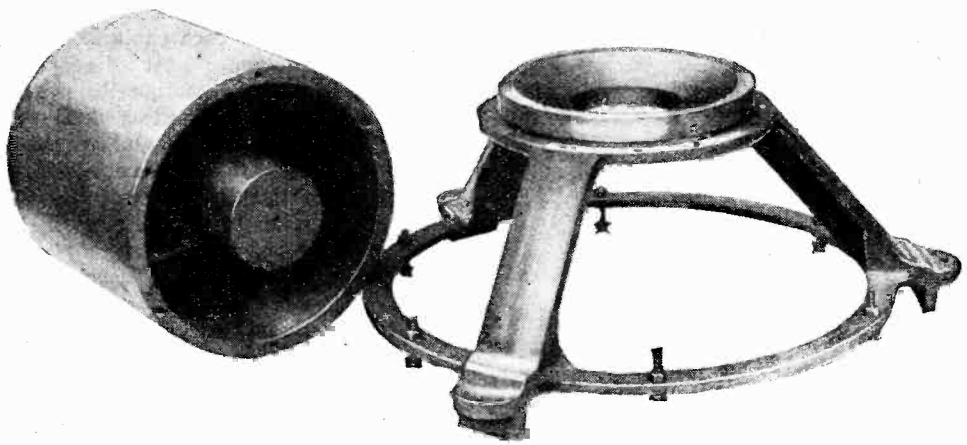
Winding Space (same in all cases): $3\frac{3}{4}$in. length × $1\frac{3}{16}$in. diameter with 2in. centre hole, allowance being made for insulation thickness.

(*a*) Suitable for 2 volts; can be run on 6 volts with moderate temperature rise.
(*b*) Slight temperature rise.
(*c*) Can be run on 20 volts.
(*d*) Suitable for 26 or 28 volts.
(*e*) Can be run on 40 volts.
(*f*) Can be run on 60 volts.
(*g*) Suitable for 110 volts; can be used on 125 or 150 with only slight temperature rise.
(*h*) Suitable for 220 or 240.

Order quantity of wire slightly in excess of amount stated.

winding from end to end. It is most important to completely cover the surface of the brass tube and inside faces of the flanges with several thicknesses of brown paper secured with shellac varnish, as well as to provide small ebonite bushes for the holes through which the ends of the winding will pass. Ready wound spools in the form of a self-supporting winding, without bobbing, and impregnated can be obtained to the overall dimensions given here from the Watmel Wireless Co., Ltd., 332a, Goswell Road, London, E.C.1. Two bushed holes are made in the back of the electro-magnet exactly coinciding with the wires passing through the flange of the bobbin for the leading out wires. In the case of the self-supporting

A light paper former carries the moving coil winding, and it is best to shape, varnish, and dry this former before attempting to wind. A strip of drawing paper known as "detail paper" (grade B.70 Drawing Office Supplies, Ltd., 51, Cheapside, London, E.C.2), is cut as a strip to the dimensions given and wrapped round a turned wooden cylinder $1\frac{27}{32}$in. in diameter, which can be ordered at the time of obtaining the machined parts. This former is thoroughly impregnated with shellac varnish, the inside face being treated after removal. It must be examined while being dried out to see that it retains its shape, and can be slipped on and off the wooden cylinder.



Machined magnet and flanged castings.

Two other narrower strips are then prepared and secured to form ridges between which the wire may be accommodated. One of these strips is provided with six projecting pieces, which may, perhaps, subsequently prove useful for holding a ring used for centring, though in the experience of the writer, the use of a centring device is unnecessary.

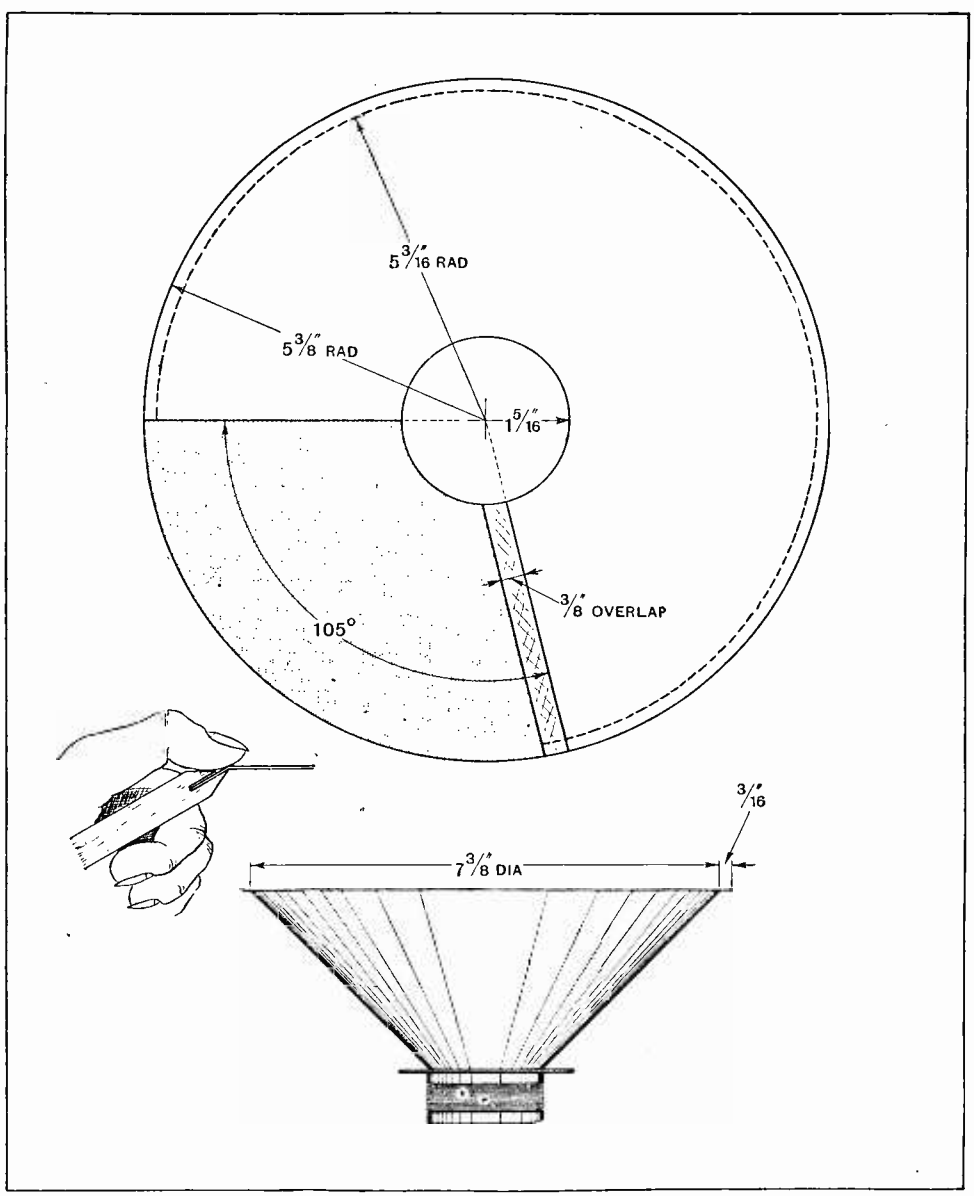
Winding is not commenced until the former is thoroughly dry and hard, and it must fit, yet be easily

Coil Drive Loud-speaker.—

removable from the former in order that satisfactory clearances will be obtained between the poles. A groove is then scraped away on the inside face to accommodate a leading out wire from that end of the former which is to be remote from the diaphragm. The leading out wire consists of fine Litz or some five strands of No. 38 wire. A clean soldered connection is made to the No. 46 enamel wire used for winding, and with the former set up on a spindle there will be no difficulty in winding on to the space provided 1,300 turns, winding not layer by layer, but completing the winding by advancing from one end to the other across the former. This winding projects just slightly above the rings on the former, and is covered with a single layer of exceedingly thin grease-proof paper, still using shellac varnish as an adhesive.

The leading out wires are fixed in position by passing in and out of pairs of holes on the centring ring. It may be mentioned here that if it is considered necessary to make use of this ring for centring four valve legs should be inserted into the face of the electro-magnet cover so as to secure cottons terminating on and in the same plane as this ring.

Next the diaphragm is constructed so as to make a tight fit over the former carrying the coil, using "two-sheet" Bristol board, obtainable from dealers in artists' materials, and carefully setting out to the details given in the drawing. After roughing with glass paper, Seccotine secures the overlapping edges. To turn over the edge a piece of wood is used, carrying a groove equal in depth to the width of the turnover. Working this round the edge readily produces the bend without fracturing the paper, though it is important that the angle made by the cone does not even slightly exceed, by error of construction, a right-angle, or the bent-over portion will tear.



Details for cutting out, folding over the rim and assembling the diaphragm and coil.

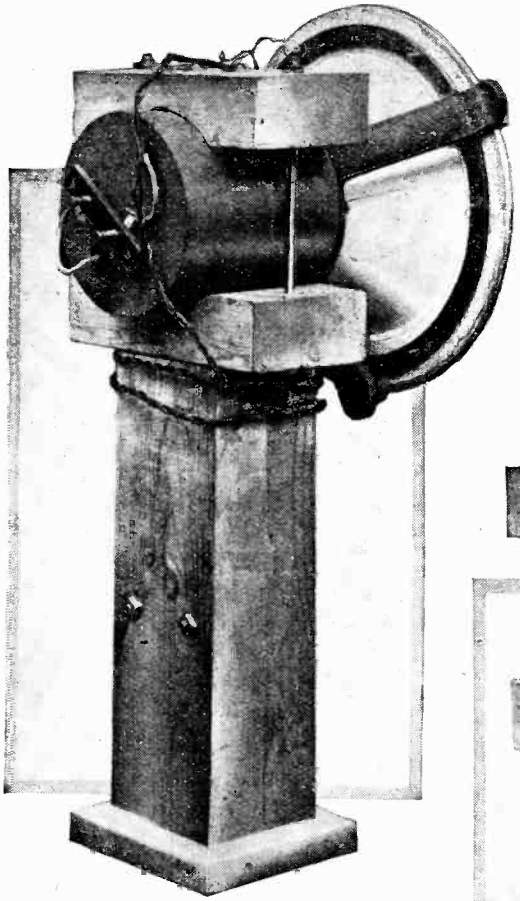
The Serrations.

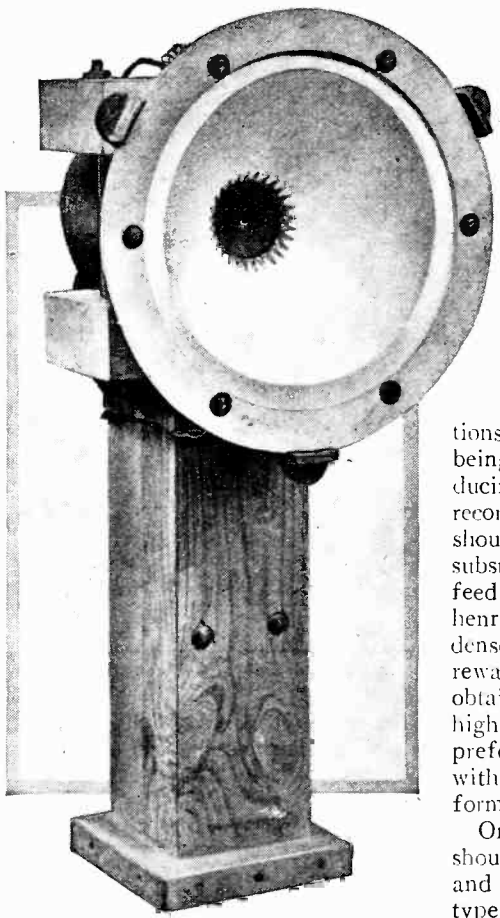
With the cylinder making a tight fit on the diaphragm, scraping away the edge of the diaphragm very slightly, perhaps, to admit the former, the serrations are very carefully made, cutting almost to the point of fixing of the centring ring. It is now necessary to glass-paper the centre surface of the diaphragm and to scrape the shellac surface on the serrations to ensure a good fixing with Seccotine. To assist the serrations in bending over, a warm iron may be passed lightly over them. A good tip is to press them backwards with a hot electric light bulb, covered slightly with French chalk to prevent sticking. All the points must be continually pressed down in position until they firmly adhere, and remembering that Seccotine dries rather than sets, this will take place quicker in the open. A re-entrant cone fitted as a stiffener to the mounted cylinder is not considered necessary.

Thin kid, obtainable from George & Co., 21A, Noel Street, Berwick Street, Soho, London, W., holds the diaphragm to the plywood

Coil Drive Loud-speaker.—

clamping ring. As the hole in ring is 8½in. in diameter and that of the diaphragm at the point of turning over is 7½in., only ½in. of flexible material is provided. It was found that a wider flexible mounting necessitated the use of a centring device, as the increased latitude of movement permitted a sideways action of the coil. This narrow mounting in no way impairs the free movement of the diaphragm.





A finished loud-speaker. Oversize holes with small bolts and washers provide the necessary latitude for centring the coil between the poles. The two pairs of terminals may be inserted in the wood on low-voltage supply which might also carry the non-inductive resistance spool which bridges the magnet winding when this is required.

It is better to cut away the hole in the skin before attaching it to the diaphragm. Every care must be taken to avoid unevenly stretching the skin before marking out the 7½in. circle with inked compasses. Only the folds need to be removed, and this may be done by fixing the skin smooth side uppermost at the centre with a drawing pin and evenly pressing out in all directions without stretching, taking points in turn diametrically opposite and inserting a circle of drawing pins. On removing the pins the marked-out circle should not lose its shape, as would occur if any portion was unduly stretched.

After the diaphragm is secured to the skin with Seccotine applied to the rough side and dried off, the skin is stuck to the plywood ring, gently pulling so as to carefully centre the diaphragm. On examination the coil should stand perfectly perpendicular when the ring is laid flat on the table. Six $\frac{5}{16}$in. holes around the wooden ring provide lateral movement for centring the coil in the poles. The leading out wires are brought out by attachment to the underside of the diaphragm diametrically opposite the seam, and soldered to a length of thin flex taken to terminals.

The Output Amplifier.

The output stage of the amplifier may well consist of an L.S.5A or B.T.H. B.11 valve, operating on 250 or more volts, bias being obtained from a 60-volt H.T. battery. A battery eliminator may provide the H.T., and this loud-speaker has been tested, using the Benjamin A.C. rectifier, and it may be mentioned that without adequate bias this rectifier is capable of running the valve anode red hot, and is entirely free even on heavy load from mains noise.

For details of the L.F. amplifier one is referred to the description of *The Wireless World* Exhibition V[1] or the Demonstration Receiver,[2] circuit arrangements which are strongly recommended, the former incorporating a breakjack for gramophone pick-up, one of the applications of this type of loud-speaker being its suitability for reproducing the electrically recorded records. The output transformer should, in this instance, be substituted with the usual choke feed arrangement, using a 32-henry choke with 4-mfd. condenser. The reader will be well rewarded in the results he will obtain for having employed a high-resistance coil winding in preference to the few-turn coil with step-down ratio output transformer.

On A.C. supply the magnet should be wound with No. 16 wire and connected to a Tungar or large type Phillips rectifier, bridged with a 6-volt accumulator. This arrangement gives no ripple. It may be considered advisable, also, to shunt the field winding with a non-inductive resistance of a value about ten times that of the coil to prevent rise of voltage when the circuit is broken.

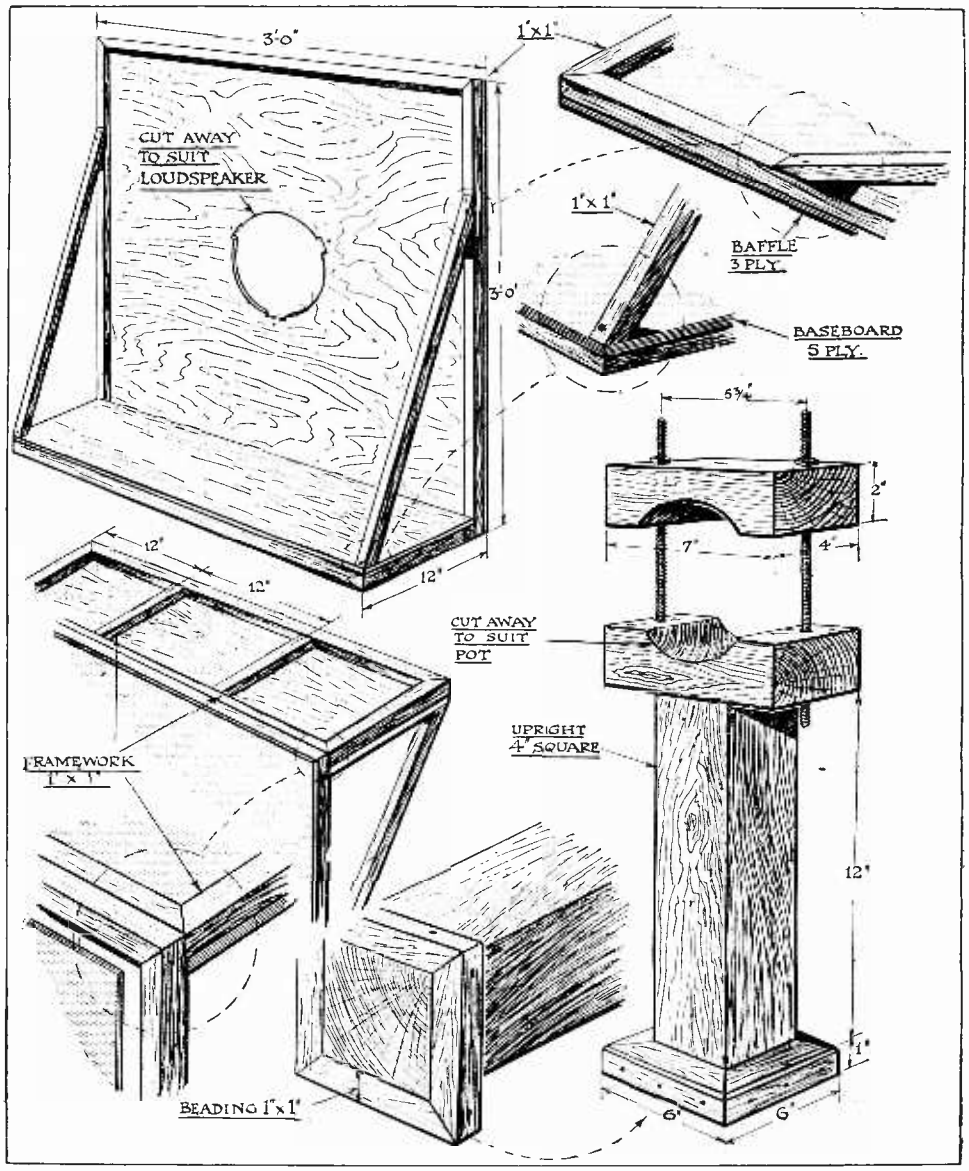
[1] *The Wireless World*, September 21st, 1927.
[2] *The Wireless World*, February 16th, 1927.

Coil Drive Loud-speaker.—

As the space occupied by the winding of the moving coil very slightly exceeds the length of the gap, the pole is left raised beyond the front of the cover. Fringing of the magnetic field is of little consequence, and the precaution of narrowing the pole behind the gap for the purpose of concentrating the field across the coil is scarcely worth while.

Full constructional details of the baffle board are given, the dimensions being the permissible minimum. In lieu of the large area baffle a cabinet is sometimes suggested to keep apart the sound waves emitted from each side of the diaphragm. Although more easy of accommodation, the danger of resonance occurring in the column of air enclosed by the box is introduced and may give rise to a peculiar box resonance.

The results obtainable with a coil-driven loud-speaker operating from a good amplifier are so vastly different from those produced by other means that it would be difficult to exaggerate the superior merit. The bowing of the strings of the double bass and the sound of the drum are heard with their true timbre. Loud signals are not overpowering, and speech can be followed with ease. Provided there is no condition existing in the transmission to falsify the effect, it would be difficult to distinguish between a studio programme delivered from the coil-driven loud-speaker and one from the actual concert platform.



Constructional details of baffle board and supporting column. Where space is available the baffle can with advantage be increased in size to 4ft. square.

London Electric Wire Co. and Smiths, Ltd., Playhouse Yard, Golden Lane, London, E.C.1. New 25-page catalogue of "Lewcos" radio products including new "Lewcos" coils, together with circuit diagrams for their correct use.

J. and J. Laker Co., Beckenham, Kent. Leaflet giving particulars of the "Laker" steel radio mast, the "Laker" bell insulator, and the "Laker" earth tube.

G. H. Hadley, Norwich Union Chambers, Congreve Street, Birmingham. Leaflet illustrating and describing "Seva" electric soldering irons.

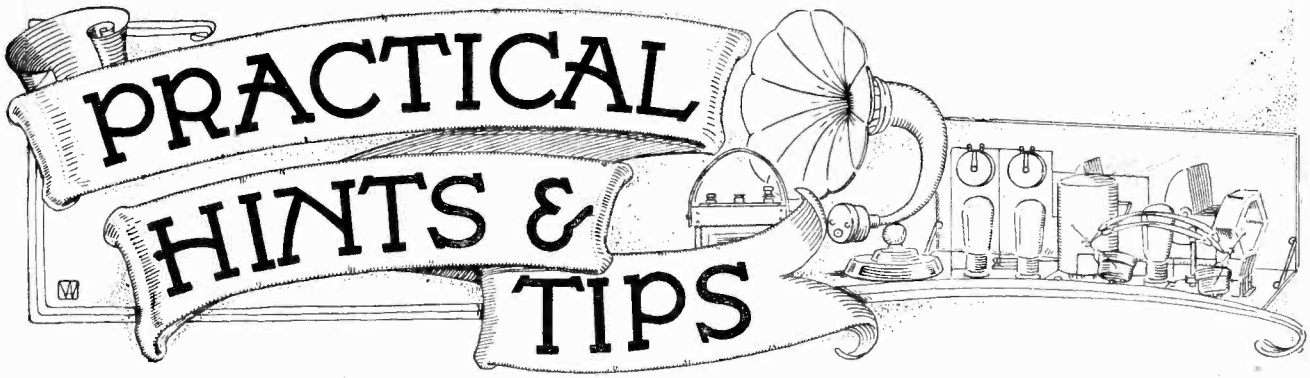
CATALOGUES RECEIVED.

Aneloy Products, 36, Hindmans Road, East Dulwich, S.E.22. Catalogue of "A.P." valves, including the 412 S.G. valve for screened grid H.F. amplification.

Garnett, Whiteley and Co., Ltd., "Lotus Works," Broadgreen Road, Liverpool. Illustrated list of "Lotus" wireless components, including remote control jacks, switches, plugs, and valve holders.

Burne-Jones and Co., Ltd., "Magnum House." 288, Borough High Street, London, S.E.1. 1928 catalogue of "Magnum" radio products, with constructional details of a new range of "Magnum" screened receivers.

Tungstone Accumulator Co., Ltd., St. Bride's House, Salisbury Square, E.C.4. 112-page booklet describing the "Tungstone" range of batteries.



A Section Devoted to the Assistance of the Beginner.

TRACING FAULTS.

IT has been noticed that many amateurs, when searching for elusive faults, show a tendency to place too much confidence in certain components. Either because they are new or the products of firms whose name is well known, the usual tests are not applied, and the source of the trouble may easily be missed. It should be realised that many pieces of wireless apparatus are fragile, and though all reputable manufacturers carry out exhaustive tests before dispatch, accidents can and do happen in transit or during assembly into the receiver. In this matter it is wise to reverse the principles of English law, and to consider every part as guilty until it is proved to be innocent.

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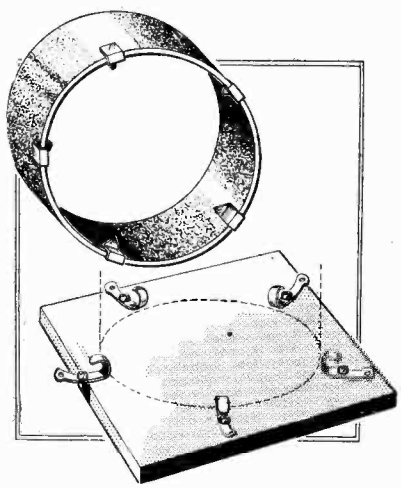
INTERCHANGEABLE H.F. TRANSFORMERS.

THE construction of the various plug-in high-frequency transformers described in recent issues is not altogether an easy matter for those who are without adequate workshop equipment, and under these circumstances many will be interested in an arrangement devised by a reader of this journal, Mr. W. A. Sloane, and illustrated on this page.

The former is a Paxolin cylinder, usually with a diameter of 3in. and a length of $3\frac{1}{2}$in. Ebonite tube, preferably with a wall of $\frac{1}{16}$in., could be used if desired. Round the lower edge are spaced a number of clips (five are generally required), made of copper or brass strip $\frac{3}{8}$in. wide and about $\frac{3}{4}$in long. These are bent over in such a way that they lie closely against the inner and outer surfaces of the former, to which they are firmly secured either by an 8 B.A. screw and nut or by a brass rivet. Whichever is used, the head should be countersunk, in order that there may be no projections which would prevent easy insertion of the finished coil into its holder. This latter is made from a rectangular sheet of ebonite some 4in. square, to which are screwed suitably spaced clips for engaging with the contacts on the transformer. These clips may be bent to shape from springy brass strips, or grid-leak clips, as obtainable from many dealers, may be used, as in the base illustrated.



Constructing interchangeable high-frequency transformers.

To prevent incorrect insertion, the contacts and clips may be spaced in an irregular manner, or, more simply, both transformer and base may carry a distinctive mark; these marks will coincide when in the correct position.

The windings will be as described in the various constructional articles. In the case of long-wave transformers it is sometimes recommended that the turns should be sectionalised; no great difficulty will be experienced in making and fitting ebonite strips having the required number of slots, although many will prefer to sacrifice a slight amount of amplification by using a simple single-layer winding of, say, No. 36 D.S.C. wire.

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SCREENED COILS.

WE have developed to such a stage in the technique of H.F. amplification at broadcast wavelengths that interstage screening has become a virtual necessity if more than one H.F. stage is being used.

The reason for this is that whereas an amplification equivalent to half the amplification factor of the old "R" valve—say, 4—was quite good a few years ago, an actual amplification of 40 per stage is not now uncommon with modern valves and Litz-wound H.F. transformers. Because of this greatly increased efficiency, small stray capacities which would once have passed unnoticed will now produce uncontrollable oscillation.

The neutralising condenser will correctly balance out true capacity strays between the grid and anode and their connections of any valve at any frequency within the tuning range of the receiver, but this condenser can be made to balance any stray magnetic coupling between the circuits at one frequency only. There are, in fact, quite a number of "neutrodyne" receivers in which the neutralising condenser has to be reset during the normal operation of the main tuning condensers.

To overcome this defect two main courses have been adopted, first to screen each coil by placing it in a copper or aluminium box, and secondly to screen each stage by placing valve, condenser, coil, etc., in a comparatively large copper box.

Of the two methods, the former suffers from the defect that in order to keep the coil screen to reasonable dimensions, it is made to enclose the coil fairly closely, which robs it of quite a large proportion of its inductance, since the screen tends to act as a short-circuited turn. This means that a coil which has to be screened will need more wire than a simple coil, which in turn means a greater H.F. resistance and reduced amplification.

When a box large enough to take the whole stage is constructed, the coil can be kept sufficiently far from any part of the metal sides as to be practically unaffected, thus retaining full efficiency.

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ALTERNATIVE PROGRAMMES.

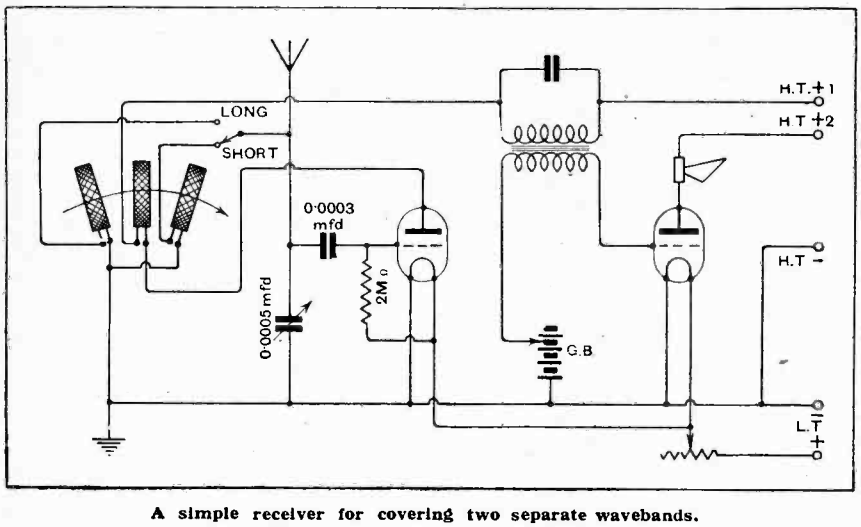
INTEREST in circuits, which permit of an easy change over from short to long waves, or *vice versa*, has been stimulated by the inauguration of the Daventry 491-metre transmitter, and it is considered that little excuse is necessary for repeating a few hints regarding what is probably the simplest arrangement of this kind.

The circuit diagram of the receiver suggested is given below, from which it will be seen that three coils are used. These are carried in an ordinary three-way holder, the centre one giving reaction control. The coils on the right and left are, respectively, the short and long wave aerial tuning inductances, which must, of course, be chosen with regard to aerial capacity, etc. Either of these may be thrown into circuit by operation of a single-pole change-over switch. At the same time, a readjustment of the tuning condenser, and also possibly of the reaction coupling, will be necessary.

The receiver, on examination, reveals itself as nothing more than the classical reacting detector arrangement, with directly coupled aerial, and thus it cannot be expected to have a high degree of selectivity. It may be slightly improved in this respect by inserting a fixed condenser of 0.0002 mfd. (or even less) in series with the aerial, although it is not put forward as a suitable circuit for those living in the immediate vicinity of a powerful broadcasting station. However, for many who are situated between two transmitters, it is perfectly adequate.

Those who have had any experience with sets depending mainly for their sensitivity or reaction effects will realise that the coil which functions most satisfactorily on the long waves is far too large for use on the normal broadcast waveband, so it will be obvious that a compromise must be made. This point is most easily decided by trial, and in most cases it will not present any very great difficulty; as a rule, maximum sensitivity will not be required on *both* long and short wavelengths.

When rendered necessary by reason of distance from the transmitter, or by the use of an indifferent aerial-earth system, an extra stage of low-frequency amplification may be added in the usual manner—in fact, excepting for the aerial and reaction circuit, it is possible to introduce a number of modifications and elaborations without sacrificing the advantages of an easy change-over. Incidentally, the operation of the set may be still further simplified (as a "two-station" receiver) by gradually removing turns from the coil requiring the highest tuning capacity until a similar condenser reading corresponds to each of the stations most generally received.



A simple receiver for covering two separate wavebands.

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IS NEUTRALISING WORTH WHILE?

THE steady increase in the efficiency of valves from the old "R" type bright emitter right down to the present-day "0.1 amp." series manufactured by most firms has brought with it a problem of its own, namely, that of obtaining stability.

Arrangements such as unneutralised tuned anode, inverse reflex circuits, and the like, used to be set up, and they would work quite well for those days.

When looking at the modern receiver with its complications of neutralising condensers, screens, Litz wire, etc., the thought sometimes comes to one as to whether the simple receivers of the good old days were better.

The answer is without a doubt an emphatic "No." The crux of the whole matter is that a modern receiver will do all and more than the very best of the older arrangements without resort to reaction, and as a result can be calibrated and relied upon to keep its "tune" indefinitely. There is really no excuse for distressing one's neighbours when searching for the most distant station.

Amateurs who have neither the time nor the resources to carry out careful experimental work on their own have only to follow good published designs to ensure results undreamed of a few years ago.

B 6

The Prospective Purchaser's Wanderings through Olympia Made Easy.

By N. P. VINCER-MINTER.

THE history of almost every invention which concerns itself with the entertainment of man has progressed along more or less the same thorny path of amazement, disillusionment, improvement, and commonplaceness.

The gramophone, the camera, the kinematograph, and the automobile each in its day has trodden this path which "Radio broadcasting" is treading to-day. Each of the inventions mentioned above has in its time burst suddenly upon the great public, who, ever seeking after some new thing, has readily assimilated it and paid extortionate prices for articles of doubtful value, for in each case as with wireless in 1922, the article has been presented to the public as a perfected production long before results warranted it. Who does not remember the early gramophone with its cacophonic tintinnabulations for which we readily paid high prices? Apart from its defect in fulfilling its intended function of a reproducer of music, it was not even pleasing to the eye. In reality it was not as an instrument of entertainment that the man in the street purchased it, nor indeed, was it sold as such, but as a scientific novelty which readily seized the imagination of the public. In a few months the glamour of novelty wore off, and the proud owners realised what a travesty of musical entertainment the instrument provided. The early motor car had a similar history, and passed also to the period of disillusionment in which only a few stalwarts comparable with the wireless experimenters of pre-broadcasting days carried on, and then gradually, as in the case of the gramophone, there came improvement not only in the instrument itself, but also in the attitude of mind adopted by manufacturers and vendors, who in the case of motor car and gramophone alike, realised that the general public were no longer interested in the function of clockwork or the complicated mechanism of an internal combustion engine, and accordingly commenced instead to sell a musical instrument and a reliable and simply controlled method of transport. The result is that now, with the exception of the comparative few, corresponding to the true wireless amateurs of to-day, who are interested in these things, the general public purchases its gramophones and cars almost solely on the score of appearance relative to the price demanded, performance, reliability, and ease of operation being taken for granted. Thus, a car purchaser is mainly guided in his choice by the price he can afford to pay. The more he pays the greater the comfort, the appearance, and the flexibility of his purchase. It is scarcely necessary, therefore, for the car purchaser to have any technical knowledge, or alternatively, to have a purely technical adviser with him when setting forth to the Motor Show at Olympia.

The Influence of Price.

This is not so, however, in the case of the man who sets out for Olympia a month earlier when the Wireless Exhibition is the centre of attraction. He cannot make his choice by the simple expedient of striking a balance between the depth of his pocket and the appearance of a receiver, for the wireless receiver has not yet reached the same stage as the gramophone and motor car, nor is it likely to do so in the present decade. It is still in the "improvement" stage. In the winter of 1922-1923 it passed hecticly through its initial stage of being a scientific novelty, when mechanical monstrosities emitting sounds reminiscent of a battalion of banshees sold in their thousands. By the summer of 1923 the novelty had passed, and only the real stalwarts struggled on until at the present time, although a long way from perfection, it is possible to purchase a receiver which can be classed as a simply controlled instrument without the subsequent necessity of joining the tail of the Carey Street queue. It is absolutely necessary, however, that before proceeding to Olympia a clear idea be had concerning the exact type of receiver it is desired to purchase. There are two things which will mainly influence our choice just as in the case

The Choice of a Receiver.—

of the motor car. One thing, namely, the price to be paid will be the same in both cases, but instead of considering the question of appearance, we must concern ourselves with the duties which a set will be required to perform, and then having decided this point it will be permissible for us to examine several sets of the type required, and see if we cannot find one housed in a cabinet suitable to our taste and our pocket. We will therefore proceed to consider what we want our receiver to do.

"Who does not remember the early gramophone with its cacophonic tintinnabulations?"

We will commence by exploding the old but firmly ingrained idea held by a great number of the non-technical public that provided one is prepared to pay a large enough price, a set can be secured which will receive any and all stations at will with perfect quality and freedom from interference. It just cannot be done, and those who have this desire as a *sine qua non* had better remain at home and order a gramophone. Receivers employing the "sine qua non" circuit will not be on sale this year, nor yet next.

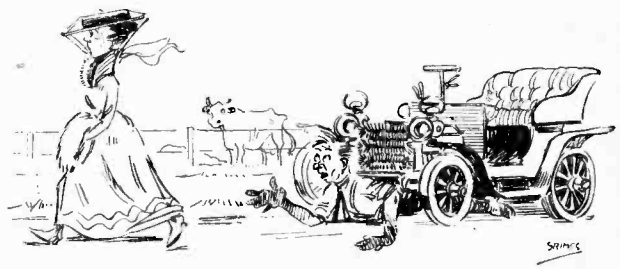
The man who wants to use telephones only on a large number of stations, is strongly advised to plump for a good single-valve regenerative receiver, as he need only use a 30-volt H.T. battery at the most, and consequently both initial outlay and upkeep costs will be low. In malicious or ignorant hands such a receiver is capable of widespread interference to neighbours, but since an "H.F." set put into similar hands is capable of equal devastation, we can at once short circuit the stock argument against the single-valve receiver.

A Complete Outfit for £8.

We now come to what is probably the most universal set in use to-day, and, moreover, one which is probably the most useful to have from the purely entertainment point of view, namely, the two- or three-valve receiver, consisting of a regenerative detector followed by either one or two stages of L.F. using a really good transformer. Without any "pushing" such a receiver will, under ordinary circumstances, to-day give really good reproduction from Daventry and the local station, and when conditions are reasonably good, other stations can be received. The set is thus peculiarly adapted to the average household which requires musical entertainment rather than caterwaulings from far Cathay. It is not particularly selective, but since those who really desire musical entertainment rather than distance will usually listen to the nearest station in any case, this will not be a disadvantage. A really well made receiver complete with loud-speaker, valves, and all accessories can now be obtained for less than £8, but it is still possible to pay much more and only obtain a relic of 1922. If possible arrange to have the receiver on trial, and do not be afraid, if necessary, to take advantage of the money-back-if-not-satisfied clause. Many manufacturers of inferior goods, wireless and otherwise, readily make use of this "bait," as they are well aware that owing to the curious psychological "stung again" attitude adopted by the general public, money back is rarely demanded.

When H.F. is Essential.

We must now consider the man who lives within reasonable distance of a broadcasting station, but owing to the impossibility of erecting an outside aerial would have to use a degree of reaction inconsistent with good quality reproduction if he made use of a regenerative type of receiver. For him there is no alternative but to purchase a receiver containing a stage of high-frequency amplification, and we have first, therefore, to settle what system of H.F. coupling it is necessary for him to employ. The simplest arrangement is resistance or choke coupling, but for broadcasting wavelengths both these systems are so hopelessly inefficient that they may at once be dismissed. There remains tuned anode or transformer coupling. Lest the phrase "transformer coupling" should conjure up visions of those little interchangeable barrel transformers, it should be said at once that such a coupling behaves in every respect as a tuned anode and may be treated as such. By transformer coupling is meant a type of intervalve coupling similar to that employed in a large number of receivers described from time to time in *The Wireless World*. Since such a form of coupling is readily interchangeable for different wavelengths, it would appear that almost the last disadvantage as compared with the relatively inefficient tuned anode has disappeared.



"No longer interested in the complicated mechanism."

This type of receiver used on the outdoor aerial will bring in quite a number of stations on the loud-speaker, although for really adequate volume a second stage of L.F. (preferably transformer coupled) will probably be needed. It may safely be said that a four-valve set consisting of one really efficient H.F. stage and two L.F. stages will provide all that is needed in the way of loud-speaker results from both British and Continental stations, whilst in the matter of American reception on the broadcast wavelengths, it will stand as much chance, when conditions are good, as will a far more ambitious instrument. Moreover, such an instrument used in conjunction with a frame aerial will bring in all that is worth while hearing from a musical point of view, and is, therefore,

The Choice of a Receiver.—

the ideal instrument for the flat dweller. It is also probably the nearest approach to the ideal circuit for the average portable receiver. The considerations of the advantages obtainable from a really good four-valve receiver prompt one to ask whether any advantage is to be gained whatever by using more than one H.F. stage.

From the point of view of the ordinary member of the public, "two H.F." receivers have three main advantages

"Money back is rarely demanded."

over the "one H.F." instrument. In the first place the extra H.F. stage enables a greater degree of selectivity to be obtained, which is vitally important to the man living within a five-mile radius of a local station. Secondly, it enables the flat dweller who is limited to a frame or a small indoor aerial to receive stations of equal distance to those obtainable with a four-valve receiver working on an ordinary aerial. Thirdly, it is possible by using two stages of H.F. to arrange for a small degree of amplification per stage and so secure more certain stability and still obtain a greater aggregate amplification than is obtainable with one H.F. stage working at maximum sensitivity. It must not be forgotten, however, that when passing from one to two H.F. stages we are in many cases buying a "wireless set" rather than solely a simply controlled instrument of musical entertainment. It would be well, therefore, before making a purchase to decide whether we wish to acquire our pleasure from listening to music or from the manipulation of a wireless receiver. With regard to the third advantage of a "two H.F." set which we have mentioned above, it might be of interest to point out that nearly all the American manufacturers have adopted this system solely for the purpose of rendering their instruments essentially foolproof in that no adjustment of neutralising condenser is necessary, and the instrument, therefore, can be sold all ready for work much in the manner of a gramophone.

The Advantages of the Supersonic Heterodyne.

The man with plenty of money to spend who desires to get the last ounce of thrill from the possession of a wireless receiver will find himself adequately catered for by means of receivers employing eight valves or more, housed in expensive cabinets. Such instruments may either employ a straight "H.F." circuit, using three or even four stages of H.F. in conjunction with a small frame aerial or the supersonic heterodyne circuit may be employed. Whichever form of coupling is used sensitivity and selectivity will be of a high order, enabling the user to pick and choose among the stations of Europe. As has already been pointed out, however, no matter how much money he spends, he cannot purchase complete freedom from interference, and mush, and the main advantage he gains is that he can have a receiver in which all such devices as aerial and batteries are completely hidden in an expensive piece of furniture. A by no means small portion of the money he pays will find its way into the pockets of the furniture rather than the wireless set designer. From the strictly wireless point of view, the main advantage gained is long range with extreme simplicity of operation, since by using a very large number of "H.F." stages each designed to give individually only a limited amount of sensitivity and selectivity, but a large overall efficiency in these respects, it is not impossible to get down to real one knob control. This is in distinct contrast to the case of a small "one H.F." set where any attempt to use one-knob control means that efficiency must be sacrificed in the interests of simplicity of control, the designer being unable to use a large number of valves to make up that loss of efficiency in an "H.F." stage which is insuperably bound up with one-knob control.

Horn or Hornless.

Having chosen our receiver we shall naturally turn our attention to those stands displaying loud-speakers. Now in one sense the choosing of a loud-speaker is not so difficult as one might at first suppose when viewing the myriad types which flood the market, for loud-speakers can, broadly speaking, be divided into three main classes: the horn type, the diaphragm type, and the moving coil type. Speaking very broadly, it may be said that these three types give better reproduction and cost more money according to the order in which we have placed them above. This is not so in every case, as there is more than one make of horn type instrument which is preferable to many of the diaphragm or so-called cone types, but undoubtedly in time the horn, at least in its present form, will disappear altogether. When purchasing a hornless

"And here we have a combined bed and wireless set."

loud-speaker make sure that the horn has not merely disappeared into a box as in the case of the gramophone. Many gramophones are sold as hornless, but in actual fact such articles are almost non-existent. When buying a diaphragm loud-speaker it must be remembered that such instruments may be obtained with the diaphragm naked and unashamed, which is, as a general rule, all to the good from the reproduction point of view, or, on the other hand, it may be obtained housed in a cabinet. When choosing a loud-speaker of this type, therefore, it is just as well to make sure that no horn is concealed in the cabinet. This must not be taken as indicating that the

The Choice of a Receiver.—

concealed horn type of instrument is undesirable. On the contrary, many of these give really excellent results, and in such cases it will almost invariably be found that its makers will boldly indicate that it is a horn type instrument, and make no attempt by means of a diplomatic silence to sell it under false pretences.

"And now turned our attention to stands displaying loud-speakers."

Having purchased the set and loud-speaker we now only need batteries or battery eliminators to complete our outfit, for naturally valves will have been decided upon by taking the advice of the manufacturers of the particular set which has been chosen. At the present day the design of H.T. battery eliminators, both in the case of D.C. and A.C., has been brought to a fine art, and the eliminator of to-day bears no more resemblance to the product of five years ago than does the receiver or the loud-speaker. There is really only one important point to remember when purchasing a battery eliminator, and that is to see that it is of a type which will deliver adequate power, for if this point is neglected, and the eliminator has not an adequate reserve of power, the only result will be a horrible hum. The cause of more than half the disappointments experienced with eliminators to-day is inadequate output. When purchasing, therefore, make sure that the eliminator will provide enough power for the particular set which you have chosen. Those who have mains in their house have the full choice between dry batteries, H.T. accumulators, and eliminators as their source of H.T., and they would do well to at once discard the idea of dry batteries. In deciding between batteries and eliminators a good rule to bear in mind is this: If a broadcast receiver has been purchased with the main idea of musical entertainment, it is best to buy an eliminator to suit the receiver. If, however, the main idea is wireless experimenting, and more especially if short wave reception is to loom large in the scheme of things, a *good* H.T. accumulator and a *good* H.T. battery charger will be the better proposition. In the case of those with no mains, experience teaches that large size dry batteries of a first-class make will, taking everything into consideration, require less attention than H.T. accumulators.

In conclusion, it may be said that the complete novice would do well to have the personal guidance of a knowledgeable friend before he embarks on the by no means simple task of choosing apparatus which will give him real entertainment and pleasure without the necessity of having to constantly "get out and get under" as in the case of the early motor car. Let him be sure, however, that his friend does really know what he is talking about. So many *expert* friends have, when put to the test, proved to be only whited sepulchres.

Northern Societies in Conference.

All the radio societies in the counties of Northumberland and Durham were represented at the annual general meeting of the Northumberland and Durham Group of Radio Associations held at Sunderland on September 17th. The treasurer presented the balance-sheet, which showed that the Group is in a healthy financial position, despite having gone through much tumultuous water during the last year. The retiring officers were unanimously re-elected.

It was decided to retain the title and maintain the unity of the Group despite the geographical position of some of the societies in the North. Two interesting future events include a lecture by an engineer from the Ferranti Co. and a description by Mr. W. R. Pape, of Newcastle, of the apparatus used by Mr. Baird in his experiments in noctovision and television at the British Association meeting in Leeds.

The next meeting of the Group will be held at Durham on December 10th. The hon. secretary is Mr. R. E. Fabian, 5, Egremont Drive, Gateshead.

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Hackney and District Radio Society.

The Hackney and District Radio Society will open its winter session on October 3rd at the Hackney Electricity Halls, Lower Clapton Road, E.5. A lantern lecture will be given by the Dubilier Condenser Co., Ltd.

Hon. Secretary is Mr. George E. Sandy, 48, Melrose Avenue, S.W.19.

NEWS FROM THE CLUBS.

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The Elimination of Red Tape.

That too many rules and attendant red tape did not contribute to the success of any radio society was the view expressed by Mr. J. E. Nickless, A.I.E.E., 2KT, President of the Ilford and District Radio Society at the annual general meeting on Thursday, September 15th During the winter, said the President, the club would meet for the exchange of experiences, for experiments and social purposes.

It was proposed that necessary steps be taken to renew the use of the wo transmitting licences 2OV and 2OT. It is hoped that one of these stations will operate on short waves. The treasurer reported that accounts had been successfully balanced. Mr. Largen has been elected treasurer, while the post of hon. secretary will be filled by Mr. H. H. Carr, 39, Lynford Gardens, Goodmayes. The next meeting of the Society will be held to-morrow (Thursday) at the Wesleyan Institute, Ilford, at 8 p.m., when Mr. Collinson will demonstrate a new five-valve screened coil set not yet on the market.

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Milan with a Crystal.

Mr. H. O. Crisp, of the Ilford and District Radio Society, has succeeded in picking up signals from the new 8 kW. water-cooled Marconi transmitter at Milan on a crystal set, this having been accomplished on the night of September 14th. The set employed loose coupling without amplification. On the same set Langenberg has been received at strength R9 without interference from 5GB.

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TRADE NOTE.

New Radio Showrooms.

Messrs. Hook and Willis, Ltd., of 74, Goding Street, Vauxhall, London, S.E.11, agents for several important manufacturers of electrical and radio specialities, have taken new offices and showrooms at 29, Ely Place, Holborn, E.C.1, where all future communications should be addressed.

CURRENT TOPICS

News of the Week —in Brief Review

LET THEM ALL COME!

An American has computed that the world now contains 18,000,000 radio receiving sets, and he assumes that the number of listeners totals 90,000,000. No wonder the National Radio Exhibition is a success!

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HONOUR TO WHOM . . .

Thanks to the radiophotograph, says a writer, it is possible for a new Paris hat or costume to be worn in New York 24 hours after it has been designed. And thanks also, he should have added, to the husband.

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A HARDY ANNUAL.

As usual, the present epidemic of wet weather has brought forth the suggestion that meteorological conditions are being affected by the extended use of wireless. But there was no wireless when Shakespeare wrote: "The rain, it raineth every day"!

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UP-TO-DATE BRISTOL.

A radio exhibition, a series of public meetings, and a special broadcast programme by Bristoleans, are promised features of the forthcoming "Bristol Wireless Week," to take place during October.

Bristol's example might well be followed by other important cities throughout the country.

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SCHOOL WIRELESS: A GENEROUS GIFT.

The Merioneth County School governors have accepted the generous offer of Sir Walford Davies to provide suitable wireless receivers to allow pupils to take weekly broadcast lessons. One-third of the cost will be provided by Sir Walford Davies's fund, which will be controlled by the National Council of Music.

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ELECTRICAL COMMISSION VISITS MUSSOLINI.

The delegates of the International Electro-technical Commission, which has been holding strenuous conferences at Bellagio, were entertained by Signor Mussolini, the Italian Premier, on their recent visit to Rome. The Commission is engaged on, among other things, the preparation of an international vocabulary of electrical terms.

A COINCIDENCE?

On the very day he was summoned for possessing an unlicensed wireless set, Ernest Eley, of Dagenham, took out a licence. He was fined 40s. and 4s. costs at Stratford last week.

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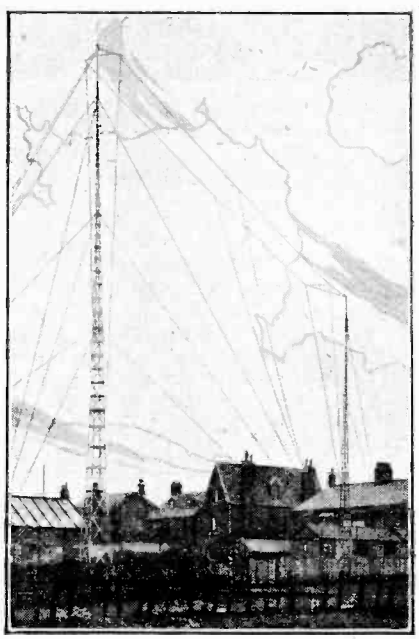
PCJJ TO RELAY DAVENTRY.

We understand that the famous Eindhoven short-wave station, PCJJ, will undertake a special 30.2-metre relay intended for South Africa on October 6th when the B.B.C. broadcasts from Daventry a description of the bantam-weight boxing match at the Albert Hall between Teddie Baldock and Willie Smith. The fight will have a special interest for South Africans, as Smith has been the amateur bantam-weight champion of South Africa. It is expected that the transmission will be re-broadcast in Cape Town and Johannesburg.



SOMETHING LIKE AN AERIAL! The aerial system of 6ZP, an amateur transmitting station owned by Mr. Geo. Pailin, of Audenshaw, near Manchester. The mast in the foreground is 90 ft. high, while the other is 70 ft.

MESSAGES BY THE INCH.

"The transmission of pictures across the Atlantic has been so successful that within a year facsimiles of messages will be sent at so much a square inch, or so much a page."—General James G. Harboard, President of the Radio Corporation of America.

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ENTHUSIASM IN SWEDEN.

Sweden is evincing a growing enthusiasm for wireless, an increase of 4,000 in the number of licensed listeners being registered during August. According to a correspondent, there are now 303,338 licences issued, which means that every twentieth Swede has his wireless set. The new high-power station at Motala is credited with having increased public interest in broadcasting.

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QUELLING NOISY LOUD-SPEAKERS.

Municipal authority has exerted itself in West Ham, where the Town Council, with the assent of the Home Office, are to adopt a by-law against noisy loud-speakers. The provisions of the by-law will forbid persons "operating or causing or suffering to be operated any wireless loud-speaker or gramophone in such a manner as to cause annoyance to or disturbance of occupants or inmates of any premises or passengers."

Provision is made for fines not exceeding £5.

The Council's action has been taken under a section of the Municipal Corporation's Act of 1882, and is not directed against loud-speakers in private houses.

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UNAUTHORISED TRANSMITTER FINED.

The owner of an illicit transmitter, run to earth by the Post Office engineers at Swinton, Lancashire, was fined 4 guineas at the Eccles police-court last week.

The defendant, William Lucas, 24, manager of a wireless shop, admitted that he radiated messages last year with the call sign "5OB" and this year with the call sign "2EZ." He told the magistrates that he was carried away by his enthusiasm for experiments and that he had not committed the offence for personal gain.

The prosecuting counsel said that the conduct of Lucas came to the notice of

the authorities last year, but before the Department could locate the sender the transmissions ceased.

In imposing the fine, the Bench ordered the confiscation of the defendant's transmitting apparatus, comprising a microphone and tuning inductance.

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BRITISH REPRESENTATIVES AT WASHINGTON.

Senatore Marconi and the Rt. Hon. F. G. Kellaway, P.C., managing director of Marconi's Wireless Telegraph Co., Ltd., will represent the Marconi Companies' interests at the World Radio Telegraph Conference which will open at Washington on October 4th to consider amendments to the international regulations that have become necessary by the development of wireless since the International Radio Telegraph Convention was signed in London in 1912.

The British Broadcasting Corporation will be represented by Captain P. P. Eckersley.

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SHORT-WAVE TELEPHONY IN COAL MINES.

Wireless telephony experiments at a depth below the ground approaching 2,000ft. are to be conducted by Mr. Keith Murray, a Calcutta amateur, in the coal mines owned by Messrs. Macneill & Co. According to the *Times of India*, the object of the tests will be to improve the existing methods of communication between the various workshops, pumping stations, and other central points underground. The wavelengths used will be 30 metres and another wave, not yet decided, between 1 and 6 metres. The latter has been specially licensed by the Government. It is considered likely that signals, although intended for underground communication, may be picked up at considerable distances on the surface.

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ROYAL COMMISSION CRITICISES AUSTRALIAN WIRELESS.

The Royal Commission appointed by the Commonwealth Government to enquire into the control and development of wireless severely criticises Amalgamated Wireless (Australasia), Ltd., which claims to hold many patents embracing all branches of wireless communication, says the Melbourne correspondent of *The Times*.

The Commission says that the company's demands for royalties are based on the principle that it is entitled to obtain from the public whatever it can get. Not only has it made excessive demands on wireless dealers, but it has sought to impose oppressive and unfair conditions. It is of the first importance that the Commonwealth Government should see that the validity of its patents is established immediately.

If the company fails to make the suggested reductions in the charges for patents and broadcast transmitters, the Commission urges that the Commonwealth Government, after ascertaining that the patents are valid, should purchase all the privately held shares in the company and so acquire complete control.

THE BEAM TO BOMBAY. A scene at the G.P.O., London, showing the reception of messages via the Indian beam service. The receiving station in this country is at Skegness.

"WIRELESS WORLD" SETS.

In addition to those on our Stand at Olympia, a number of "Wireless World" Sets are now on view for the benefit of readers at 116, Fleet Street, E.C.4, from 10 to 6 daily.

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BURNDEPT "ALL-BATTERY" ELIMINATOR.

We regret a slight error which occurred in the announcement of Messrs. Burndept, Ltd., on p. 9 of the advertisements in our last issue. The "All-Battery" Eliminator, for A.C. only, takes 100/250 volts, and not 100/125 volts, as stated.

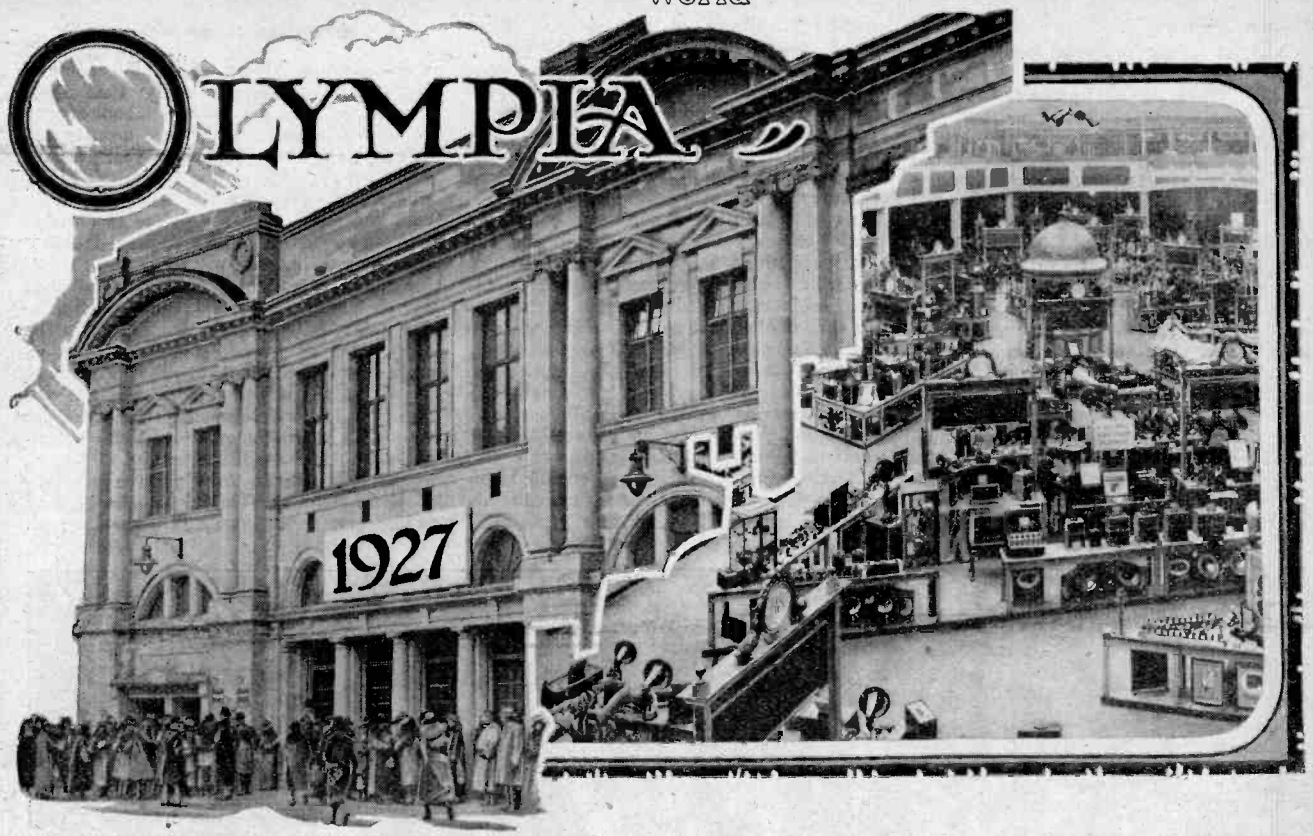
WIRELESS IN FICTION.

"On the Air,"[1] as its title implies, is an American book. In it the author has been bold enough to offer us eighteen short stories all taking radio as their theme. This serious limitation—for restriction to even the wide gamut which wireless gives is a limitation—has not lessened the author's resourcefulness or his enthusiasm.

The atmosphere is indubitably romantic. It is non-technical. The purport of each tale will be grasped by the veriest tyro. There are no concessions to the technically-minded. But despite these omissions the author has a trick of gripping the reader even when the said reader knows that this sort of thick sentiment is not quite his line. One of the best tales concerns an unreclaimed soul who, surrounded by "DXA tubes" and no end of miscellaneous apparatus, spends his days and nights in quest of the *rara hookuppa*, "that Utopian arrangement which would reach to the earth's dim corners and bring in Alaska, Hawaii, London, Paris, Lima." His wife goes nearly mad with loneliness, but is saved by the arrival of a timely consolation. "It wasn't as Cora's father had feared, half human and the other half heterodyne, but a normal little boy baby, weight nine pounds and a quarter." As might be expected, the baby does the trick, and father finds that the new "loud-speaker" is as interesting as the old.

In a few places the author's style approaches that of O. Henry, than which no higher praise can be bestowed on a modern American fictionist. E. C. T.

[1] "On the Air," by Paul D. Augsburg, pp. 274. London: D. Appleton and Co., 34, Bedford Street, Covent Garden, W.C.2. Price 7s. 6d. net.



The Annual Dinner of the Radio Manufacturers' Association.—Lord Birkenhead on the Opportunities of Broadcasting.—Sir Edward M. Iliffe, M.P., on the Importance of Good Reception.—The Aims of the Exhibition.—Stand to Stand Report.

THE wireless season opened on September 22nd with the annual dinner of the Radio Manufacturers' Association, which was held at the Hotel Victoria, with the president of the association, Sir William Bull, M.P., in the chair.

Opportunities of Broadcasting.

The toast of the "Radio Industry and Success to the Exhibition" was proposed by Lord Birkenhead, who emphasised the importance of broadcasting and the enormous influence which it was within its power to wield—he hoped for the good of the public. Very nearly one household in every three in England was listening. Even in the United States, which so obviously defeated us in almost everything, statistics showed that only one household in seven there owned a receiving set. The transmitting side of broadcasting in this country, he said, had reached a standard of remarkable efficiency, but there was still room for improvement in many types of receivers, as the receiving elements were still of varying efficiency. He felt that if the great industry of broadcasting was to carry through adequately the chances and opportunities which lay before it, it was essential that everyone should concentrate on perfecting the technique of the receiving instrument. He was old enough to remember the time when no man could drive a motor car in the streets unless a corpulent pedestrian with a red flag walked in front. We might, indeed, draw some consolation from that fact when impatience was shown at the attitude of authority in relation to what was unquestionably the most amazing development of modern times. No great statesman in the past, before modern Press developments, ever enjoyed the opportunities of making the acquaintance of his fellow-countrymen which broadcasting might one day afford. The certainty and directness of contact which broadcasting provided even exceeded the enormous influence of the modern Press. He looked forward to the time when the honest statesman who had an honest message to deliver and an honest creed to teach, if it could be made public by means of broadcasting, would not only himself succeed—which mattered little—but would carry this country and the Empire to success—which mattered much.

Controversial Broadcasts.

Capt. Ian Fraser, M.P., who gave the toast of the British Broadcasting Corporation, outlined some of the very definite indications of progress which had been made since the British Broadcasting Company became a Corporation. The news service had improved and we now had eye-witnesses' accounts of national events. He made a special plea for more latitude to be given to the Corporation by the Government, with more freedom to use their discretion on the question of controversial broadcasting. He believed that controversial matter would do much to enliven the programmes.

B.B.C. and Set Manufacture.

Sir Edward M. Iliffe, M.P., who responded to the toast to the guests, expressed the view that the British Broadcasting Corporation had shown a disposition to utilise its privileged position in such a way as to safeguard as far as possible the interests of the various industries upon which its activities could be said to encroach. In referring to this question of competition with other interests, he expressed his satisfaction at the statement published recently by the Chief Engineer of the B.B.C., indicating that the Corporation did not intend at any time to embark upon the trade of manufacturing and selling wireless receiving apparatus. He thought that the trade owed a debt of gratitude to the B.B.C. for making that position clear.

He hesitated to endorse the policy of the B.B.C. of holding up an Empire Broadcasting Service until nearly perfect results could be assured because he felt

Olympia, 1927.—

that by so doing progress would be retarded.

The Handicap of Obsolete Sets.

The greatest handicap of efficient reception and satisfaction with the broadcasting service was, he felt, due to the fact that so many of the receivers in use at the present time were out of date and did not compare with the more perfect sets of to-day. It would be greatly to the advantage of the trade and broadcasting generally if possessors of old sets could be induced to throw them away and invest in new ones. One of the reasons why old sets were not discarded was that a royalty of 12s. 6d. per valve-holder had been paid on the sets and this royalty, as things stood at present, would have to be paid again when a new set was purchased. He believed that it would be to the commercial advantage of the company which collects these royalties if the wireless licensee could be induced to discard his obsolete set with greater frequency and purchase a new one. He therefore made the suggestion that it might well be a good business proposition for that company to give a rebate on the royalty when a new set was purchased and the old one dismantled. A kind of crematorium for old receiving sets might be organised, where they could be secretly buried and a ticket given which would entitle the owner to a rebate on the royalty of his new set.

In conclusion, he paid a tribute to the B.B.C. and to Sir John Reith, the Chief Executive Officer of the Corporation, and emphasised that the continued success of the wireless industry was bound up with the success of the broadcasting organisation.

Opening of the Exhibition.

No ceremony marked the opening of the National Radio Exhibition on Saturday, September 24th, but the enormous attendance as soon as the doors were opened proved how important a factor in public life broadcasting has now become and indicated the undoubted value, from an educational as well as from the commercial point of view, of this and similar exhibitions. The principal annual shows at Olympia have many features in common and deal with problems of which, perhaps, those connected with the Ideal Home Exhibition and the National Radio Exhibition are most akin. Both of these shows are designed to attract and interest the layman as well as the technical expert and manufacturer, and in the design of either broadcast receivers or labour-saving devices the same three classes of user must be considered—the average citizen, the super-intelligent, and those who have little or no scientific or mechanical knowledge.

The design of a receiver or a labour-saving device for use by a person of average intelligence offers no very great difficulty, as the manufacturer may reasonably assume that such a purchaser will read the directions given and will take some trouble to understand the purpose and proper working of the various components. In catering for those whose intelligence does not run in the direction of any scientific or mechanical ability the problem is slightly more difficult, but such persons may generally be relied on to read the directions, and eventually, after some trial and error, to acquire a working knowledge of the proper uses and functions of the apparatus. It is perhaps in dealing with those who suffer from "superiority complex" that the greatest difficulty is encountered, for they are too elevated to study any directions and almost invariably blame either the manufacturer or the apparatus when they fail to obtain the desired results; in other words, apparatus designed for their use must actually be made "super-fool-proof"!

Education of the Public.

Broadcast receivers have now become so much a household necessity that their comparison with the general labour-saving devices to which we are now accustomed in our homes becomes every year less incongruous. We have heard of a good lady whose enthusiasm for lightening the daily task of her servants was so keenly aroused at one of the first "Ideal Home" exhibitions that she placed a large order for useful "gadgets," only to find that her cook and parlourmaid gave notice the day after their arrival. Similarly, in the early days of broadcasting the raucous-voiced loud-speakers and other somewhat primitive apparatus introduced into the house by the wireless enthusiast were not welcomed with joy and gratitude by unscientific members of his family. Thanks, however, largely to the educative influence of these popular exhibitions, the general public now appreciates and demands both the labour-saving devices which have become almost essential to modern domestic comfort and an efficient wireless receiver which can reproduce speech and music from a choice of stations with good volume and purity of tone. Manufacturers are therefore reaping the benefit of their early efforts and overcoming the inherent conservatism and passive resistance of those unable to realise the many obstacles to be surmounted in the introduction of any new contrivance, and those who, in their impatience, expect immediate perfection without considering the necessity for experiment and gradual development.

This year's Exhibition demonstrates in a marked manner the great advance along the path towards the achievement of the ideal receiver which will not only satisfy the needs of the expert, but at the same time be proof against mishandling by the novice, for the general trend is towards simplicity of control and maintenance.

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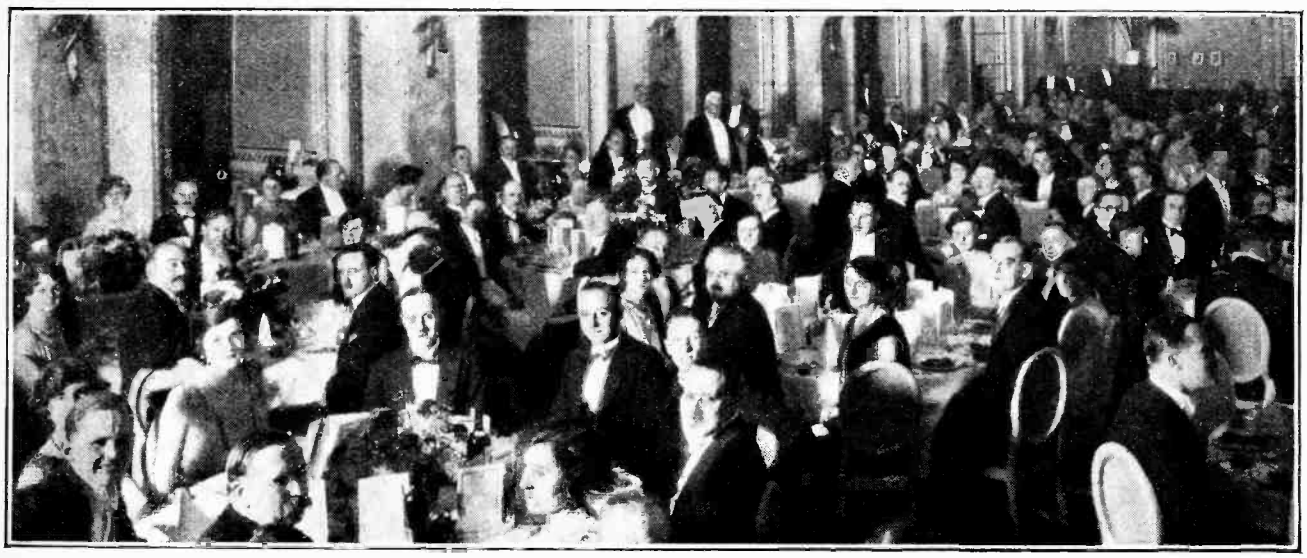
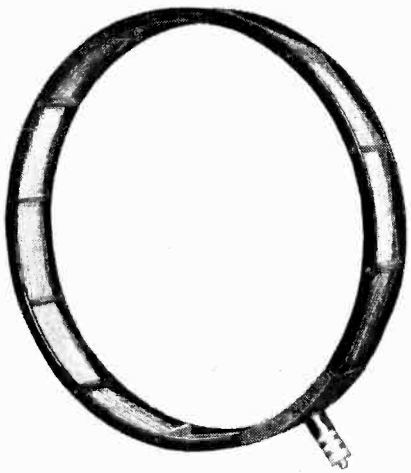


The Annual Dinner of the Radio Manufacturers' Association held in connection with the opening of the Wireless Exhibition.

Stand to Stand Report.—

(27 & 159) A.J.S.

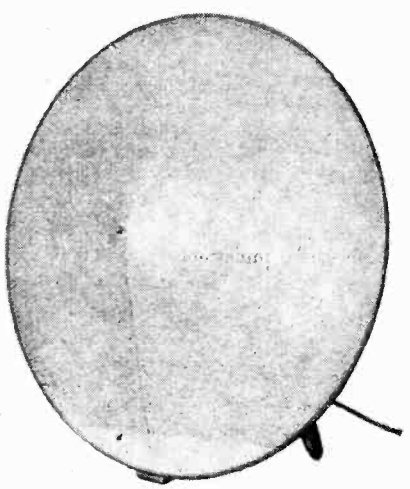
Circular Frame Aerial.—Owing to rapid advances made lately in high-frequency amplification, it is safe to predict that the frame aerial will have a greater sphere of usefulness than heretofore. The A.J.S. frame consists of two hoops of the same diameter joined together by a number of ebonite strips in which



A.J.S. Circular Frame Aerial with provision for earthing the centre point.

saw cuts hold the turns of wire apart. Frames are provided for short and long waves and a supporting circular wooden boss to attach the frame to a wooden base is provided with three flush concentric metal rings which pick up contact with each end of the winding and with the centre point which is earthed.

Cone Reproducers.—The A.J.S. Company have decided to abandon the word loud-speaker and substitute 'reproducer" as being more indicative of the true function of this latest type. An enclosed model cone reproducer sells at £3 10s., while a less pretentious open model is sold at the moderate figure of £1 15s.



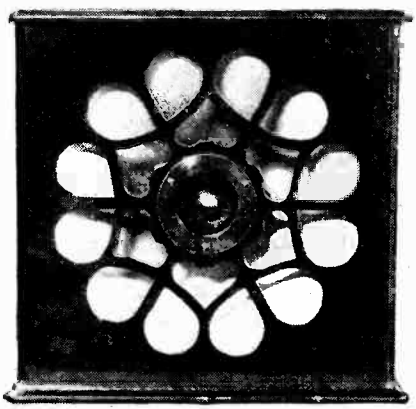
A.J.S. Cone Loud-speaker.

Symphony Portable Five Receiver.—As the H.F. valves and the detector are usually a source of microphonic trouble, it is interesting to note that in this portable receiver the valves used are made by the Six-Sixty company and have double walls between which is a vacuum. The H.F. stages are aperiodic and choke-coupled, while two transformers couple the L.F. valves. The only tuning control is across the frame, while volume is controlled by a variable condenser working on the Reinartz principle. A key switch changes over from short to long waves, and provision is made for attaching an outside aerial and earth if greater range is required. For those to whom a capital outlay of £22 10s. for this receiver does not appeal, the hire purchase system can be arranged.

A. J. Stevens and Co. (1914), *Ltd., Walsall Street, Wolverhampton.*

(202) ADVANCE.

The leading feature is a completely self-contained set housed in a remarkably attractive cabinet. This receiver is



Amplion Cabinet Loud-speaker type A.C.4.

known as the "Advance" Super 3. The instrument is intended to be carried from room to room as desired, although, of course, provided that some method of transport is available there is no reason why it should not be taken out into the country in the summer time. A diaphragm type of loud-speaker is built into the set, and it is claimed that, using its internal frame aerial, good loud-speaker volume can be obtained within twenty-five miles of the local station. At the price of 18 guineas this instrument should have a very wide appeal.

City and General Radio Co., Ltd., 79, *Cannon Street, London, E.C.4.*

(137) AMPLION.

A cone type loud-speaker at a popular price is a feature of the Amplion exhibit. The Junior cone, model A.C.1, sells at £2 12s. 6d., and takes the form of a cone diaphragm, with apex outwards, mounted in a well-finished metal rim and fitted with a hinged piece so that it can either stand vertically or hang from a picture rail. The overall diameter is nearly 15in.

The Junior cabinet, model A.C.4, in either oak or mahogany, is also a newcomer to the Amplion cone range. For a low-priced loud-speaker the cabinet is particularly well polished, and the removal of sharp corners on the cabinet work, although minor, is a noteworthy point. Mottled Bakelite mounting, harmonising in colour with the woodwork, supports the moving coil and gives a cen-

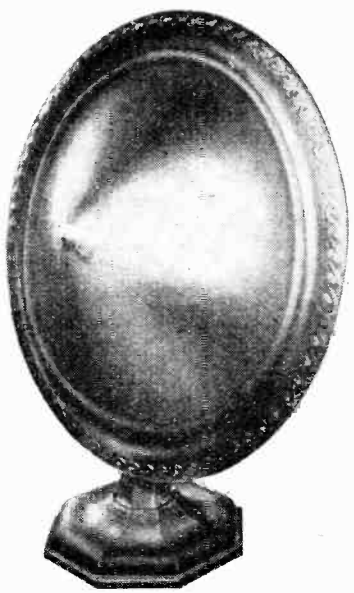
Jacobean Amplion Model A.C.7.

tral adjustment. This model is priced at £4.

Amateurs will appreciate the production at a popular price of cone assemblies for fitting to portable and cabinet receivers. A good feature is the inclusion of a mahogany or oak grill with the cone, which is available in 10in. or 12in. diameter.

The two large type cabinet loud-speakers recently introduced were inspected. The Jacobean oak model A.C.7 is 15½in. in height, the cone being fitted with apex to the back.

Differing only in appearance is a Chippendale model, A.C.9, housed in a well-made cabinet, the mark of quality being



The new open type Amplion Cone A.C.3.

Stand to Stand Report.—

good polishing. Its grille is circular and harmonises with the Chippendale design.

Horn type and Radiolux Amplions form a large part of the exhibit.

Visitors are recommended to call at Amplion House in Hammersmith Road, adjoining the exhibition, where arrangements have been made to demonstrate the various models.

"The Persian King," an example of Andia Loud-speaker construction.

Graham Amplion, Ltd., 25-26, *Savile Row, Regent Street, London, W.*

(126) ANDIA.

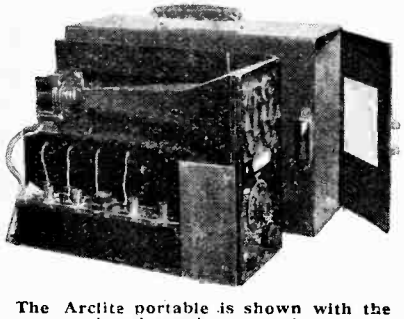
This stand is probably more pleasing to the eye than any other at the Exhibition, and goes to show that wireless apparatus, and in particular loud-speakers, need not necessarily be surrounded with the severe atmosphere to which we have become accustomed.

Unless one were definitely told so, it would be difficult to believe that the artistic porcelain figures and ornaments are indeed loud-speakers.

Artandia, Ltd., 38, *Bedford Street, Strand, London, W.C.2.*

(248) ARCLITE.

It is often contended that a portable receiver designed for use outdoors can be used in the home with equal facility, but it cannot be denied that a proper permanent cabinet type of instrument has a more attractive appearance for use indoors. Messrs. Arclite, Ltd., get over this difficulty by a special design of their portable receiver. The whole of the receiver, including batteries and loud-speaker, can be withdrawn from the leather carrying case and inserted in a special home type cabinet which is provided. The home cabinet can be obtained in various woods, such as oak, mahogany, etc. When the receiver is used in the house an ordinary external loud-speaker may be used if desired.



The Arclite portable is shown with the interior unit removed.

Another interesting feature is a remote control unit and jack, which should prove popular amongst those who are contemplating the installation of a permanent house wiring system.

Arclite, Ltd., 54, *Theobald's Road, London, W.C.1.*

(83) ATLAS.

Tapped Plug-in Coils.—The well-known Atlas coils are now produced with centre tappings for use in neutralised circuits. For use in auto-coupled aerial circuits, Reinartz circuits, etc., a double-tapped coil can be obtained.

Resistance Capacity Coupler.—For use in conjunction with valves having a high impedance and high amplification factor, a coupler with interchangeable components is now on the market. The price is 7s. 6d.

Neutro-four Receiver.—In this 4-valve set (1-v-2), special attention has been paid to the neutralised H.F. transformer coupling. The primary is wound laterally to the secondary, and swinging coil reaction is arranged inside the Pirtoid former. The H.F transformer and an aerial coupling coil also wound on Pirtoid can be purchased as separate units.

Those wishing to dispense with H.T. and L.T. batteries would be well advised to examine the very comprehensive range of D.C. and A.C. battery eliminators exhibited.

H. Clarke and Co. (M/c), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

(38) AUTOMATIC COIL WINDER.

"Slektun" coils are on show at this stand and are being sold at reduced prices during Exhibition week as an advertisement. The coils are of the multi-layer type with ebonite spacers, and the turns in each layer are air-spaced.

Mechanically minded visitors will find much to interest them in an automatic coil-winding machine, and the experimenters in an interesting testing instrument (the "Avometer") indicating voltage current and resistance.

The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Rochester Row, London, S.W.1.

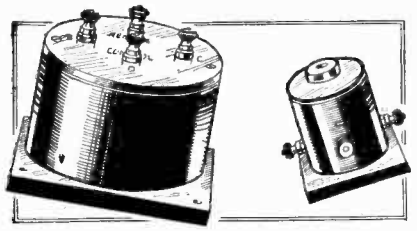
(237) AUTO SUNDRIES.

A large number of high-class receivers were exhibited which were of the self-contained type. The R.S.N. dual frame aerial and loud-speaker were of particular interest. One of the most interesting receivers was the R.S.N.5, which is fitted with both an internal and an external frame aerial, the former being for use on the local station and the latter, of course, for receiving more distant stations. Everything, with the exception of batteries, has a twelve months' guarantee.

Auto Sundries, Ltd., 10*a*, *Lower Grosvenor Place, London, S.W.1.*

(100) B.S.A.

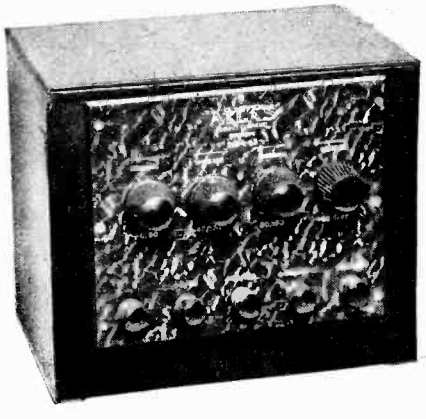
"Kone" Loud-speakers.—The model 36 D has a 36in. diameter diaphragm and is eminently suitable for use in large halls and for the reproduction of dance music where great volume is required. This model is fitted with a special pedestal, but is made also with an attachment to enable the speaker to be fixed in an elevated position on either a picture rail or other suitable ledge. The price of the stand model is £18 2s. 6d., and the hanging model £16.



The Arclite remote control unit.

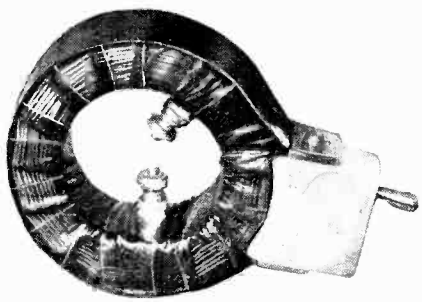
4-Valve Receiver.—A new 4-valve receiver, consisting of a detector valve followed by three low-frequency amplifying valves, the last two of which operate on the push-pull principle. This set is fitted with the B.S.A. patent coil tuning assembly, and a switch enables a quick change from short to long wave to be achieved. Volume and quality are the two outstanding features of this receiver, and the best results are obtained when the receiver is used in conjunction with the large 36in. "Kone" loud-speaker.

8-valve Superheterodyne Receiver.—This receiver, as its title implies, functions on the well-known superheterodyne principle, and embodies a separate oscillator, first detector valve, an intermediate amplifier, a second detector valve, and a low-frequency amplifier functioning on the push-pull principle. To change from short



Atlas D.C. Eliminator. Note the provision for a number of H.T. tappings.

Stand to Stand Report.—
to long waves it is necessary to replace the frame aerial by one suitably wound to cover the wavelengths required, but the oscillator circuit can be changed over by means of a switch. All component parts of the receiver are attached to the

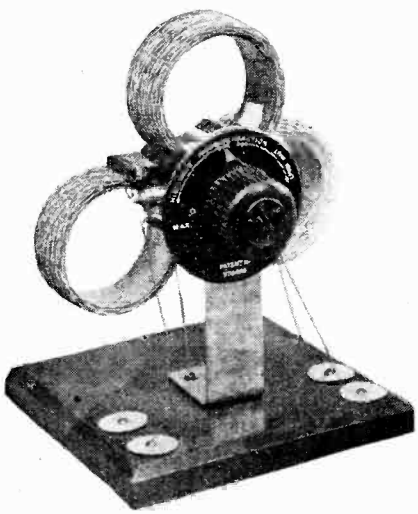


Atlas Double-tapped Plug-in Coil, useful for auto-coupled aerial or Reinartz circuits.

baseboard, the case being merely a shell which can be removed by loosening a few screws, leaving all parts *in situ*. The set can be operated in this condition and any adjustments required carried out, after which the case can be replaced.

Coil Unit.—This patent coil unit is fitted to all B.S.A. receivers, and carries three specially-wound low self-capacity coils. An extension rod enables the long- or short-wave coils to be brought into operation.

B.S.A. Radio, Ltd., Sparkbrook, Birmingham.



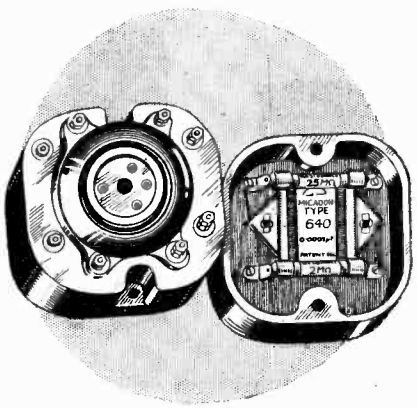
B.S.A. three-coil Tuner Unit for panel mounting

(138/139) B.T.H.

Anti-microphonic Valve Holder.—The valve mount is supported on absorbent rubber and not on metallic springs, a method which effectively prevents audio-frequency vibrations reaching the valve. Moreover, the form of construction employed avoids the prolonging of vibrations or the setting up of periodic swing.

Resistance-capacity Unit.—Selling at 10s. 6d. the unit embodies anode resistance, coupling condenser and grid leak resistance, access being obtained to the resistance mountings from the under-side. Like the B.T.H. valve holder, it is constructed of special moulded insulating material, red in colour, and is fitted with an anti-microphonic rubber support for the valve. A booklet describes the method of using the unit, and recommends the use of the B8 valve.

The Resistor Receiver.—A new home receiver has been introduced, employing a detector valve with capacity reaction, followed by two resistance-coupled L.F. stages using the B.T.H. resistance coupling unit. The two-wave ranges are readily obtained by a plunger switch action, and the tuning condenser is fitted with vernier control. The aerial is auto-coupled to the tuned closed circuit, three tapping points being provided to regulate the aerial load, and to compensate for differences in aerial dimensions. The high grade cabinet merits special comment, and harmonises with the vertical front panel made of hard insulating

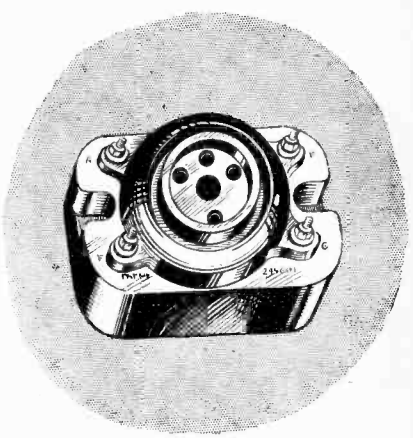


B.T.H. resistance capacity coupling unit incorporating a rubber-supported valve holder.

material with a mahogany vernier on the outer face. Two-volt valves are recommended in the sequence, B8, B8, B23, filament control only being provided in the case of the detector valve. Instead of terminals, the more convenient method of using a cable is adopted. Exclusive of valves, batteries and royalties, the set sells for £8. Although slight modification of wave range results from altering the aerial tapping, a wave band of 250 to 2,000 metres is covered with the aid of the change wave switch.

Rice-Kellogg Loud-speaker.—As was the case last year, the B.T.H. still carries on the exclusive manufacture of the moving coil loud-speaker. For use with either A.C. or D.C. supply the unit incorporates the output amplifier as well as the mains equipment giving the necessary high anode voltage exceeding 400, while grid bias is also obtained from the mains. The electro-magnet is of large diameter, the pole being about $1\frac{5}{8}$in. across. A supple centring device holds the coil in position, and the diaphragm is about 6in. in diameter. Plunger-operated contacts break all current supply circuits by the act of removing the unit from its attractive containing cabinet.

New B.T.H. Valves.—For use with resistance coupling units, the B.8 valve has recently made its appearance. Requiring a filament voltage of 1.8 to 2.8 and passing a current at minimum potential of 0.12 amperes, an amplification of 50 is obtained with an impedance of 180,000

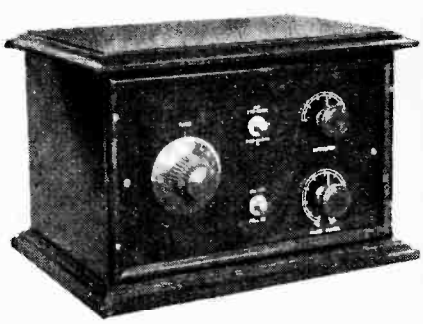


B.T.H. anti-microphonic valve holder. A rubber cushion support is provided.

ohms. Of considerable importance is the new B.12, a super power valve which is likely to become popular owing to the increasing interest in moving coil type loud-speakers. It requires the unusual filament voltage of 7.5, conveniently obtained if the amplifier is mains-operated and passes a current of 1.2 amperes. A super power rectifying valve is the new R.H.1 suitable for a maximum D.C. load of 65 mA, working with an A.C. anode potential of 550 volts R.M.S.

Screened Valves.—Now being shown to the public for the first time, are the new B.T.H. screened valves. They differ considerably from other types which have just become available, being fitted with a 1-volt filament passing 0.1 ampere, no doubt admirably suited for H.F. work, while they are capped to stand vertically in a standard valve holder, the additional connection being made at the top Of particular interest to the home constructor is a four-valve set of compact design, and enclosed in a metal container, the H.F. stage employing the B.T.H. screened valve.

British Thomson-Houston Co., Ltd., (138-139), *Crown House, Aldwych, W.C.2.*

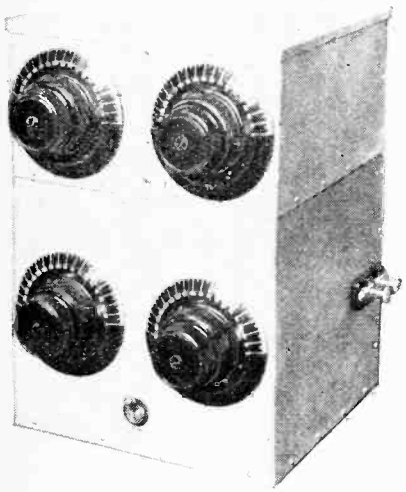


The new B.T.H. three-valve receiver.

Stand to Stand Report.—

(119) BAKELITE.

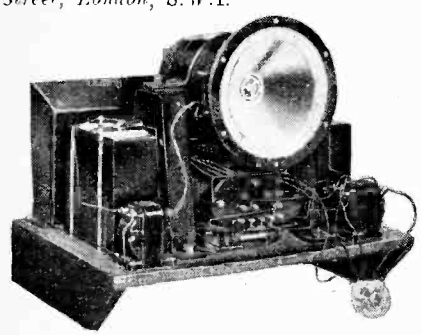
An interesting exhibit showing the number of uses to which Bakelite may be put in the construction of wireless apparatus. We are all familiar with its applications to such purposes as the making of knobs, small and large mouldings, coil shrouds, terminal strips, etc., but other less known uses such as for impregnation purposes and lacquering are not so well known. An "All-Bakelite" receiver is shown.



B.T.H. Screened Valve Set for the home constructor.

Laminated panels, made of Bakelised paper, are produced in a number of colourings, some of which closely imitate woods such as mahogany and walnut. They are of extremely pleasing appearance, and it is claimed that they do not deteriorate with age. Mechanical strength is excellent. The exhibit is not strictly confined to wireless products, and visitors will be interested in other applications of this substance.

Damard Lacquer Co., 68, *Victoria Street, London, S.W.1.*



Rectifier and Amplifier unit combined with the R.K. moving coil Loud-speaker which can be inspected at the B.T.H. stand.

(100 & 102) BECO.

The Beco "Junior" and "Rose Bowl" are already widely known, and the Beco movement is to be found in many of the portable sets at the show.

An addition to the range of exhibits this year is the "Popular" cabinet model, which sells at 47s. 6d. and is of neat and attractive appearance.

Other interesting types are the "Portable" and the "Cabinet de Luxe."

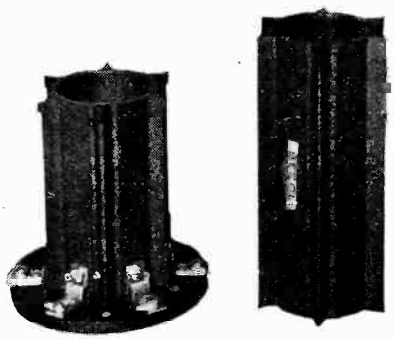
British Electrical Sales Organisation, Alexandra Works, Brentview Road, Hendon.

(76) BECOL.

Ebonite Panels.—Ebonite panels cut to standard sizes with matt, polished or mahogany finish are shown in a variety of sizes; every panel is guaranteed against surface leakage.

Tapped Former.—A six-ribbed former with six spring contacts provides a means for the constructor to wind various coils to his own requirements. A base is provided with six complementary contacts and by means of a slot and pin it is impossible to insert a coil making a wrong contact.

All formers produced by this Company now have flat surfaces between the ribs, so that should it be required to attach a right-angle bracket this need not be made to conform to a curve as was necessary heretofore.



Becol six-tapped Ebonite Coil Former.

British Ebonite Co., Ltd., Nightingale Road, Hanwell, W.7.

(207) BELLING-LEE.

In addition to the well-known type "M" ebonite shrouded terminal with non-revolving top a new type terminal of attractive design is being shown. This terminal sells at 3½d., and is intended to take the place of the type "M" when expense is a consideration in designing a receiver. It will be appreciated that this reduction in price as compared with the more expensive type will mean a by no means negligible saving in a multi-valve set where a large number of terminals are used. The type "B" terminal is in evidence, and also dial indicators, sub-connectors, and air-spaced aerial wire.

Belling and Lee, Ltd., Queensway Works, Ponders End, Middlesex.

(79) BENJAMIN.

Earthing Device.—The earthing device for a receiver is probably the most neglected component; interest will therefore be taken in a well-designed flexible copper earthing strip, consisting of two long pieces of stout copper tape interlaced at right angles and giving a maximum surface exposure of over 100 square inches. Connection is made by soldering preferably a stout stranded conductor to one end of the device, and coke or cinders are packed tightly around it to hold moisture before the soil is replaced. The price is 5s. 9d.

Battery Switch.—This push-pull switch, made essentially for breaking L.T. circuits, has a good positive "on" and "off" action, and is designed for panel mounting. The price has been reduced to 1s.

Self-contained Rheostat.—This rheostat is designed with the resistance element

Benjamin Copper-strip Earthing Device, exposing over 100 square inches of surface.

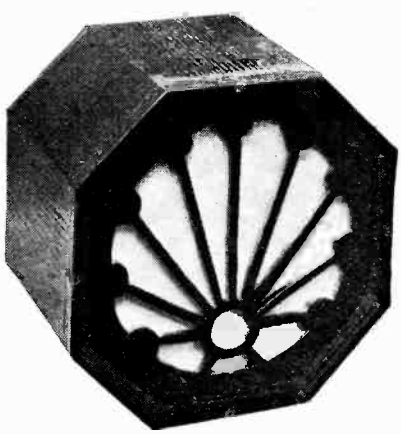
and moving contact within the body of the knob and dial, so that when panel-mounted there is practically no projection inside the receiver. For portable sets where space is confined this should be a valuable feature. The knob is of large dimensions, and a scale is provided on the dial so that settings can be repeated. Three sizes are manufactured, viz., 6, 15 and 30 ohms, and the price of each is 2s. 9d.

The Benjamin anti-microphonic valve-holder, so well known to amateurs, has been reduced to 2s.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

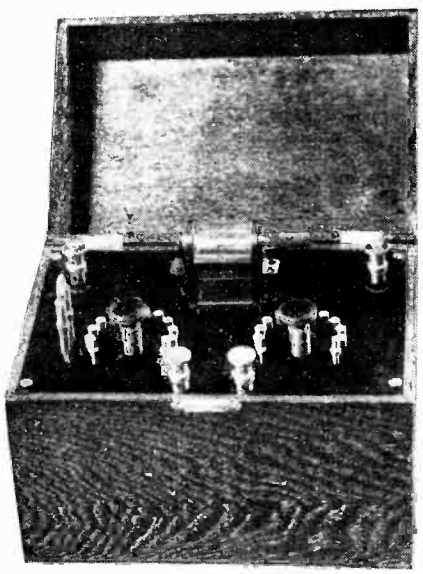
(205) BOWERMAN.

Cabinet loud-speakers of very pleasing appearance are shown on this stand. These instruments are rather smaller and more compact than the usual cabinet loud-speaker, but, although selling at a competitive price, it is claimed that by means of special design the output obtainable, from the point of view of quality and volume, rivals that of instruments of a similar type selling at 5 guineas. Another interesting feature shown is a



The Bowerman Cabinet Loud-speaker presents a very pleasing appearance.

Stand to Stand Report.—



The Bowerman Crystal Set.

crystal set, and it was gratifying to note that, although comparatively few of these were seen in the exhibition, the model shown was of superior design, both from the technical and the appearance point of view.

In addition, telephones at the extremely low price of 12s. 6d. were available. From the brief examination which we were able to make it would appear that no sacrifice has been made from the point of view of technical design.

C. Bowerman, 10 and 12, Ludgate Hill, London, E.C.4.

The Bowyer-Lowe H.F. Choke.

(124) BOWYER-LOWE.

The Bowyer-Lowe Co., Ltd., are equally well known as manufacturers of components and designers of complete receivers, and their stand this year bears witness to this versatility, for there are kits of parts for superheterodyne and short-wave sets and many components of new design.

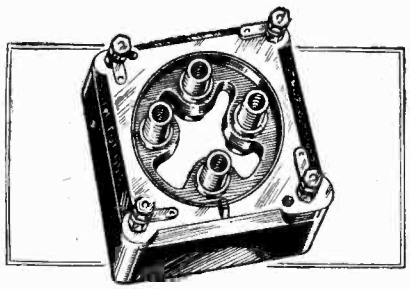
Short-wave Sets.—Two models tuning from 20 to 200 metres are available with two and three valves respectively, and the receivers may be purchased complete or may be built up by the constructor from sets of parts.

The design shows careful thought, particularly in the arrangement of tuning condensers, which are spaced away from the front panel and operated by ebonite rods to reduce hand-capacity effects. The main tuning condenser is built in two halves set at an angle of 180°, and by connecting these in series a very low minimum is obtained, while both sets of fixed plates may be joined to "live" points in the circuit.

There is a big demand for these sets overseas and special coil formers, etc., have been developed for use under tropical conditions.

Wavemeters.—The Mark I is a buzzer wavemeter for 150-600 metres, and can also be used as a wave trap.

The Mark II covers a wave range of 150 to 2,000 metres, and is buzzer-excited.

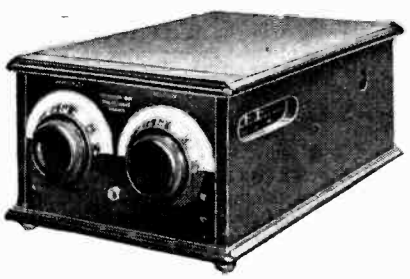


Bowyer-Lowe "Whiteline" Spring Valve Holder.

It can also be used as an absorption wavemeter for checking transmitters, resonance being indicated by a lamp.

Components.—Among the many useful components on this stand the following should receive special attention. The "Whiteline" valve holder, of greater mechanical strength than its predecessor the well-known "Antipong," but retains many of its excellent electrical properties, "Two Speed" dial and station recorder manufactured under Burndept licence, "Universal" H.F. choke, sectionalised and with graduated diameter, inductance 50 millihenries, semi-variable filament resistors with calibrated scale on base, L.F. transformers and chokes, of liberal design and neat appearance.

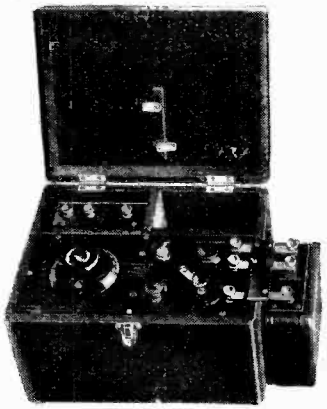
The Bowyer-Lowe Co., Ltd., Radio Works, Letchworth, Herts.



The Bowyer-Lowe two-valve short-wave receiver, a duplicate of which was presented by the R.M.A. to Mr. Goddard, of Sandown, the first visitor to enter the Exhibition.

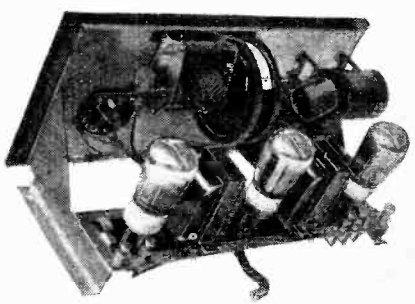
(161) BRANDES.

III—A Receiver.—Selling at the popular price of £6 15s. (excluding royalties), this three-valve set undoubtedly gives good value. Behind the wooden front panel of the polished oak cabinet is a metal screen, to which points of low potential are connected to minimise hand-capacity effects. The circuit follows well-tried practice, and consists of a detector



Bowyer-Lowe Mark II. Buzzer Wavemeter for wavelengths between 150 and 2,000 metres.

valve followed by two L.F. valves coupled by Brandes transformers. Swinging-coil reaction is so arranged that on turning the panel-reaction control clockwise the coil approaches the long-wave inductance, and when turned anti-clockwise it approaches the short-wave coil. The volume control consists of a switch which cuts out one L.F. stage at will, but it is arranged that the last power valve always feeds the loud-speaker, a point in design which militates against overloading. Two knurled circular discs placed edgewise to the front panel provide



Brandes III.—A Receiver. Note the thumb-drive condenser control.

thumb-drives for direct and vernier condenser controls respectively: this is a very convenient means of tuning, and is to be found on many sets this year. There are three alternative aerial connections, one wired to the grid of the first valve and the other two through 0.0003 and 0.0001 mfd. condensers to increase selectivity.

Ellipticon Loud-speaker.—Among the popular loud-speakers shown, this is one of the most elaborate, consisting of a cone housed within a polished wooden cabinet with artistic grille in front; its

Stand to Stand Report.—

design is such that it harmonises with the furniture in a drawing room as there is little external evidence that it is an electrical instrument.

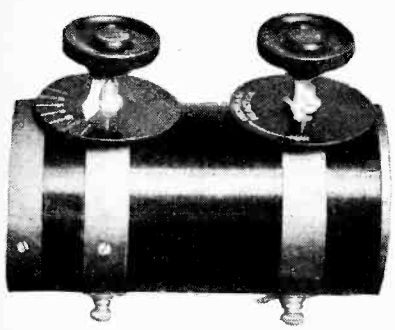
S.L.F. Condensers.—Condensers with a smooth 20 to 1 friction reduction gearing are made in values of 0.0003 and 0.0005 mfd., and are priced respectively at 15s. and 15s. 6d.

Brandes, Ltd., 2 and 3, Norfolk Street, W.C.2.

Brandes Ellipticon Loud-speaker.

(111) BRITISH GENERAL.

Aerial Tuning Unit.—A good specimen of the popular tapped aerial tuning unit is produced by this firm. It is arranged for easy mounting on a panel; two holes pass the spindles for an inductance selector switch and reaction control. It is noticed that the reaction coil is wound with extremely fine wire, and the damping



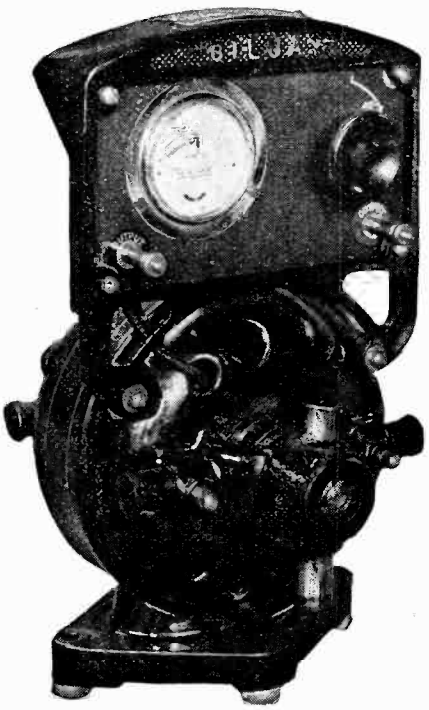
British General All Wave Tuner.

introduced will make for easier and better control of regeneration over the wide tuning range covered.

All-wave Three-valve Receiver.—A detector-L.F. combination incorporating the tuner mentioned above. The apparatus is mounted in an attractive cabinet having a sloping panel, at the side of which are compartments for H.T., L.T., and grid batteries. As the latter has a voltage of 16½, it is assumed that the use of a super-power valve in the output stage is envisaged.

Other products of this firm are L.F. transformers with highly polished screening cases, L.F. chokes, and a choke coupling unit.

British General Mfg. Co., Ltd., Brockley Works, Brockley, S.E.4.



Giljay D.C. Charger. This provides an economical means of charging L.T. accumulators from D.C. mains. (Brown Bros.)

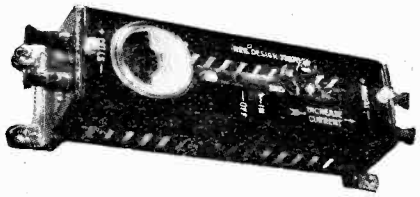
(59) BRITISH RADIO CORPORATION.

For revolutionary technical developments the calibrated semi-fixed tuning receiver is an outstanding example. Lever switches throw various stations on to the loud-speaker, yet the circuit changes are not effected by the more obvious methods of sacrificing efficiency. The design has involved the development of intricate mechanical devices, while careful attention has been paid to the electrical requirements of the circuits. Particularly does the receiver shown represent an achievement when it is realised that the H.F. stages employ the new screened valves. Further reference, giving more detailed information, will be made later to this set, which is of outstanding interest, in the pages of this journal.

British Radio Corporation, Ltd., Elm Grove Road, Weybridge, Surrey.

(25 & 26) BROWN BROS.

D.C. Rotary Converter.—The charging of an L.T. accumulator from D.C. lighting mains has always presented a difficulty owing to the fact that as much as 95 per cent. of the energy taken from the mains is absorbed in heating the resistance which has to be interposed to reduce the current. Amateurs who use their D.C. lighting mains for L.T. accumulator charging might well compare, say, two years' cost of this method with the first cost and running expenses of a good rotary converter, such as the £5 17s. 6d. D.C. model "Giljay," which consumes under 100 watts and delivers a maximum of four amperes at nine volts. The machine is built on sound lines and has ample plain bearing surfaces with large greasers; an ammeter in series with the accumulator



G.E.C. H.T. Accumulator Charger for D.C. mains. A milliammeteris provided to indicate the charging rate. (Brown Bros.)

indicates the charging rate, which can be controlled by a variable resistance in the field circuit. A great advantage in using this machine is the short time required to charge an accumulator, since the full charging rate as given by the manufacturers can be utilised.

H.T. Accumulator Charger for D.C. Mains.—The G.E.C. high-tension battery charger, shown by Brown Bros., consists of a suitable length of resistance wire wound on a former of ample dimensions to dissipate heat, and is provided with a rubbing contact so that a variable output up to 250 mA can be obtained. The resistance element is housed in a robust metal container and the charging rate is indicated by a milliammeter.

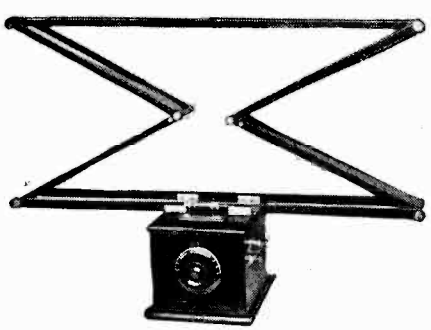
An excellent range of eliminators manufactured by well-known concerns can be seen on this stand.

Brown Bros., Ltd., 20, Great Eastern Street, E.C.2.

(122) BROWN.

The range of horn type loud-speakers and also the world-famous type of headphones remain practically unchanged, and there is a wide selection on view on the stand. There are, however, two important additions to the series of "diaphragm" type loud-speakers.

"Mascot" and "Universal" Loud-speakers.—While retaining all the acoustic qualities of the "Disc" loud-speaker, these two types are mounted in cases



The Brown Crystaframe Receiver, showing collapsible frame aerial.

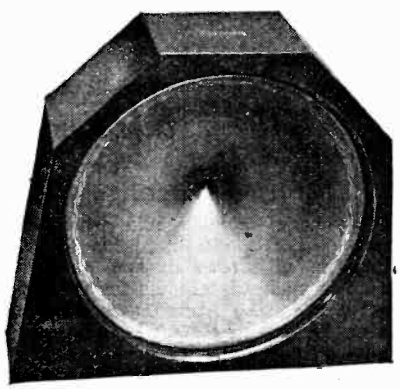
Stand to Stand Report.—

of different design, and are consequently sold at lower prices. The "Universal" is contained in a polished mahogany case, and the diaphragm is protected by an openwork metal front, the price being £6. The "Mascot," in a less expensive cabinet without front, costs £4 10s.

C.T.S. Constructors' Unit.—This is an inexpensive loud-speaker unit (13s. 6d.), which can be used as a gramophone attachment or converted into a table or cone type loud-speaker with the aid of a set of accessories supplied by the manufacturers for the modest sum of 2s. 6d.

Electrical Gramophone Pick-up.—The "Brown" pick-up incorporates many of the principles which made the "A" type telephone so successful, and has been designed with a view to reducing noise due to scratch. It is an excellent example of "Brown" instrument making, and the price is £4. Adaptors are supplied which enable the pick-up to be fitted to British or Continental gramophones.

There are also on view on this stand public address amplifiers, microphones



The Brown Mascot Loud-speaker.

and loud-speakers, and an interesting range of valveless receivers, including a crystal set working off a frame aerial.

S. G. Brown, Ltd., Western Avenue, North Acton, London, W.3.

(145) BROWNIE.

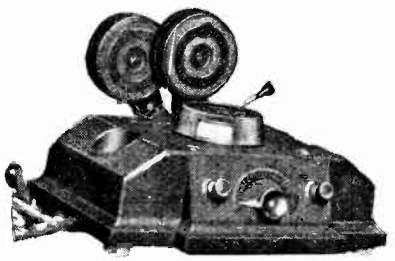
Styled "a valve set for the million" the two-valve Brownie receiver represents extraordinary value. Selling at £2 10s. complete with coils, but plus the price of valves and Marconi royalty, it is a thoroughly robust set, of good appearance and sound technical design. Its circuit is the typical two-valve arrangement, using coupled plug-in coils of durable construction having carefully arranged air spaced windings. There is a tuning condenser with attractive indicating scale. The set is in the form of a large moulding in good black material, possessing a matt surface comparable with sand-blast ebonite. No screw leads are to be seen. Connection to H.T., L.T. and grid batteries is made by a coloured multi-wire cable.

Brownie Wireless Co. of Great Britain, Ltd., Nelson Street Works, Mornington Crescent, London, N.W.1.

(152) BULLPHONE.

Copper Cone Loud-speaker.—The NC2 is an interesting model finished in oxydised copper and incorporates the well-known Bullphone movement. The overall dimensions of this speaker are 17in. high by 14½in. wide, and has very little depth so that it can be easily accommodated on a shelf or other support where no great depth is available.

A New Cone Unit.—This is the model



An inexpensive two-valve Receiver on the Brownie stand. The novel form of condenser scale is of interest.

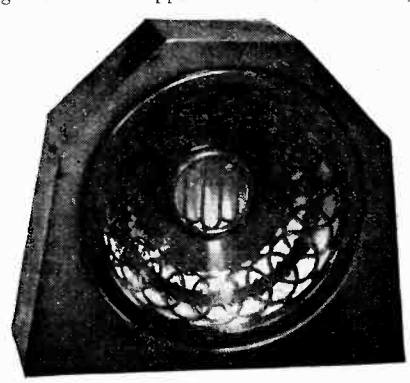
NC3, and is intended to be used in conjunction with home-constructed cones. The descriptive leaflet supplies the necessary informaton to enable the constructor to make up a diaphragm from stout paper or other suitable material.

Wm. Bullin, 38, Holywell Lane, Great Eastern Street, London, E.C.2.

(127) BURNDEPT.

An atmosphere of soundness and real worth surrounds the array of exhibits on the Burndept stand. Designed by an active research department, constructed with the best materials and components, and finished to present a neat and businesslike appearance, it is not surprising to find them surrounded by people of discriminating taste.

Short-wave Receiver (Mark IV).—A compact instrument of high-class construction designed for headphone and loud-speaker reception and covering a wave band of 12 to 100 metres. Eight special wound, plug-in coils are used to cover these wavelengths and fit into sockets in a compartment behind the front panel. This compartment also contains the valves, the rest of the receiver being covered in by partitions. This not only gives a clean appearance to the interior,



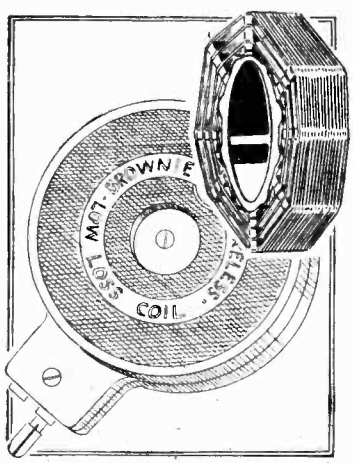
The Brown Universal Loud-speaker.

but excludes dust from the variable condensers, etc.—an important precaution in short-wave work.

There are three valves, a regenerative detector, resistance-coupled L.F. amplifier and transformer-coupled output valve. In the amplifier, attention has been paid to quality of reproduction—an important point if short waves are eventually to become the medium for world-wide broadcasting—and it is claimed that the frequency response is practically uniform from 80 to 5,000 cycles. This is in no sense a freak receiver, and is just as easy to handle as one designed for ordinary broadcast wavelengths since particular attention has been paid to stability and freedom from hand-capacity effects.

Broadcast Receivers.—These remain substantially the same as last year when they were rightly regarded as of advanced design, particularly in respect to the amplifier couplings and output to the loud-speaker. This amplifier gave exceptional quality for a commercially produced instrument. This year the prices are considerably reduced, and the sets represent very good value for money having regard to the high standard which the manufacturers have set for themselves.

There are two- and three-valve sets for



Tuning Coil used with the Brownie Receiver showing the air-spaced winding.

high-quality loud-speaker reception of the more powerful B.B.C. stations at Daventry and other stations close at hand, the Ethophone-Four for long-distance reception, the Ethodyne seven-valve superheterodyne and other types including a robust portable using five valves.

"All Battery" Eliminator.—Among the numerous mains units this instrument is by far the most interesting. It is designed to function on A.C. mains of any voltage from 100 to 250 with frequencies of 40 to 100 cycles, and not only supplies L.T. current at 6 volts and H.T. at 50, 100, 150 and 180 volts, but also provides grid bias up to 30 volts. Thus it fully justifies its title, yet the overall dimensions are not more than 16in. × 10in. × 11in. The values of H.T. and grid bias available indicate that it is suitable for

Stand to Stand Report.—

use with receivers designed for the highest quality loud-speaker reproduction. Yet the cost of running is estimated at less than 6d. per week.

Power Amplifier.—An exhibit of interest to the student of design is the special power amplifier for demonstrations, dancing, etc. This is self contained and de-

The Burndept Mark IV. Short-wave Receiver (12–100 metres).

rives its power supply from A.C. mains through a single plug adaptor which is suitable for power points or lighting sockets.

There are two L.S.5 amplifying valves in parallel working off 500 volts H.T., and the input circuit is designed to take the output from an ordinary receiving set. An adjustable output circuit enables the amplifier to be adapted to any number or type of loud-speakers.

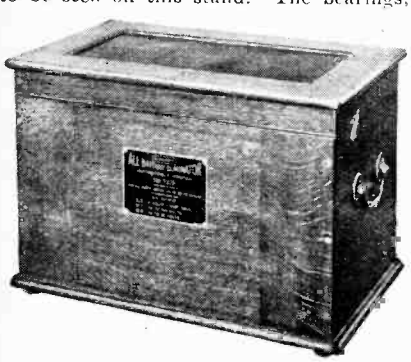
Accessories.—There is a demonstration board showing the principle of the Burndept Auto-broadcast System by means of which the receiver may be controlled from any part of the house.

In addition to a comprehensive range of well-known and well-tried components the visitor will find one or two recently developed features of special interest. For instance, there is a range of heavy-duty wire-wound resistances ranging from 330 to 250,000 ohms and also some shielded power filter circuits of liberal design.

Burndept Wireless, Ltd., Eastnor House, Aerial Works, Blackheath, London, S.E.3.

(37) BURTON.

An interesting S.L.F. condenser incorporating many novel points of design is to be seen on this stand. The bearings,



The Burndept "All-Battery" Eliminator presents a particularly neat exterior.

which are supported in bakelite end plates, are each of the cone type and can be adjusted for end play but do not supply the friction necessary to keep the moving vanes in position. The required degree of friction is applied by a miniature adjustable band brake and anchorage, which is also used to pick up contact with the rotor. The condenser as a whole is well made and well repays examination, as does the "Micro-Log" dial, which is increasing in popularity.

Other components on this stand which should not be missed are a calibrated resistor for baseboard mounting and a neat push-pull switch for one-hole fixing.

C. F. and H. Burton, Progress Works, Bernard Street, Walsall.

(157 & 212) C.A.V.

Baby Grand 5-valve Receiver.—This pedestal cabinet receiver is a very fine and artistic example of radio design; the cabinet-making and polishing are superb, and although the receiver is entirely self-contained with hinged frame-

The Burndept Power Amplifier for use in conjunction with Rice-Kellogg and other large Loud-speakers.

aerial, batteries, etc., the price is only £35 (royalties extra). There is only one tuning control for the frame aerial, the two H.F. valves being aperiodically coupled by chokes. The two L.F. stages are respectively transformer- and resistance-coupled, the reverse order giving difficulty in providing reaction on long waves. Volume control is by Reinartz type reaction, and a key switch provides a means of changing from short to long waves. A C.A.V. cone loud-speaker of the "Musicola" type is built into the cabinet and is hidden by an artistic wooden grille.

High-tension Accumulator H.T.18.—Experimenters will appreciate a high-tension battery capable of giving a really big discharge when occasion demands. This battery will give 300 mA. for 8 hours on constant discharge, or 200 mA. for 15 hours; at lower rates of discharge the capacity is 5,000 mA. hours. By limiting the voltage per unit to 42 the battery still remains portable, although other similar units can be built on top of each other by dowel plugs provided.

A large variety of low-tension accumulators are to be seen at this company's stand; of particular interest is a

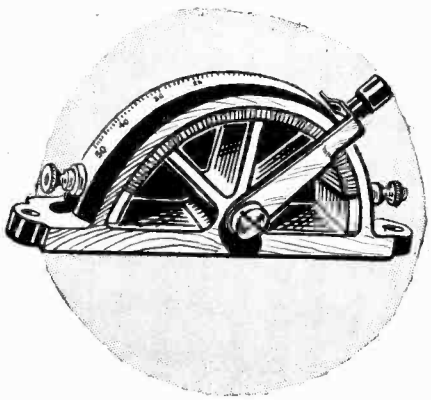
The Burndept Portable Five.

series of unspillable two-volt cells of large capacity for portable sets.

C. A. Vandervell and Co., Ltd., Warple Way, Acton, W.3.

(12) CAMCO.

Ready-made cabinets into which the home constructor can build his receiver are shown in profusion, and a special feature is made of cabinets for the most popular of the sets described in various wireless journals. In addition to supplying cabinets with ebonite panels fitted, a special stand for the purpose of supporting the wireless receiver is featured. This is provided with a compartment, open at the top, in which the H.T. and L.T. batteries can be accommodated. The unsightly leads which would otherwise be required to connect externally the various batteries to the receiver can be totally enclosed and the appearance of the receiving equipment is thereby greatly enhanced.



Burton Calibrated Filament Resistance for baseboard mounting.

Stand to Stand Report.—

Panel Brackets.—These are right-angle brackets cast from aluminium, and they facilitate the attachment of the vertical panel to the baseboard. Two sizes are supplied, 6in. × 4in. and 3in. × 2½in.

Carrington Manufacturing Co., Ltd., Sanderstead Road, South Croydon.

C.A.V. Unspillable Accumulator, especially suitable for portable sets.

(125) CARBORUNDUM.

A feature of this exhibit is the R.C.C. Unit incorporating carborundum resistance elements. These elements consist of a mixture of carborundum powder and a bonding material, which is forced into sticks and fired. The result is a practically unbreakable element of large cross-section capable of carrying a considerable current.

Other interesting exhibits are large carborundum crystals, sections of permanent detectors and a testing unit for demonstrating the rectifying properties of carborundum.

The Carborundum Co., Ltd., Trafford Park, Manchester.

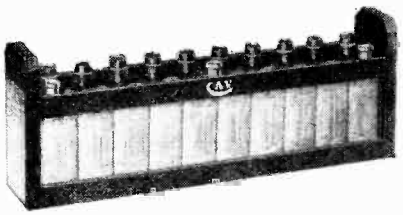
(90) CAYDON.

A new Caydon model known as the "Long-range Portable" is on view on this stand. The loud-speaker and receiver are assembled side by side in a narrow case which is somewhat easier to carry than the standard model. A new circuit has been developed and the range considerably increased. Two types are available; one in oak at 25 guineas and the other in pearl walnut with a Celestion loud-speaker at 30 guineas.

The Dispatch Case Model remains practically the same, the price being 35 guineas. A de luxe edition of this instrument in real pigskin is available at 40 guineas.

A Table Model designed in anticipation of the B.B.C. Regional Scheme is also on view. It operates without aerial and earth and has the range and selectivity required for the reception of the proposed alternative programmes; many existing stations including Daventry are, of course, already within its range.

All Caydon sets use "Simplicon" variable condensers made by Messrs. Williams and Moffat, Ltd., Birmingham, which have an ingenious internal reduction gear, and



C.A.V. Heavy Duty H.T. Accumulator.

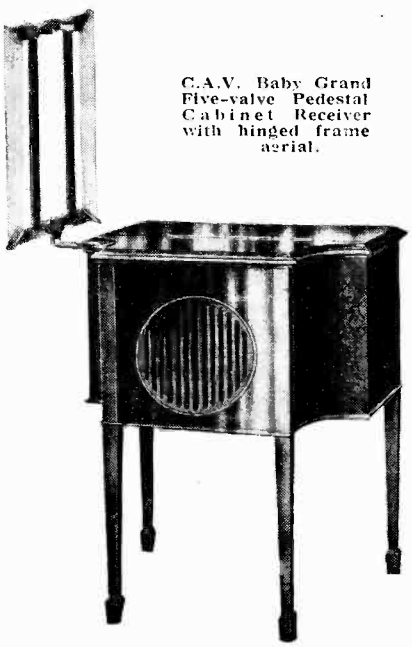
examples of these condensers are on view at this stand.

Campbell and Addison, 40, Howland Street, London, W.1.

(151) CELESTION.

The various models of loud-speakers now manufactured incorporate many improvements, and the latest addition to the range of this company's products is the C24 model, priced at £25. This has a resistance of 750 ohms, and is primarily intended for use where a great volume is required. This speaker incorporates the well-known specially constructed reinforced conical diaphragm which is the feature of all Celestion products, and is mounted in a handsome cabinet carried on four legs. The smaller sizes of loud-speakers range from the C10 at £5 10s. to the C14 at £14, and are made in either mahogany or oak. If desired the models can be supplied finished in Japanese lacquer carried out in a variety of designs. These speakers do not require a specially built amplifier, but owing to the sensitivity of the movement will function in a satisfactory manner with the average broadcast receiver. A knob for adjustment is provided at the back of the instrument and this should always be set so that the moving parts do not foul the magnet system and thus produce a rattle which would naturally lead to distortion.

The Celestion Radio Co., 29-37, High Street, Hampton Wick, Kingston-on-Thames.



C.A.V. Baby Grand Five-valve Pedestal Cabinet Receiver with hinged frame aerial.

(96) CENTROID.

This stand is almost exclusively devoted to components, though there is one complete receiver which at once attracts the eye. This demonstrates the uses to which Centroid products may be put in a receiver of typical design.

Screening boxes in copper and aluminium are on view, and the ingenious method of assembly should be noted. There are also a series of screened coils of rectangular shape, together with non-reversible bases.

The Centroid variable condensers are an attractive job, the vanes being die-cast together. Series of gang condensers with screw-down compensating condensers are also on view.

Last, but not least, there is a very simple and effective slow-motion dial at 3s.

The Camden Engineering Co., Ltd., Bayham Place, Camden Town, London, N.W.1.

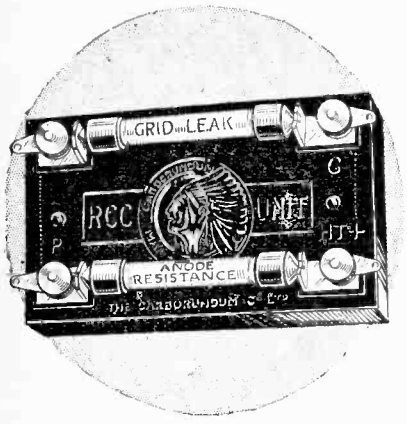
C.A.V. Musicola Cone Loud-speaker.

(58) CHAKOPHONE.

The policy of the Eagle Engineering Co. is the supplying to the public of certain receivers described in constructional articles in this journal, such as the "Wireless World Everyman Four," "All-Wave Four," the "Long Range Five-valve Receiver," and the "Four-valve Portable" modified for reception on two wave ranges. The performance of these sets is well known to readers and a call at the stand is recommended to inspect the receivers, which necessarily embody minor modifications, such as the fitting of switches in L.F. stages, the use of Ferranti plate current meters in power stages, and alterations of cabinet work, rendering the general appearance more attractive than the designs upon which they are based. For those requiring H.F. transformers for building *Wireless World* receivers a complete range is available, including the new transformers specified

Stand to Stand Report.—with the recently described screened valve set.

Eagle Engineering Co., Ltd., Eagle Works, Warwick.



Carborundum R.C.C. unit.

(18) CHAMPION ACCUMULATORS.

Accumulator Parts.—An interesting feature is a complete set of all the necessary parts by means of which a 60-volt H.T. accumulator can be built up in about half an hour. The plates are constructed on generous lines, and a capacity of 3,000 milliampere hours is claimed.

H.F. Choke.—A very compact component for baseboard mounting. The winding is sectionalised, and the self-capacity is thus reduced to a minimum. It can be used in all positions in a receiver where a choke of this type is required.

Tuner.—A very neat unit fitted with a single hole fixing attachment, and intended for panel mounting. The wave range covered, when used in conjunction with a 0.0005 mfd. variable condenser, is 200 to 2,000 metres, and reaction is available over the whole band. The price is only 12s. 6d.

The Champion Accumulator Co., 2, Prebend Street, Leicester.

(88, 89) CLIMAX.

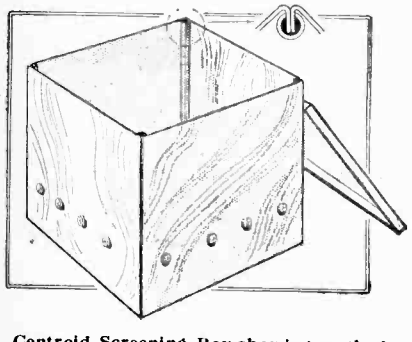
Some very businesslike mains receivers are shown with frame aerial and loud-speaker built into the lid. The design is very clean and the arrangement of controls neat. Thumb-control condenser drums are used; there is a volume control, and a particularly neat double-push mains switch. The mains unit is screened to avoid induction effects with the frame.

Mains Equipment.—A comprehensive range of transformers, heavy and light duty chokes, resistance units and potential dividers are on view; there are practically all the materials necessary for the construction of battery eliminators for H.T. and L.T., A.C. and D.C.

Another corner of the stand is devoted to a series of cone loud-speakers, of which the most interesting is probably the "Puritan" model, which sells at 37s. 6d.

The well-known Climax insulators and earth pins are again displayed.

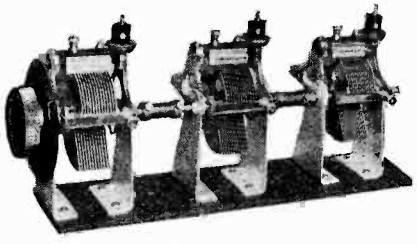
Climax Radio Electric, Ltd., Quill Works, Putney, London, S.W.15.



Centroid Screening Box showing method of jointing corners.

(227) CLIX.

The ubiquitous Clix, with its famous "Clix" uses, is again present at the exhibition, but in a new and improved form. Of particular interest are the new Clix sockets with special bushings for panels made of non-insulating materials. In view of the fact that metal panels are becoming more and more common, this small device should have a widespread appeal. Among other innumerable devices shown are spade and pin ends, wander plugs and valve sockets. It should be noted that all the types of plugs shown employ the new Clix fittings, with which, it is claimed, that far better contact is obtained than with the ordinary split pin or even the "banana" fitting. Multi-plugs for the purpose of connecting up batteries, etc., are also on view. One of the leading features of this stand is the reasonable price demanded for the majority of components shown.



Centroid Triple Gang Condenser with screw-down compensators.

Lectro Linx, Ltd., 254, Vauxhall Bridge Road, Westminster, London, S.W.1.

(255) COLLETT.

An imposing array of well-made small components, such as terminal tags and adjustable panel brackets, is shown. Special spring clips for making rapid connection when experimenting are an interesting feature, and should appeal to the real enthusiast. One of the most interesting features, however, is the Collett self-hoisting aerial pulley, which not only makes aerial erection easy, but enables broken aerials to be raised in a very few minutes. This component is made of very heavy gauge brass with tin finish for the purpose of resisting inclement weather conditions.

S. H. Collett Manufacturing Co., 60, Pentonville Road, London, N.1.

(80) COLVERN.

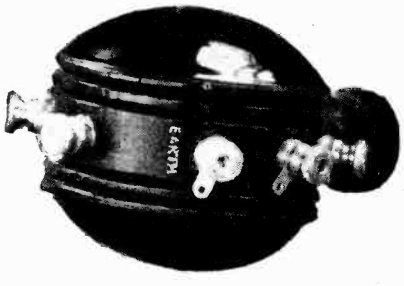
All those interested in short wave receiver construction either as short-wave enthusiasts or for short-wave broadcast reception should find an opportunity of seeing the special short-wave equipment exhibited by Collinson's Precision Screw Company. To cover an extensive tuning range on short wavelengths plug-in coils are essential in order to keep a high ratio of inductance to capacity in the tuned circuit and to produce a smooth control of regeneration by associating each tuning inductance with a reaction coil of the requisite size. For convenience of receiver construction these interchangeable short-wave coils give a simple wiring lay-out and leave little to be done to complete a set. The construction of a first-class set is further simplified by the introduction of aluminium panels cut to size and fitted with brackets, apertures being made for viewing the edgewise scales of the new Colvern vertically mounted condensers. These embody new features of particular interest to the home constructor. The short-wave equipment conforms to all the constructional requirements of the *Wireless World* "Short Wave II" and "Short Wave III" described recently. Paxolin and brown Bakelite insulation are features in the method of mounting the short-wave coils, while the pin connectors engage tightly with a snap action on spring faces without the difficulty which occurs when locating pin connectors in the holes.

The Champion H.F. Choke.

Colvern plug-in formers are well known, and these are shown in the modified form as used in the *Wireless World* "Exhibition Five" for horizontal as well as vertical mounting and with more liberal pin spacing.

This company is now specialising in the marketing of machined castings and other parts for building moving-coil loud-speakers.

Collinson's Precision Screw Co., Ltd., Provost Works, Macdonald Road, London, E.17.

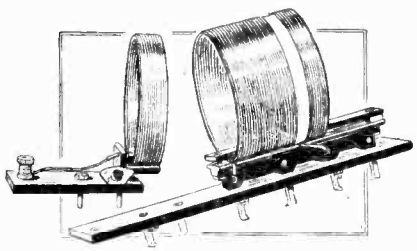


The Champion Tuner, with variable reaction.

Stand to Stand Report.—

(155 & 156) COSMOS.

Constructor's Set for A.C. Mains.—This set derives both H.T. and L.T. from A.C. lighting mains; the Cosmos H.T. and L.T. eliminators are sold as separate complete units and would be too bulky



Colvern Short-Wave Tuning Coils for use in building "The Wireless World" Short-Wave 11 and 111.

to be included in the receiver. The circuit used is a reacting detector valve, followed by two stages of resistance coupling. The detector valve-holder, which has special contacts to accommodate the A.C./G valve, also contains the grid leak and condenser in a moulded container. Reaction is of the capacity type, controlled by a variable condenser, a Cosmos H.F. choke suitably deflecting the H.F. impulses. The L.F. resistance stage components are contained within the valve-holders, which again have special contacts for the indirectly heated cathode valves. Short- and long-wave A.N.P. coils are accommodated very close together and in the same plane, their astatic windings effectually preventing magnetic coupling. The Cosmos series of A.C. valves has such an excellent mutual conductance that a set built up on the above lines exhibits considerably better characteristics than is possible with ordinary three-electrode valves. Constructors having A.C. lighting mains will do well to examine this set.

A.C. Valves.—The convenience of obtaining filament current for valves from lighting mains, thus dispensing with the L.T. accumulator, is influencing manufacturers to produce a number of types of indirectly heated cathode valves. The Cosmos A.C./G and A.C./R valves have a very high efficiency where this is considered in terms of amplification factor measured against anode impedance. It is claimed that even with the noisiest mains these valves give an output free from hum, owing to the fact that the heater is non-inductive and the cathode has an equipotential surface. The valves have five-pin bases, but an adaptor can be obtained so that ordinary valve-holders can be used.

A.N.P. Coils.—The inherent difficulties in high-frequency amplification are many, but the more important can be classified under three headings—magnetic coupling between coils, stabilisation at fundamental frequency, parasitic oscillation at high frequency. As the A.N.P. coils are astatically wound there is practically no external field, and thus magnetic coupling, even if the coils are adjacent, parallel and not screened, is absent. These coils are

Cosmos indirectly heated Cathode Valve showing "Getter" Plate.

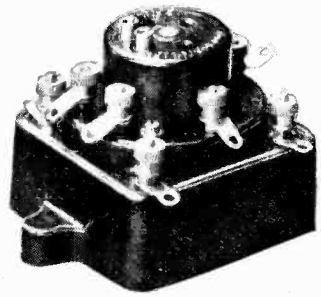
quarter and centre tapped, so that neutralisation can be suitably carried out. It has lately been found that centre-tapped coils produce parasitic oscillation on wavelengths far below their fundamental; to obviate this A.N.P. coils have a few turns of resistance wire wound on each section. The short-wave coil sells at 6s. 6d. and the long-wave at 10s. 6d.

Metro-Vick Supplies, Ltd., 155, *Charing Cross Road*, W.C.

(86 & 87) COSSOR.

Screened Grid Valves.—These valves take the form of a cylindrical glass bulb with moulded caps at each end provided respectively with three and two contact pins. It is arranged that the getter enters into the screening scheme by being present on the inside of the bulb to a point half-way along the valve. Full information was not available at the time of writing these notes, but it is understood that two different types of valve will be marketed, one for 2-volt accumulators consuming but 0.1 ampere, and one for 6-volt accumulators with a filament rating of 0.25 ampere.

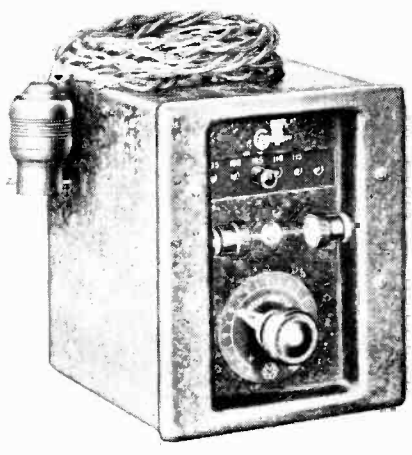
A.C. Valves.—Somewhat of the same appearance as the screened grid valves with two moulded end caps, but with spherical bulbs, these valves are manufactured with indirectly heated cathodes to run on raw A.C. from lighting mains



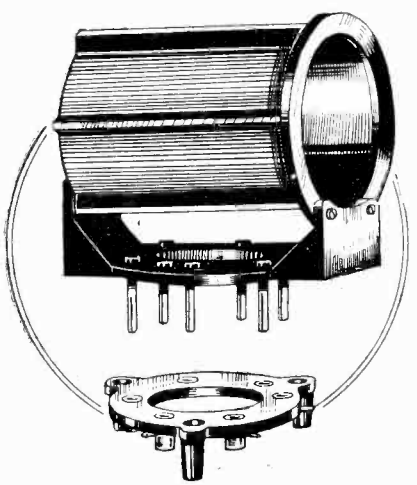
Cosmos Composite Resistance Coupler with valve holder for A.C. valves.

suitably reduced in voltage by a transformer which the Cossor Company supplies. One end cap carries four valve pins disposed in the usual positions, the other cap carries two terminals to take the connections for the heater element. It is thus seen that a special valve holder is not required, and that little alteration in wiring is necessary when these valves are substituted for ordinary valves. The valve pins occupying the normal positions for filament pins are shorted within the valve cap. Four types at 22s. 6d. each are sold for the following uses: H.F., detector or first L.F., resistance coupling, and power amplification.

Three-electrode Valves.—There are three series of valves for 2-, 4-, and 6-volt accumulators respectively, and further, there is a valve for suitable characteristics for H.F., R.C., L.F. and power amplification for each series. The filaments of these twelve valves all consume 100 milliamperes (except the 2-volt power valve, which takes 200 mA.). The Stentor Six (61C Power) is an interesting valve having good characteristics; the impedance is 3,000 ohms, amplification factor 3.5, and at 150 volts H.T. a grid swing of over 30 volts can be accommodated on the straight part of the anode curve.



Cosmos L.T. Battery Eliminator for A.C. Valves, giving an output of 5 amperes at 4 volts.

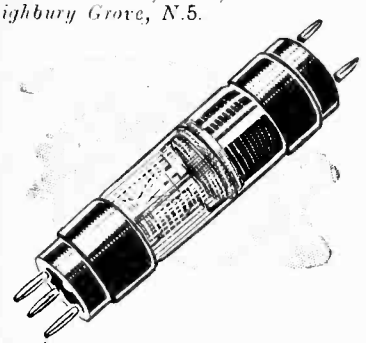


Modified Colvern Coil Former now adapted for horizontal as well as vertical mounting.

Stand to Stand Report.—

Home Constructor's Three-valve Set.—This receiver (0-v-2) is sold in the form of parts for assembly by the amateur. Components of well-known make are employed and the circuit given follows well tried practice. The single layer tuning coils are wound on a large-size former, and an Ormond condenser is used for tuning. Reinartz reaction is employed, and the first L.F. stage is resistance coupled, while a Ferranti transformer couples the second to the third valve. Fixed T.C.C. condensers are used.

A. C. Cossor, Ltd., Cossor House, Highbury Grove, N.5.

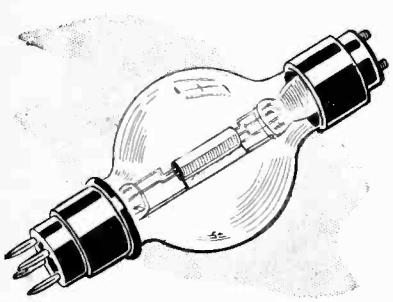


Cossor Screened Grid Valve, made for 2-volt and 6-volt accumulators.

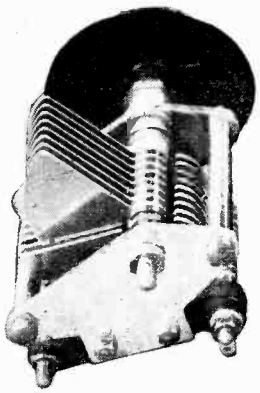
(60) CURTIS.

Ilfradyne.—The trend in design is marked by the development of the portable into a self-contained home receiver, including frame aerial, multi-valve receiver and enclosed cone loud-speaker capable of giving a good rendering of the local station programme as well as Daventry, and with a good possibility of tuning in other stations, thus doing away with installing difficulties. The new Curtis product is a two-stage H.F. amplifier with valve detection and two L.F. stages. One of the H.F. stages is aperiodic, and the other tuned so that a simple three-dial operation is obtained representing the frame, the tuned H.F. stage and reaction control.

The frame aerial in this instance is of special merit, for, although self-contained, it is comparatively large and built in four sections. There is no dead end or disused part of the frame when switching from Daventry to the broadcast band, a carefully thought out change over system being effected by means of a multi-contact switch, the circuit arrangement altering from the series to a parallel connection of the sections. The loud-speaker



Cossor Indirectly Heated Cathode Valve. The two pins at the top connect with the heater element.



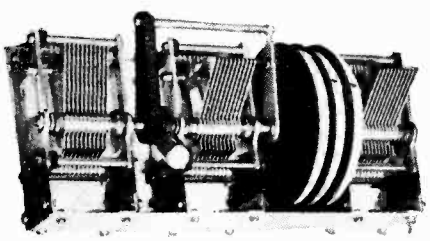
Cyldon Bebe Condenser.

incorporated is the large-size Celestion, and the price of the complete set, including valves, batteries and royalties, is £30.

British Curtis Radio, Ltd., 11, Red Lion Square, London, E.C.1.

(121) CYLDON.

This stand should not be missed by anyone who takes an interest in craftsmanship and perfection of workmanship. It is no exaggeration to say that Cyldon

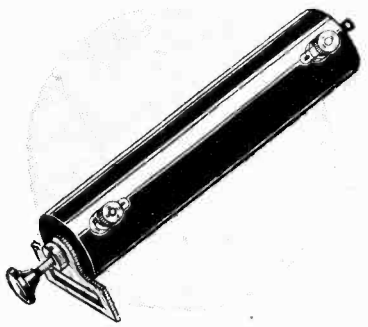


Cyldon Triple Gang Thumb-Control Condenser.

condensers could not possibly be surpassed in any of the essential mechanical properties required in a variable condenser—rigidity, accurate spacing of vanes, perfect fitting bearings, etc. To build a single Cyldon condenser would be an achievement, yet these components are produced in quantities with astonishing uniformity and at quite normal prices.

Thumb-control Condensers.—This system is rapidly gaining in popularity owing to the ease with which the controls of independently operated condensers can be centralised and to the nicety of adjustment provided by the large diameter drum and open scale of degrees. The Cyldon method of mounting makes use of an aluminium chassis, which also serves as a capacity screen. Standard Cyldon Log Mid Line condensers are used with the spindles running parallel to the panel, and units incorporating from one to four condensers are available. The knurled drums are of Bakelite and project through a rectangular hole in the front panel, for which a special metal "window" and hair line is provided. Two or more drums may be locked together if desired to give unified control for searching, after which they may be operated for final adjustments. The fixed and moving vanes and the frame are each electrically isolated, so that the units are adaptable to all types of circuits.

Short-wave Condensers.—These are very similar to standard Cyldon condensers, the only important point of



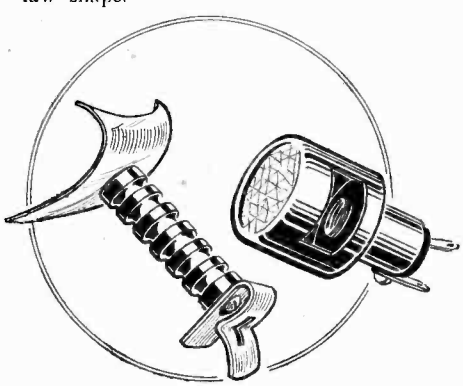
A novel Change-over Switch made by Messrs. A. F. Bulgin & Co.

difference being the increased spacing of the end plates from the fixed vanes. This ensures the low minimum capacity so desirable in short-wave work.

Connection to the moving vanes is made as usual through a phosphor-bronze hair spring, but the length and shape of the spring has been carefully chosen to prevent turns touching, a circumstance which would give rise to irritating noises on short wavelengths.

Square law or Log Mid Line vanes are available, and there are four capacities—0.0001, 0.00015, 0.0002, 0.00025 mfd., the prices being 12s. 6d. 13s., 13s. 6d. and 14s. respectively.

"Bebe" Condenser—A miniature condenser for capacity reaction, balancing, etc., is shown, the workmanship and finish of which, even down to the pig-tail connection, is the same as in the larger models and performs its function with the same precision. It should prove useful to the experimenter as well as the set constructor. The vanes are of true square-law shape.



The Decko Panel Light and Indoor Aerial Insulator are extremely attractive.

Stand to Stand Report.—

In addition to these special features, standard square-law, S.L.F., Log Mid Line and "gang" condensers are on view, together with a range of Tempryte filament control units.

Sydney S. Bird & Sons, "Cyldon" Works, Sarnesfield Road, Enfield Town, Middlesex.

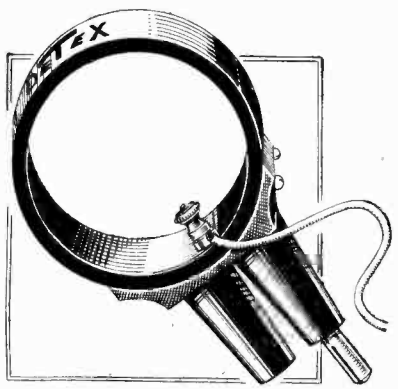
(213) D.X. COILS.

Carefully designed coils of the plug-in type are the predominant feature of this stand. Ordinary coils are shown, and also those having one or more tappings. In addition some extremely compact mains units are shown.

D. X. Coils, Ltd., Glebe Road, Dalston, E.8.

(222) DE LA RUE.

The whole of the display on this stand is devoted to the exhibition of high-



To improve selectivity a tapped plug-in coil is now included in the Detex range.

class moulding. Almost every variety of article employing ebonite was represented on this stand, the workmanship being of a very high order.

Thomas De la Rue and Co., Ltd., Shernhall Street, Walthamstow, E.17.

(236) DECKO.

This firm needs no introduction to the enthusiastic experimenter. In addition to the large number of devices shown in previous exhibitions there is an extremely useful change-over switch of the push-pull type, its main use being for the purpose of changing over from one programme to another, although, of course, a large number of other uses will suggest themselves. In view of the ever-growing popularity of loud-speaker extension and house wiring systems, the new wall jacks should not be missed. These may be obtained in a variety of finishes, such as oxidised silver, oxidised copper, etc., the wood blocks on which they are mounted being obtainable in mahogany, walnut, or oak, thus rendering them inconspicuous in a well-furnished room. They are made for either series or parallel wiring. Of particular interest also is a new type of indoor aerial insulator consisting of a small insulator permanently attached to a standard picture hook. The indoor aerial, therefore, may be mounted an inch or so away from the wall, thus bringing about greatly enhanced efficiency.

A. F. Bulgin and Co., 9-11, Cursitor Street, Chancery Lane, London, E.C.4.

(68) DIBBEN.

The Allclear III.—A three-valve receiver consisting of a detector valve followed by two stages of transformer-

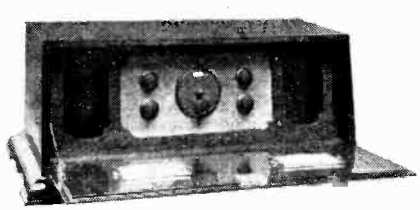
The Monarch II. (Wm. Dibben.)

coupled low-frequency amplification. An interesting feature of this receiver is the provision of two separate compartments, one to house the L.T. battery and one for the H.T. batteries. The L.T. battery compartment is lead lined to prevent any loose acid from affecting the other portions of the receiver. The H.T. compartment is provided with a two-tier removable tray in which the batteries are rested. This greatly facilitates their removal from the set when renewals become necessary. A remote control circuit is incorporated, and employs a neatly housed relay for operating the valve filaments.

Wm. Dibben and Sons, Southampton.

(2) DETEX.

The Detex range of components includes a distinctive tuning dial giving a fine adjustment with metal cover plate, scale and aperture for indicating station tuning. All Detex prices have this season been reduced, the 3in. Vermo dial selling for 3s. Among the com-



The Dibben: Allclear III.

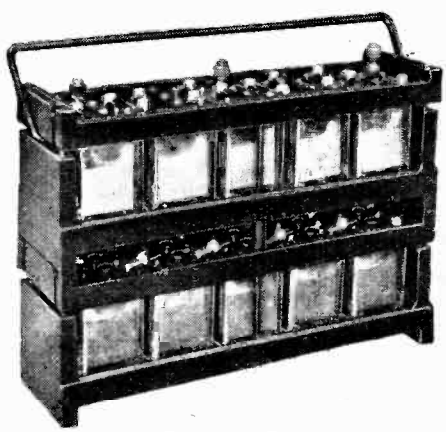
ponents already well known are various types of breakjacks, keys and switches, a permanent crystal detector and a two-coil holder. The new components are an H.F. choke and tapped plug-in coil. The former is section wound and stands vertically from the baseboard, three terminals being fitted to provide a tapping point. Listeners within the shadow of 5GB will find the Detex plug-in coil useful for improving selectivity. It is well made, the moulded plug-in mount being particularly well finished.

Detex Distributors, Ltd., 125-129 Rosebery Avenue, E.C.

(107) DIONOID.

This new range of batteries includes several novel features. The cells are contained in a heavy moulded case, with a special sealing arrangement for the lid, which, however, may be easily removed, together with the plates which are firmly attached to it. The usual opaque container makes an examination of plates or acid rather a difficult matter, and the user is often at a loss to know whether gas is being evolved at the end of a charge; this difficulty is overcome in the Dionoid cells by fitting a small glass window, which also shows whether the acid level is correct, as an indicating line is provided.

H.T. batteries in glass cases, but with a somewhat similar sealing device for the moulded top, are also shown, as is a special gravity bead hydrometer in which risk of accidental breakage is minimised by a simple yet most ingenious fitment in



Dionoid H.T. batteries.

the form of a soft rubber flange. This useful accessory sells at 3s. 6d.

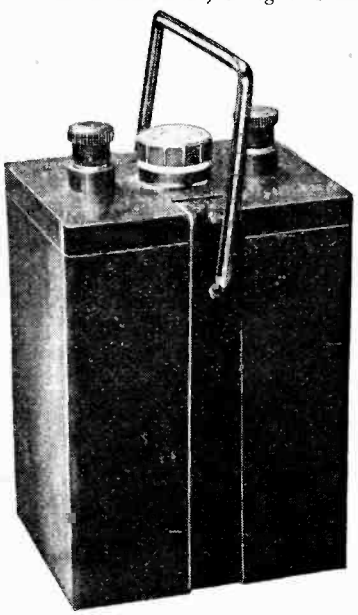
Dionoid Battery Co., Ltd., Victoria Works, Prince of Wales Road, Darnall, Sheffield.

(206) DONOTONE.

This instrument, which was one of the leading features of last year's show, was again well to the fore. As is well known, the ordinary type of loud-speaker, apart from other defects, suffers from the fact that it possesses several resonances in the musical scale, that is to say, that in the whole of the musical scale there are a number of notes to which the loud-speaker gives special prominence, the result being a blaring effect very displeasing to the ear. The older horn type of loud-speaker was specially prone to resonance, and, of course, the diaphragm type of instrument, in spite of careful design, is not altogether free from this disadvantage. In the Donotone loud-speaker an effort has been made to subdue resonance in a very ingenious

Stand to Stand Report.—

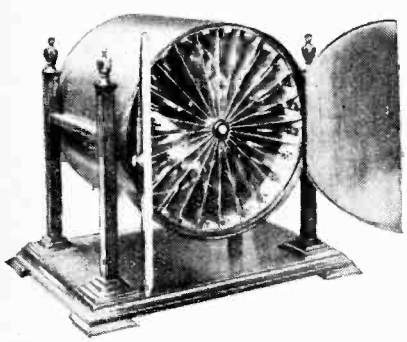
manner. Inserted in the instrument are a large number of tuned gongs whose purpose it is to absorb any resonances of which the loud-speaker may be guilty. It is claimed also that, using this loud-



The Dionoid L.T. Cell with observation window.

speaker after a well-designed amplifier, the lower end of the musical scale does not suffer from the same attenuation common to many instruments. This loud-speaker is obtainable in many different finishes for the purpose of harmonising with the furniture of various rooms in the house.

The Donotone (Reg.) Loud-Speaker, 40, *Furnival Street, London, E.C.*4.



The "Donotone" Loud-speaker is designed on entirely novel lines.

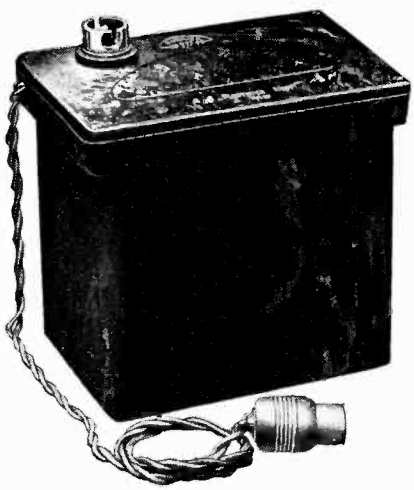
(162) DUBILIER.

The "K.C." Condenser and Dubilier Toroids.—These new products, which are primarily (though not essentially) intended to be used together, represent a successful attempt to produce a combination which will give what is to all intents and purposes a "straight line frequency" tuning curve. In other words, changes in the frequency to which the circuit is tuned are strictly proportional to dial readings.

The condenser is of the one-hole fixing type, with a novel and interesting slow-motion device giving a reduction of 200 to 1. There is an alternative direct drive. The vanes are of brass, and, taking into consideration the high standard of workmanship and general design, the component may fairly be considered as extremely good value at 12s. The capacity is 0.0005 mfd.

The Toroids are "fieldless" high-frequency transformers, wound on what is generally known as the toroidal principle, which gives an electro-magnetic field no more intense than that of a single turn having the same mean diameter. It is thus possible to use them without screening, even in modern lightly damped circuits.

The primary is inside the secondary, and there is no neutralising winding, as it is recommended that the special bridge method of balancing developed by the



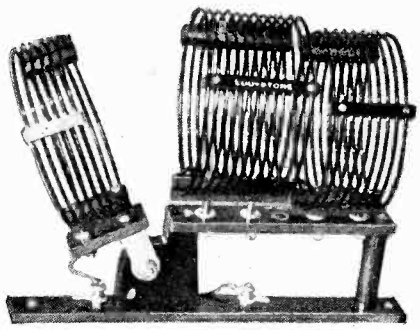
A Dubilier Rectifying Unit.

Dubilier Co., and shown in their pamphlet, should be used. The short-wave transformer is wound "on air"; in spite of this it is extraordinarily rigid and robust, and would appear to be capable of withstanding quite rough treatment, although, as a precaution, a separate base is supplied with each coil in order that spare ones may be mounted on a board.

In the pamphlet already mentioned a number of other possible uses for the transformers are discussed, with accompanying circuit diagrams. One of the most interesting suggestions relates to the use of the combination (Toroid and K.C. condenser) as a heterodyne wavemeter, in which the primary acts as the plate or reaction coil. With the calibration as supplied, the instrument should be accurate enough for the average wireless user without additional checking.

A five-valve demonstration receiver having two H.F. stages illustrates the use of the components in question. The Toroids are placed on a common axis and are only two or three inches apart.

H.T. Eliminators.—The Dubilier Co. have adopted a somewhat unusual, but nevertheless eminently practical, method in designing their new high-tension battery eliminators. The D.C. unit may be regarded as the nucleus, and comprises a potential-dividing and smoothing device. Two models are available, the larger being for heavy currents and where



Eddystone Short-wave Inductance Unit. The coils are wound with No. 16 gauge enamelled wire and are air-spaced.

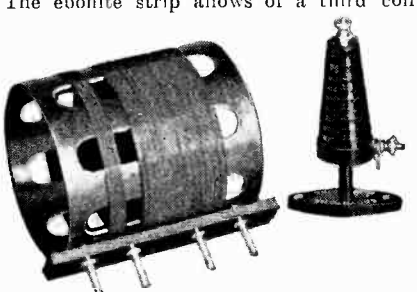
specially complete filtering is necessary. On A.C. supplies a rectifier is added to the D.C. unit, using a specially designed valve.

Electrostatic Gramophone Pick-up.—This component, which is the most recent product, is of exceptional interest, and, it is believed, is quite original. Designed for fitting on the tone-arm of a gramophone, it is, in effect, a small air-dielectric condenser, one plate of which is rigidly fixed while the other is free to vibrate under the influence of the needle traversing the record. A polarising potential is obtained from the high-tension battery, voltage variations produced being applied to the detector valve of an ordinary wireless set by means of an adapter (supplied separately) which automatically converts this valve into a first-stage L.F. amplifier.

Dubilier Condenser Co. (1925), *Ltd., Ducon Works, Victoria Road, North Acton, W.*3.

(77) EDDYSTONE.

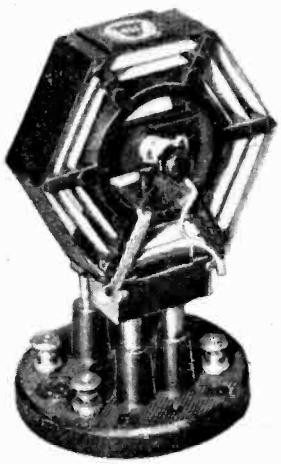
Short-wave Unit.—An interesting series of air-spaced coils wound with 16-gauge enamelled wire and provided with two pins for attachment to an ebonite strip give scope for experiment on waves between 15 and 200 metres. On 30 metres, for example, a three-turn aperiodic aerial coil could be used next to a six-turn coil, part of which would serve as a reaction coupling by the Reinartz method. The ebonite strip allows of a third coil



Eddystone B.B.C. Aerial Transformer on skeleton paxolin former. On the right is the Eddystone Coned H.F. Choke.

Stand to Stand Report.—being attached, which can be hinged to give a variable coupling if desired. The turns of wire touch the dielectric at only three points, yet the coils are mechanically strong. The same type of coil with two-pin fixing is now wound on Paxolin formers to cover the ordinary B.B.C. band.

Scientific Four Receiver.—The circuit and design of this set follow closely that of the "Everyman Four." The Paxolin formers on which the aerial and H.F. transformers are wound are slotted so as to cut down by about 33⅓ per cent. the amount of dielectric used without impairing strength. The aerial and H.F. transformers have a series of pins to make contact with sockets on a baseboard, thus



Edison-Bell Hylo Coil, with plug to change over from short to long waves.

allowing the coils to be easily interchanged. For Daventry, Litz coils wound to the full inductance are used rather than loading, and the H.F. stage is not cut out. Within each Paxolin tube at the top is an ebonite crossbar to facilitate removal of coils. A potentiometer is shunted across the L.T., while a connection from the grid return lead of the detector is taken to its moving arm, thus giving a volume control by causing the input to be impressed either on the bend or the straight of the characteristic. To prevent H.F. impulses from reaching the L.F. portion of the set, a H.F. choke is incorporated in the grid circuit of the first L.F. valve. Resistance coupling follows the detector and a Ferranti transformer couples the third and fourth valves.

H.F. Choke for Short Waves.—Wound on a skeleton former of about 2in. diameter, this choke is suitable for wavelengths between 8 and 100 metres. The length of the fine silk-covered winding is about 4in., and turns are air-spaced. The problem of evolving an efficient H.F. choke for short waves is a difficult one, but this firm appears to have produced an article built on sound lines.

Stratton and Co., Ltd., Bolmoral Works, Bromsgrove Street, Birmingham.

D 17

(153) EDISON BELL.

Anode Resistance, Wire Wound.—A series of anode resistances wound on long slotted spools have certain features which distinguish them from the more usual

Edison-Bell Portable Daventry Set, with one tuning control only.

types now on the market. The end caps which form the contacts are about 3½in. apart, and thus capacity effects, which can exist where somewhat massive metal plates are used close together, are absent. There are ten slots, and the direction of winding is reversed in alternate slots to prevent, as far as possible, inductive effects. The resistance element is suspended between clips mounted on a moulded ebonite base, and any value of resistance between 10,000 and 100,000 ohms can be supplied at prices starting at 4s. 6d. for the lowest value. The current carrying capacity of these resistances is 20 mA.

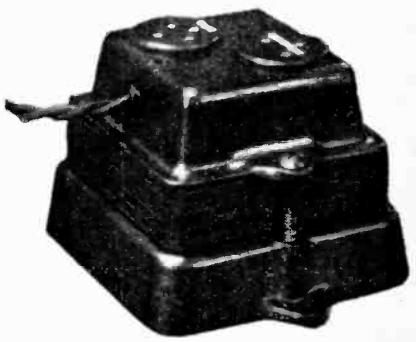
S.L.F. Condensers.—Two new condensers, 0.0003 and 0.0005 mfd., are now made. Ball bearings are provided at each

Edison-Bell Wire Wound Anode Resistance. The length of the resistance spool is over 3 inches.

end of the spindle, which is hollow to allow the spur-wheel reduction gearing rod to pass through. The reduction ratio is 92 to 1, and an extremely smooth control is obtained. The vanes are stamped from hard brass sheet and have particularly clean edges, and to prevent hand-capacity effects a metal plate, which can be earthed, is attached to the under-surface of the dial.

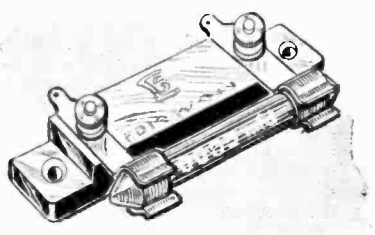
"Hylo" Coil.—To avoid having a number of plug-in coils to interchange rapidly from Daventry to the lower B.B.C. band, the "Hylo" coil has been produced, in which a small wander-plug is attached to a length of flexible wire, one end of which is permanently connected to the last turn of the coil. By inserting the plug into a socket in the centre of the coil a suitable proportion of the inductance is short-circuited, leaving a short-wave coil. The manufacture of this coil was prompted by the introduction of the regional broadcast scheme.

Daventry Portable Five Receiver.—This set has been designed to receive Daventry only and is entirely self-contained, with built-in cone loud-speaker and frame aerial. There is conspicuous freedom from knobs, dials, terminals, etc., and virtually only one control exists to tune the frame. The two H.F. valves are choke-coupled and are aperiodic, and the detector working on the leaky grid principle is followed by a transformer, which is again followed by a final resistance-coupled stage; the relative positions of these two L.F. couplings is controlled by the fact that if an anode resistance is put in the detector plate circuit, reaction control on long waves is made difficult. A large-capacity two-volt accumulator is rendered unspillable by the use of glass wool to absorb the free acid. The price of this interesting set is £22; Marconi royalties extra.



New Ediswan A.C. Battery Charger suitable for use on all common voltages and making use of an arc rectifying valve.

"King" 3-valve Receiver.—Designed for use with an outside aerial this set (O-v-2) sells at a popular price and contains a detector with swinging coil reaction, followed by transformer and resistance-capacity coupling to the last valve. The twin coil holder carrying the reaction coil is interesting; the first turn given to the control dial causes the reaction coil to move away radially from the aerial coil, and further movement causes a twist of the axis of the coil mount; this ingenious movement in two planes



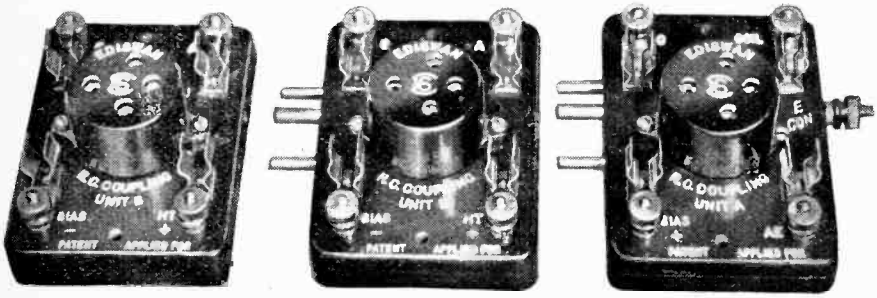
Ediswan Baseboard Mounting Grid Leak Holder. The new type Ediswan tubular condenser is shown in the clips.

Stand to Stand Report.—

is brought about by introducing a cam into the ordinary friction control.

A gramophone pick-up device at 12s. 6d. should attract much attention.

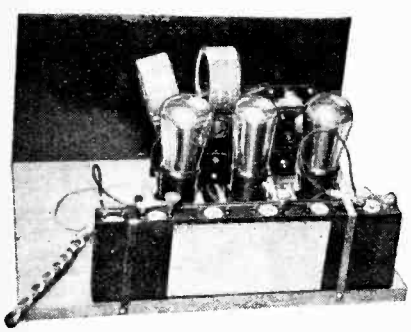
*Edison Bell, Ltd.; Edison Bell Works, Glengall Road, S.E.*15.



Wiring is simplified by the plug-in connectors now fitted to the resistance-coupling units of the Ediswan R.C. Threesome.

(146) **EDISWAN.**

New R.C. Threesome.—As many home constructors find difficulty in carrying out internal wiring it has been the aim in the new three-valve resistance-coupled set to limit as much as possible the number of connecting leads. To achieve this the detector and two resistance-coupling units are so devised that many of the circuit connections are automatically completed by means of pin-and-socket connectors when the units are assembled side by side. As a result, it is understood that only five connecting leads are required for joining up the tuning equipment.



Absence of wiring is a feature of the new Ediswan R.C. Threesome for home construction.

A novelty is the production of a grid condenser in the form of a capped sealed glass tube of the type adopted for grid leaks, though distinguished by being blue in colour. From the anode of the detector valve is connected the coupling condenser, stated to have a value of 0.0007 mfd., while the anode resistance is of comparatively low value. The second L.F. unit, in which a moderate power valve is used (the P.V.2), is coupled through a low-value condenser. The anode resistance serving as its input has a value of about 3 megohms. Anode resistances and grid leaks are of the special form of construction making use of the Loewe patents. A cable battery connector further simplifies the wiring.

For use with the clip-in condensers, which retail at 1s. 6d. and are obtainable in values of 0.0001 to 0.0005 mfd. and 0.001mfd., a useful insulating mount with clips has been introduced for baseboard mounting.

A.C. Battery Charging Unit.—Making use of an Ediswan arc rectifying valve and current limiting resistance, this battery charger, which gives 1.5 amperes, for charging 2, 4, or 6 volt batteries, resembles a mains transformer. The heavy iron cover plate is pierced for the recessed valve and resistance holders while the removal of the under cast-iron cover exposes several terminals so that the rectifier can be adjusted for use with all common voltages. This battery charger is both compact and robust and sells at £2 2s. plus the price of the valve and resistance.

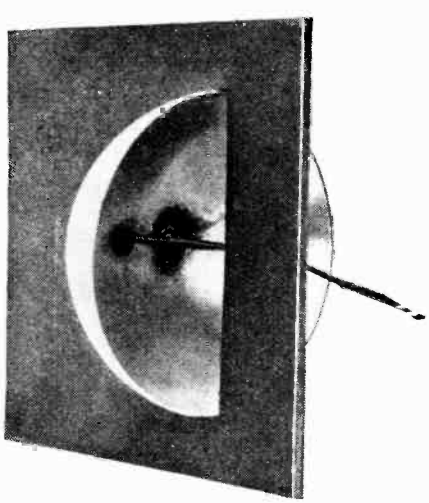
A new L.F. transformer retailing at 25s. is shown for the first time. Both primary and secondary are section wound and the ratio is 1 to 3.5.

Edison Swan Electric Co., 123, *Queen Victoria Street, E.C.*4.

(245) **EELEX.**

Among the many types of terminals, plugs and sockets, spade ends, etc., several new and well designed types have been introduced. The new treble duty terminal is worthy of special attention; it is supplied with the top finished in various colours and markings for easy identification. The terminal is so designed that it may be used in the ordinary manner for telephones or other connections, and in addition a socket is arranged in the top, into which fits an Eelex plug so that, if necessary, the plug and socket system of connection to batteries, etc., may be used. This device is so designed that a spade head can be gripped easily under the head of the terminal or the plug may be inserted. It should be stated that the dimensions of the actual plug and socket are the same as the ordinary barrel pin and socket, so that there is ready interchangeability for using other makes of plug or plugs hastily made from valve pins. This is a most useful accessory which will undoubtedly find its way into the design of a large number of home constructed sets.

J. J. Eastick and Sons, Eelex House, 118, *Bunhill Row, London, E.C.*1.



The novel Earthing Bowl made by Messrs. J. J. Eastick, Ltd.

(70) **ELECTRON.**

Useful Strip.—This consists of a perforated strip ¼in. in width which can be made to answer a variety of purposes. Supports for grid leaks, a connecting piece between individual cells in a battery, and an earthing clip to wrap round a water pipe readily suggest themselves. In addition, straps for holding grid batteries in position can be made up in a few seconds. The perforations obviate the necessity for drilling holes, and considerable time and labour are thus saved.

The New Electron Cabinet Loud-speaker.

The New London Electron Works, Ltd., East Ham, London.

(11) **EKCO.**

H.T. Adaptor Type M1.—This is for use on a D.C. supply circuit only, and fits into the standard lamp-holder. Its overall dimensions are no greater than the household electric lamp; it forms a very compact and useful unit for the supply of H.T. current to a receiver with a limited number of valves. Voltages of 60, 90 or 120 can be obtained with different units, and a maximum current of 10 milliamps is available. The price of this unit is only 17s. 6d.

A comprehensive range of battery eliminators for both A.C. and D.C. supply circuits are manufactured by this firm, and a special model for D.C. only enables H.T., L.T. and grid bias to be obtained from one unit.

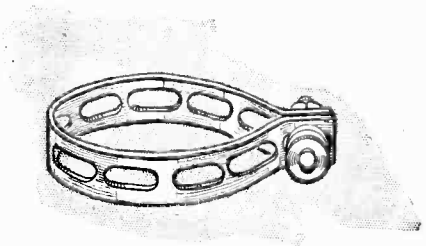
Stand to Stand Report.—

Mains Receiver.—An "All from the mains" receiver dispensing with an outside aerial is made a special feature, and embodies a high-frequency amplifying valve, a detector and two stages of low-frequency amplification. A switch enables both short and long wavelengths to be received without changing coils.

E. K. Cole, Ltd., Ekco Works, London Road, Leigh-on-Sea, Essex.

(259) EMACO.

A large selection of highly attractive cabinets of all types are shown, not only for the purpose of housing wireless receivers but also for fitting to existing reproducing units. The receiver cabinets present a very attractive appearance, some models having an oval opening in the front. The loud-speaker cabinets may be obtained completely fitted with internal sound chamber, and are very well finished. All that remains to be done is to introduce one of the many loud-speaker units now upon the market and a handsome cabinet type of loud-speaker is then available at comparatively small expenditure.



Earth clip made from Electron "Simple-Strip."

High quality filament resistances and similar components are also shown, but probably the most interesting component are the new E.M.C. coil, complete with screen, which is designed on thoroughly scientific lines.

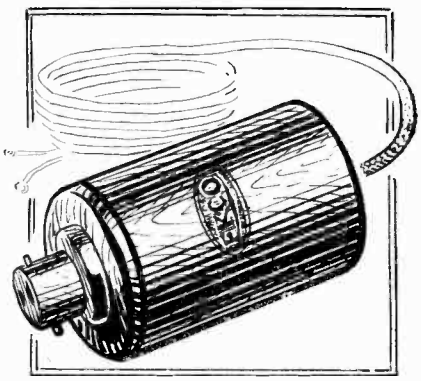
Enterprise Manufacturing Co., Ltd., Emaco House, Grape Street, Shaftesbury Avenue, London, W.C.2.

The Ekco Combined Battery Eliminator H.T., L.T. and grid bias for D.C. mains.

(244) EMPIRE ELECTRIC.

An exhibit which is completely unique in the show is a special station locator, consisting of a map, a compass and a locating device. By making use of this instrument anybody, no matter in what part of the country he lives, can at once ascertain the exact direction of any broadcasting station, thus enabling him to rotate his frame aerial or his portable receiver to the correct position for picking up any given station; the whole is enclosed in a unique case and can easily be slipped into a breast pocket. Needless to say, a high-class portable receiver of thoroughly sound design is shown. It is very interesting to note that the weight of this receiver is only 15 lb., thus bringing it into the class of a true portable which can be carried a considerable distance without fatigue. Batteries and loud-speaker are included in the receiver, and at the modest price of 10 guineas it is good value for money. A de luxe model can be obtained for 12 guineas.

Empire Electric Co., 203, Euston Road, London.



Ekco H.T Battery Adaptor.

(118) EMPRESS.

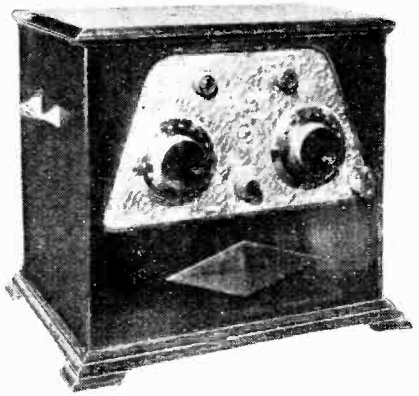
"Classic" 4-valve Receiver.—A combination of high-frequency amplifier with neutralised transformer, detector and two transformer-coupled L.F. stages. There is a wavelength change-over switch and another switch for eliminating the last valve. Both L.F valves are of the low impedance type. The increasingly popular "edgewise" dials are used, and they are mounted side by side so that tuning may be carried out with two fingers of one hand. As the condensers may be set so that they are "in step" over a large part of the tuning scale, it is almost correct to say that there is a single control only.

The same firm produces another and cheaper receiver having the same valve combination but with a "gang" condenser for tuning both circuits. It is priced at £13, without accessories, but including royalty.

Empress Radio and Elec. Co., 105, Union Street, Stonehouse, Plymouth.

(94) EUREKA.

A new product on this stand is the Orthodyne five-valve receiver. This is entirely self-contained and is intended for home use. The finish is excellent and may be had in oak or mahogany. The loud-speaker, which is housed in the lid, is a Celestion, and is surrounded by the frame aerial. Single dial tuning is adopted and the H.F. transformers are interchangeable for long and short waves.



Four-valve Ekco Receiver H.T., L.T. and grid bias from D.C. mains.

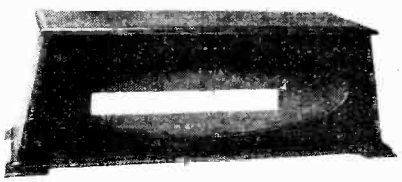
A new condenser, the "Loga-cyclic," has been developed to obtain greater spacing of the more powerful stations at the upper and lower limits of the broadcast band, and other special condensers are on view. The "Loga-cyclic" is supplied with an ebonite coupling sleeve for ganging, and the end moving vane is independently adjustable for balancing purposes.

"Eureka" transformers and the "Ortho-cyclic" condenser are again shown.

The Portable Utilities Co., Ltd., Eureka House, Fisher Street, London, W.C.1.

(154) EVER-READY.

Power Type High-tension Batteries.—This is a new and popular size of H.T. battery, the 64-volt model, selling at 17s. 6d. The whole of the top of the battery is sealed against ingress of moisture by a waxed sheet of cardboard, and in order to obtain contact with a wander plug this cardboard has to be punctured.



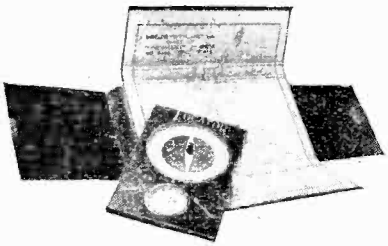
The Supreme cabinet, made by the Enterprise Mfg. Co.

The idea is obviously a good one in that it protects the purchaser from obtaining batteries that have already been used for demonstration, etc.

Grid Bias Batteries.—These are now made tapped in 1½-volt steps up to 16 volts. This is an advantage where power valves are concerned, as in the past it has been necessary to connect two smaller batteries in series.

Stand to Stand Report.—

A feature of importance is the metal casing of Ever-Ready high-tension batteries which, for home use and especially



Station Locater. One of the unique features of the exhibition made by the Empire Electric Co.

for export work, is of importance for protection against moisture.

Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

(167) EXIDE.

6-volt Accumulator Type 3 CZ4/1GL.—This 6-volt accumulator consists of a cleanly moulded container divided into three compartments, and is provided with a removable lid. The assembly is carried out on similar lines to the self-starter batteries used in cars, and will stand up to a fairly heavy discharge.

H.T. Batteries.—A novel feature of the new high-tension accumulators is the employment of 10-volt units from which batteries of 20, 40 and 60 volts can be readily assembled. Each unit consists of a glass container having five separate compartments, and the plates are constructed to have a long life under normal working conditions. These units can be obtained tapped at every two volts should it be desired to employ an accumulator in place of the usual dry battery for obtaining grid bias.

D.H.G.—The extensive use of low consumption valves necessitates the employment of an L.T. accumulator capable of being discharged at a very slow rate without deteriorating or showing signs of internal sulphation, and the D.H.G. type of 2-volt cell would seem to be admirably suited for this purpose. The plates are constructed on the "mass" principle and are very thick. A slow discharge of 1,000 hours will not damage the accumulator, and in addition this can be left charged for a period of six months without sulphation or other detriment. It naturally follows that an accumulator of this type cannot be charged at the normal rate, and certain precautions are necessary in this direction. The charging rate for these special accumulators is marked on the instructional label, and must not be exceeded, otherwise the working life of the cells will be adversely affected.

Unspillable Accumulators.—The increasing popularity of the self-contained portable sets would not be so marked if a suitable L.T. battery were not available, and the wide range of cells specially constructed for this purpose proves that the makers of "Exide" batteries realise the potentialities of this type of receiver.

Special crates and carrying devices for all types of H.T. and L.T. batteries are provided, and by the use of these the burden of carrying the batteries to the charging station is considerably lessened.

Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester.

(116) FELLOWS.

"Little Giant" 2-valve Receiver.—There have been interesting changes in the design of the majority of Fellows receivers, including that of this particular set. The increasing need for selectivity seems to have been fully realised; a coupled aerial circuit, in conjunction with bottom-bend detection, tends to reduce damping. Grid bias for

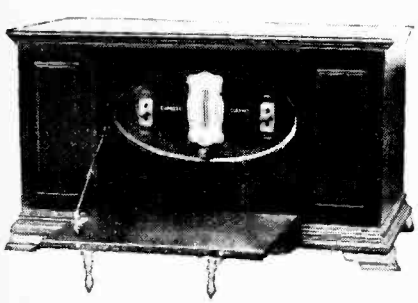
The Empress Concert Receiver, with "gang" control.

the detector valve, which is of the high-magnification type, is obtained by utilising the drop of potential across its rheostat, which is connected in the negative L.T. lead. Coupling to the detector is by means of a resistance of high value, and reaction is capacity-controlled. The tuning condenser is of the logarithmic type, and a metal panel is fitted to this and all the new models.

"Premier" 4-valve Receiver.—The general arrangement is similar to that of the two-valve set, the same detecting and L.F. coupling device being used. The H.F. valve is coupled by interchangeable transformers, balanced by means of a fixed neutralising condenser. The aerial-grid transformer is also of the plug-in variety, and there is a selector switch for three or four valves. A special base for the batteries is supplied as an extra. Both L.F. stages are resistance-coupled.

Cabinet Loud-speaker.—A reed drive transmits vibration to a "doped" fabric cone, which is in tension. The instrument is of particularly neat appearance, and is supplied in black crystalline finish, as well as in oak or mahogany.

Fellows Mfg. Co., Ltd., Cumberland Avenue, Park Royal, Willesden, N.W.10.



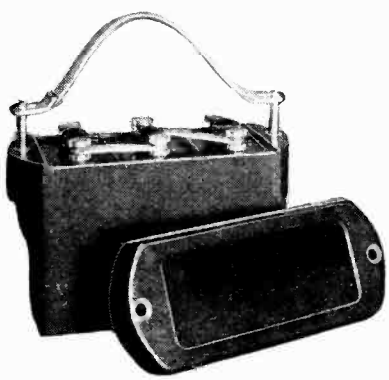
The Empress Classic Four-valve Receiver has edgewise condenser dials placed side by side.

(142) FERRANTI.

It is not out of place to draw attention again to the new type of Ferranti

Exide D.H.G. Accumulator for very slow discharge at a low rate.

audio-frequency transformer, the A.F.5. Still maintaining the 1 to 3.5 primary to secondary ratio, the primary inductance is 120/150 henries when passing 4/2.5 mA. Response curves show that with a 17,000 ohm four-volt valve of the 0.1 class an amplification of 50 is obtained throughout the larger portion of the audible scale. The droop in the curve at 50 and 8,000 cycles is only 8 per cent., quite an indiscernible amount. Although the curves terminate at 50 cycles, it is understood that at as low a frequency as 32 cycles the amplification still remains at about 60 per cent. of the maximum, showing the performance of this transformer to closely approach perfection. As with other Ferranti transformers, the practice of internally bridging the primary with

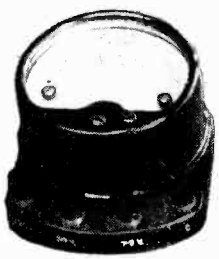


Exide 3CZ4/1GL 6-volt Accumulator.

Stand to Stand Report.—a small by-pass condenser is retained. An opportunity is afforded at this stand of examining the unique construction of Ferranti transformers.

Radio Meters.—The introduction of a range of first-grade meters at moderate prices has long been awaited by the radio industry, and the new Ferranti meters will contribute largely to the obtaining of improved reception by revealing errors in the working conditions of valves. Equal in external finish to high grade instruments the new meters are fitted with D'Arsonval jewelled movements, a unique design of magnetic circuit, a fuse to protect the winding and, in the case of the three-range instrument, a switch which in changing the scale alters the external circuit connections. External short circuits are avoided by using moulded cases. A comprehensive range of milliammeters and voltmeters are sold at the low price of 30s., and the descriptive pamphlet giving types and sizes is well worth securing.

Permanent Trickle Charger.—Unheralded, an entirely new form of battery charger has made its appearance in the



One of the new low-priced Precision Meters of Ferranti.

Ferranti range. Little technical information is available although it is understood that the rectifying unit is of the dry type and at the same time indestructible, as evidenced by the fact that access cannot be readily obtained to the interior. It has no valves to burn out, chemicals to renew, or vibrating parts to get out of order. The charging rate is 0.5 ampere.

Ferranti Components.—It is interesting to observe that bridging condensers and anode resistances, together with specially designed low-frequency chokes of large current-carrying capacity, as well as a loud-speaker of the horn type, are new Ferranti products making their first appearance at this Exhibition.

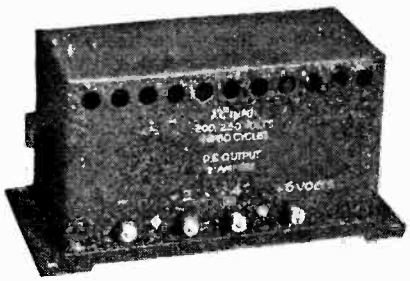
Ferranti, Ltd., Hollinwood, Lancashire.

(81) FORMO.

Formo-Densor.—This component provides a means of varying the capacity between small limits in a coupling condenser. The dielectric is mica, and the constructor will find many uses in which a slight adjustment of capacity, where he has hitherto used a fixed condenser, is of importance.

Illuminated Condenser Dial.—When receivers are operated in a dark corner of a room this condenser dial, behind which is a small flash lamp bulb operated from the L.T. battery, will prove of value. A semi-transparent ivorine scale is read through a small window, and a template is provided so that the correct-shaped hole can be cut in the panel.

Ganged Log Condensers.—Logarithmic condensers provide the only proper means of simultaneously tuning two or more circuits, and so as to arrange for the ganging of separate single condensers a small universal joint giving slight flexibility to the drive can be supplied. This is considerably cheaper than purchasing a built-up ganged condenser.



The Ferranti Battery Charger embodying a new type of dry rectifier.

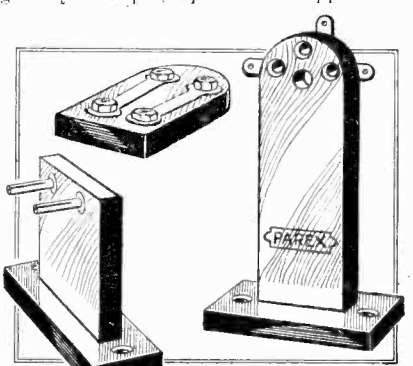
Individual Ganged Condenser.—The unique design of this instrument in which there are three separate condensers is such that, although the three sets of moving vanes are controlled by the centre vernier dial by means of a linking arm, individual adjustment can be made to each condenser, if necessary, to ensure their remaining in step.

The collapsible aluminium screening box to contain all the components for a high-frequency stage will appeal to those who appreciate that stability is not only obtained by neutralisation of the valve capacity.

The Formo Co., Crown Works, Cricklewood Lane, N.W.

(140) G.E.C.

6-valve Stabilised Receiver.—Duplicate H.F. equipment to cover the long and short broadcast wave range is a feature of this stabilised receiver, consisting of two H.F. stages, valve detector, and three L.F. stages. The multi-contact wave change device is cleverly designed, and consists of double springs for every contact, engaging on short pins projecting from the H.F. screening boxes. By means of a breakjack the output from a gramophone pick-up can be applied to the L.F. amplifier, which, by the way, would seem to be a feature of all "Gecophone" sets this season. Two forms of volume control are fitted, one regulating the filament current to the H.F. valves and the other a potential divider in the L.F. amplifier.



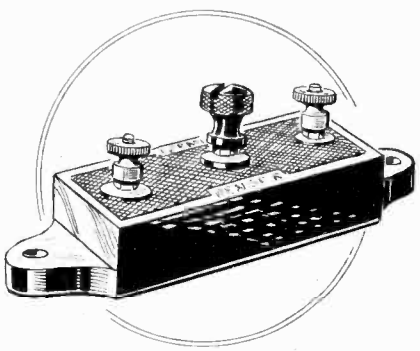
The new Parex Screened Valve Holder seen at the stands of several wholesalers.

5-valve Portable.—This is an entirely new set incorporating two H.F. stages tuned by means of two dials. A two-position range switch changes over from 250-650 to 740-2,200 without recourse to the changing of plug-in coils. The L.F. stages are transformer-coupled, the output operating a cone loud-speaker built in the cabinet.

Combined H.T. and L.T. Battery Charger.—An entirely new accessory is a compact electrolytic rectifier giving output suitable for H.T. and L.T. battery charging. The H.T. rectifier consists of four small cells for full-wave rectification, and the L.T. output is obtained from a three-electrode electrolytic rectifier of slightly larger dimensions in a single container.

Banks of H.T. batteries are also to be seen fitted with suitable electrolytic rectifiers so that the batteries can be readily put on charge.

Cone Loud-speakers.—The diaphragm and drive of last season's "Standard"



Formo-Densor: Small-capacity Variable Condenser with mica dielectric.

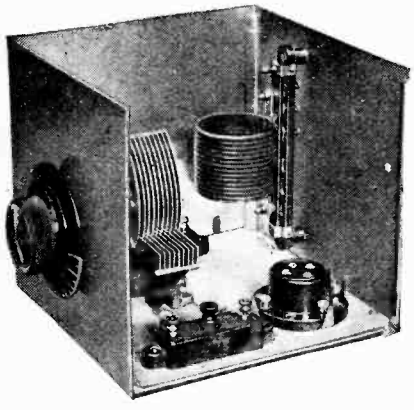
cone loud-speakers are now available in other mountings. One convenient form is an arrangement for either hanging from a picture rail or for standing vertically, and another is fitted in a walnut fire screen, the increased dimensions probably improving the acoustic properties. In the cabinet range, owing to the increased available depth, a deeper cone can be accommodated, the sides being actually curved so that the diaphragm is conoidal in shape. The drive and mechanism is of the balanced armature type.

Osram Valves.—A new valve of the super-power type has been added to the 2-volt Osram range having an impedance of 3,000 ohms and the relatively high amplification factor of 3.5. This result is obtained by large filament surface area, the filament being long, in the form of a "W," and passing a current of 0.4 amperes. Other new valves are the 4-volt series D.E.L., D.E.H., and D.E.P.410.

As a guide to the home constructor a

Stand to Stand Report.—receiving set is shown using the new Osram screened valve, type S625. The tuning inductances only are in metal boxes, though screening for the tuning condensers and wiring results from placing the condensers in the recesses between the metal boxes. A pamphlet is available giving full information concerning this valve and showing in a circuit diagram exactly how to use it.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.



Formo Collapsible Screening Box for a stage of H.F. amplification.

(69) GAMAGE.

Remote Control Relay.—This relay is intended for use in receivers embodying a remote control circuit. Current is consumed only at the moment of operating the relay, and no wasteful drain is therefore imposed on the battery. The switch is enclosed in a mahogany box and all brass contacts are heavily lacquered.

A.W. Gamage, Ltd., High Holborn, E.C.1.

(66) GAMBRELL.

3-valve Mains Receiver.—The Cabinet three-valve receiver has been designed to work entirely from the house mains, two models being available, one for D.C. mains and the other for A.C. mains. The receiver is totally enclosed in a handsomely finished cabinet constructed from various Indian woods. The receiver embodies a high-frequency amplifier, a detector and one stage of low-frequency amplification; selectivity, simplicity of operation and quality of reproduction have been given preference over sensitivity.

The D.C. mains model can be obtained with an additional stage of L.F. amplification, and a switch is provided to enable three or four valves to be brought into operation. When the switch is in the three-valve position the first L.F. stage is put out of circuit, the last valve being used under all conditions as the output valve.

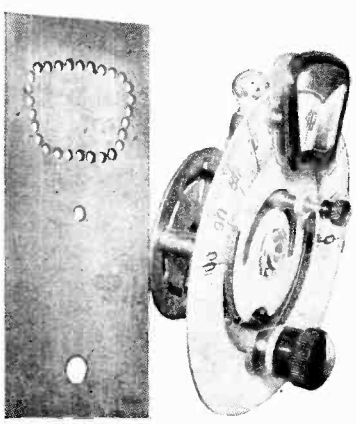
Inductance Coils.—All Gambrell coils can now be obtained with a tapping brought out from the electrical centre of the coil, thus enabling their employment in neutralised tuned anode circuits where a centre tapping is required. It is interesting to note that since the first coil was made 15,000,000 of the small strips spacing each layer have been used, each one having been assembled by hand.

Buzzer Wavemeter.—This wavemeter has been designed to meet the requirements of experimenters who desire an accurately calibrated instrument for research work. A switch enables the buzzer to be put in or out of use as the occasion demands. The new Gambrell buzzer is incorporated, and when the most suitable adjustment has been found will remain constant over a long period.

The instrument can be supplied with coils and charts to cover wavelengths of from 20 metres to 7,000 metres, and each coil is separately calibrated. The price of the wavemeter type D with two calibrated coils is £5.

Heterodyne Wavemeters.—In many respects similar to the buzzer type of wavemeter but embodying an oscillating valve. Calibrated coils to cover wavelengths of from 50 to 7,000 metres can be supplied with this instrument.

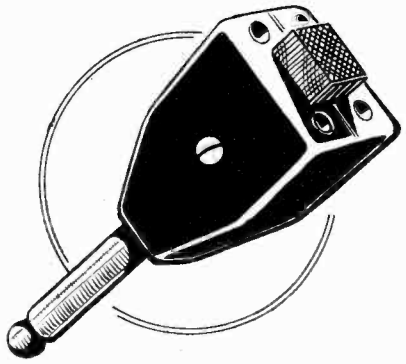
Gambrell Bros., Ltd., 76, Victoria Street, London, S.W.1.



Formo Illuminated Dial. On the left is a template for cutting away the panel.

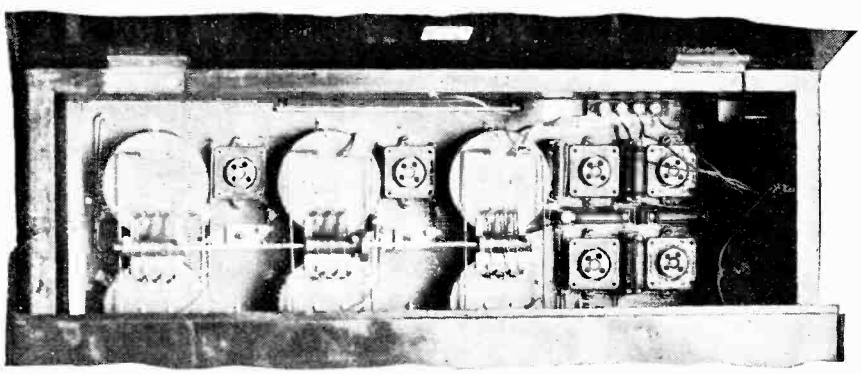
(45-48) GENERAL RADIO.

The standard two-valve receiver has been completely redesigned, and includes several interesting features. The circuit arrangement comprises a regenerative detector followed by a transformer-coupled L.F. amplifier; reaction is controlled by two moving coils operated through a reduction gear. Waveband change is by means of a switch which eliminates a part of the aerial coil for short-wave reception.



A useful plug, the tags being released by a plunger. A new G.E.C. product.

The valves are of a new type, having double "V" filaments with an external connection. When one filament is broken, or when its emission fails, the other may be put into circuit. The consumption is slightly over 0.1 amp at about 1.4 volt. The holders are of interesting design,



The Wave-change Switch fitted to the H.F. intervalve coupling of the Gecophone Six-valve Receiver.

with spring contacts to the pins and a single-turn helical phosphor-bronze spring as a shock-absorber. There is no solid dielectric between the pins.

The provision of a new two-fluid primary cell as standard L.F. equipment may be regarded as revolutionary. A zinc electrode is contained in a porous pot, which is in turn surrounded by a carbon plate, the whole being fitted in a moulded case. The cell is re-charged with two solutions prepared by dissolving tablets in tap water, and a new zinc (which is, of course, consumed during the process of discharge) is supplied with each charge. The title of "Filonator" is applied to this cell, which is sold separately.

The loud-speaker, with a 4-inch metal cone, is included in the cabinet, on the front panel of which are mounted two edgewise dials (for tuning and reaction), an "on-off" switch, and a wave-change

Stand to Stand Report.—switch. Magnifying glass windows facilitate the reading of dial settings.

General Radio Co., Ltd., 235, *Regent Street*, W.1.

(235) GILLAN.

Those who are in search of a really high-class receiver, which at the same time is relatively inexpensive and tastefully designed in the matter of external appearance, might well consider a visit to this stand. A large number of high-class models are shown, from the small and inexpensive one-valve set to the large "Monodyne 4" receiver. In addition, a soundly constructed portable containing an internal loud-speaker built on novel lines should not be missed. Various other components, such as the Gillan "Charge Adapta" for charging wireless batteries from the lighting system of motor cars, should also be examined by the visitor.

Gillan Radio-Electric, Ltd., 64, *High Holborn, London, W.C.*1.

(78) GOTTLIEB.

Instrument Wires.—A good selection of all types of wire is demonstrated in plain, enamelled, cotton and silk coverings. Those who wish to wind their own coils, chokes, etc., should find interest in this exhibit.

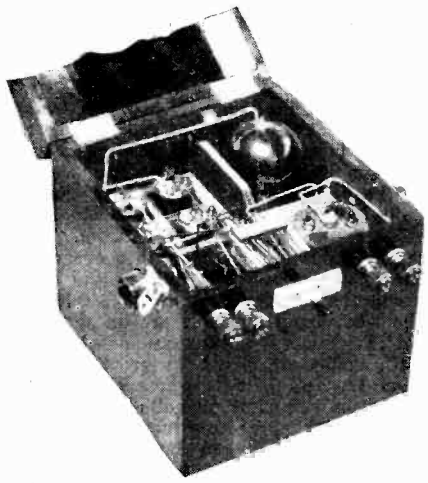
Xtratone Plus Valve Unit.—This is a device for quickly incorporating a further stage of L.F. amplification in an existing receiver. It takes the form of a small 3-inch cylinder, with four pins in the base to plug into the valve-holder of the last valve of the set. Two valve-holders are placed at the top of the unit, and by inserting valves in these a further stage of resistance capacity coupling is added without altering the wiring of the set.

J. L. Gottlieb and Co., Ltd., 89, *Upper Thames Street, London, E.C.*

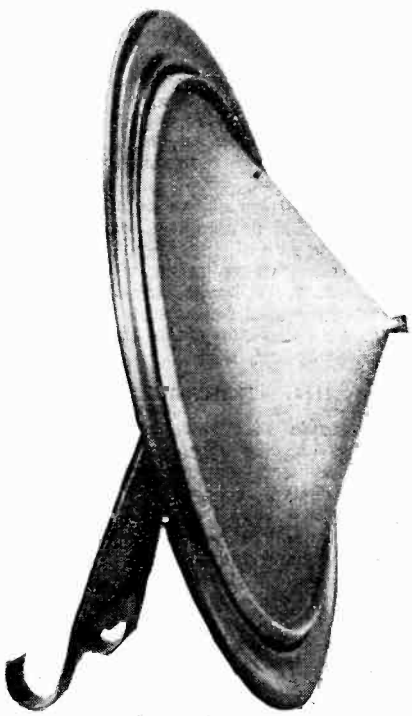
(218) GRAHAM FARISH.

A very interesting R.C. coupling unit in which, by means of a special design of fitting, it is possible to mount the unit in several different ways is to be seen The anode resistance and grid leak are guaranteed by the manufacturers to be absolutely constant in the matter of resistance and are quite unaffected by climatic conditions or by the application of high voltages. It is stated that one of the tests which had been carried out was alternately boiling and then connecting across electric light mains, subsequent tests showing no change in resistance value. The standard type of grid leak selling at the extremely low price of 1s. 3d. particularly meets the requirements of the amateur owing to the fact that it is fitted with spring plungers at each end. This not only enables it to make good contact with the clips supplied by the firm, but also means that it may be used with any make of clip. Few experimenters have not been annoyed at some time or other when using leaks and clips of different manufacture in their receivers to find that the grid leak was either too large or too small for the clip. This device completely overcomes this difficulty. Anode resistances are also obtainable with spring plunger ends, thus rendering them of equal utility.

The Graham Farish Manufacturing Co., 17, *Mason's Hill, Bromley, Kent.*



A new G.E.C. product. An Electrolytic Charger for H.T. and L.T. batteries.

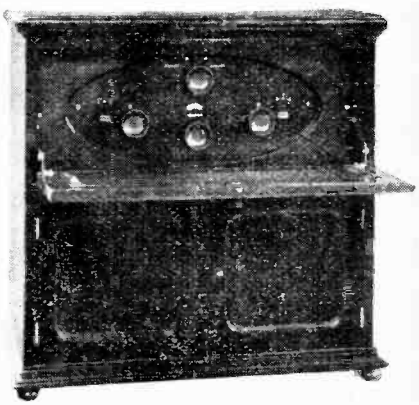


The G.E.C. Cone Loud-speaker. The clip may be used for supporting from the picture rail.

(201) GRAHAM (R.F.).

On this stand is shown a large variety of the well-known "Norbex" devices for wireless receivers, including plugs and sockets of various types, panel mounting valve sockets, and other interesting features of a similar type. Of particular interest is a universal crystal detector made to plug into any valve receiver. Supposing that batteries fail in the middle of an interesting item in the programme, by insertion of this device crystal reception can be carried on straight away on the telephones.

R. F. Graham and Co., Norbiton Engineering Works, 45 *and* 47, *Cambridge Road, Kingston-on-Thames.*



Gambrell 4-valve Receiver for A.C. mains.

(211) GRIPSO.

The chief feature of this stand is a large number of well-finished small components, including terminals, earthing clips, pin ends, wander plugs, spade tags, etc., which are justly proving very popular with the more discerning of the visitors to the Exhibition. From a close inspection of the articles shown it is evident that they have been designed as a result of considerable practical experience.

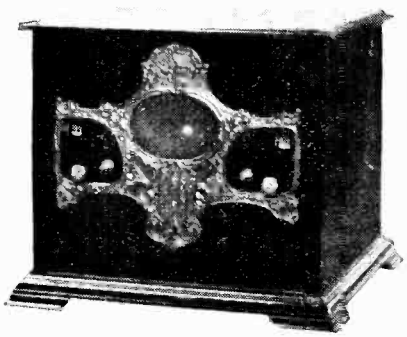
L. H. Reid and Co., 32, *Victoria Street, London, S.W.*1.

(41) GROSVENOR BATTERIES.

A large variety of high-tension batteries are shown on this stand, ranging from 108-volt high-tension units at 15s. to 9-volt grid bias batteries at 1s. 11d. These batteries are of comparatively small dimensions and are admirably suited for use in portable receivers.

On the stand is a long list of manufacturers of portable sets who make use of Grosvenor batteries in their products.

The Grosvenor Battery Co., Ltd., Grosvenor Works, Lower High Street, Watford, Herts.

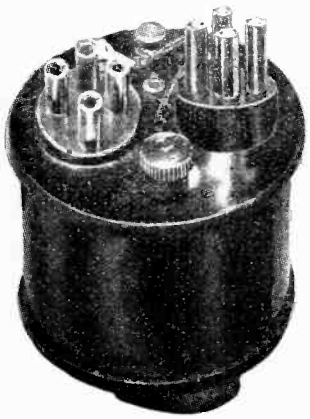


The General Radio Standard Receiver. Filament current is supplied by a new type of two-fluid cell.

Stand to Stand Report.—

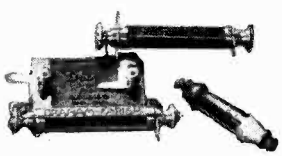
(168) HALCYON.

Portable 5-valve Receiver.—This set is entirely self contained, with Celestion loud-speaker built in; it has a very neat appearance, and the cabinet work is of the highest order. Above the grille which covers the loud-speaker is a hinged lid, which when shut conceals the recessed controls. There is only one tuning dial



Gottlieb's Xtratone double-valve fitment, whereby an extra stage of L.F. can be added without alteration to wiring.

for the frame aerial, the two high-frequency valves being choke-coupled and aperiodic. Capacity-controlled reaction gives a smooth means of controlling volume, and an interesting feature is the provision of a small red flash-lamp bulb which glows when the valve filaments are alight. By means of a low-capacity switch added inductance can be brought into circuit for long-wave tuning; it is thus unnecessary to make use of any plug-in units either in the aerial or the H.F. stages. Should greater volume of signals than that given by the built-in loud-speaker be required, an external loud-speaker may be plugged into a socket provided for that purpose. An outside aerial



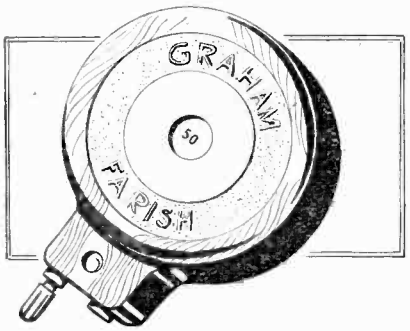
The Graham Farish R.C. Unit.

and earth may be used if desired, when, of course, the directional properties of the frame are no longer useful. The weight of the set with 48 ampere-hour accumulator is only 35 lb., and the price complete and including royalties is 32 guineas.

Halcyon Wireless Supply Co., Ltd., 110, *Knightsbridge, S.W.*1.

(112) HART.

Small-sized high-tension accumulators are of little use in ambitious receivers having two or three paralleled super-power valves in the output stage, and for heavy duty a battery with a capacity of 6,000 milliampere-hours has been produced. These are sold in 10- or 15-cell units (20 or 30 volts), mounted in a solid teak crate in such a manner that one



The Graham Farish Plug-in Coil is very substantially built.

battery may be placed on top of another in order to economise space. The cells are contained in cylindrical glass jars with sealed tops.

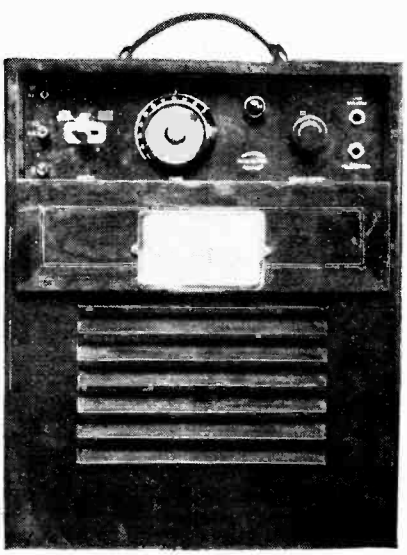
Another battery, with a capacity of from 1,500 to 3,000 milliampere-hours, depending on the rate of discharge, is assembled in glass containers having separate compartments for six cells, and internal ribs to avoid the need for separators.

*Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.*15.

(114) HART COLLINS.

"Portable Five."—A receiver of particularly pleasing appearance supplied in either an oak or mahogany cabinet. Tuning control is by a single condenser, as the two high-frequency stages are coupled by chokes which "peak" on the short waveband and act as pure chokes on long waves. "Hartley" type reaction between the detector and frame and detector is included.

3-valve Cabinet Receiver.—In the new



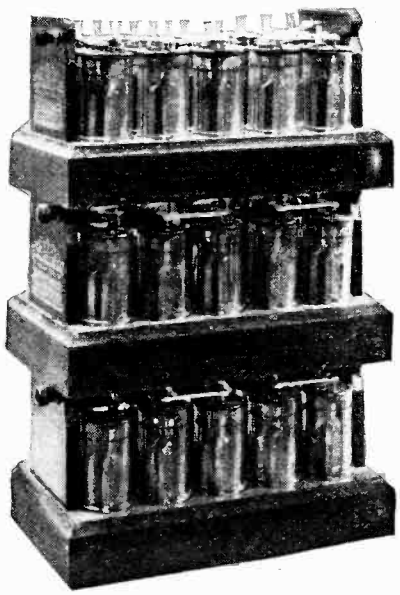
Halcyon Portable Five Receiver with single tuning control.

three-valve receiver (detector, two L.F.) provision for connection of a gramophone pick-up is provided by a jack, the contacts of which automatically convert the detector into a first stage L.F. amplifier by making a suitable change to its grid bias voltage. The change from long to short wavelengths (or *vice versa*) is made by a switch, and a special short-wave coil for waves of the order of 100 metres is also supplied. The batteries are contained in the cabinet.

*Hart Collins, Ltd., 38a, Bessborough Street, S.W.*1.

(254) HENDERSON.

One of the most interesting exhibits shown is the "Kwik" Tester, which consists virtually of a small oblong box on which are mounted a valve holder and a Neon lamp. With this instrument not only can a rapid point-to-point continuity test be made of wiring connections but instruments such as L.F. transformers and chokes can be examined in a



The Hart Large-capacity H.T. Battery.

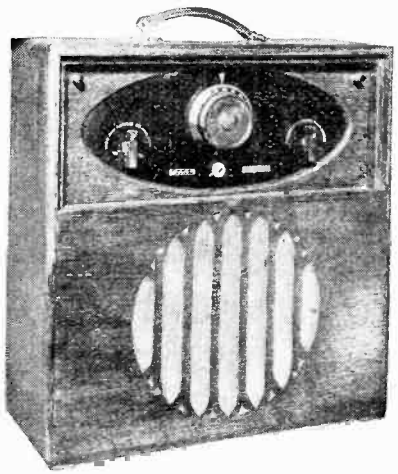
manner far more rapid and satisfactory than the old "telephones and dry cell" method. A modern valve, which, owing to its absence of filament glow, gives no visible indication of whether or no its filament has burnt out, can be inserted in the valve-holder provided and the required information immediately obtained. At the modest price of 12s. 6d. this tester should find its way into every enthusiast's wireless den. Other and more ambitious testing instruments employing the Neon lamp principle are on show.

H.T. battery eliminators suitable for D.C. mains are shown in great variety, from the No. 1 unit, which supplies an output of 12mA. at 60 volts, to the No. 4 (a), which gives two variable and one fixed voltage tappings, being thus eminently suitable for the experimenter. The A.C. unit, which has been designed by a very well known radio engineer, employs

Stand to Stand Report.—

full wave rectification, and gives an output sufficient for even the largest type of receiver.

The Henderson portable receiver, which is designed for both long and short wavelengths contains a built-in Celestion loudspeaker and presents a very handsome appearance which is in keeping with its well designed circuit. A waterproof cover is also supplied for the instrument. *W. J. Henderson and Co., Ltd.*, 351, *Fulham Road, South Kensington, London, S.W.*10.



Hart Collins Portable Five-valve Receiver.

(258) H.T.C.

Some extremely attractive receivers are seen on this stand, together with several models of H.T. eliminators and L.T. chargers which have evidently been very carefully constructed. Probably the most interesting feature of all is the two-valve set, which can be obtained complete with loud-speaker for the very reasonable sum of £6 4s. It should be pointed out that this price includes the complete outfit. Arrangements can also be made to obtain the receiver on the deferred payment system on very reasonable terms. A complete three-valve receiver on the same terms can also be obtained, and the moderate price of 8 guineas is in its favour.

The Hart Collins Cabinet Three with enclosed batteries and provision for 100-metre reception.

The H.T. Electrical Co., Ltd., 2, *Boundaries Road, Balham, London, S.W.*12.

(148-149) IGRANIC.

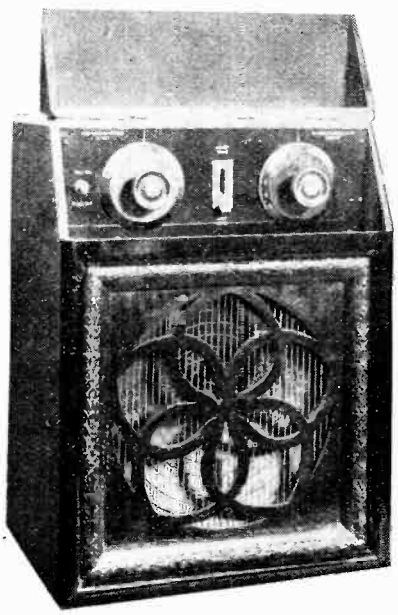
L.F. Transformers.—Three types of L.F. transformers are prominent among the new components manufactured by this company: the type G, in two ratios, 3.6 to 1 and 7.2 to 1; type F, 3.5 to 1; and the metal-shrouded Super Audioformer. The lower ratio of the G type is intended for use in the first stage of an amplifier, and the 7.2 to 1 ratio in the second stage, or in the anode circuit of low impedance valves.

Micro Condenser and Balancing Condenser.—The micro condenser and balancing condenser are now made for both panel and baseboard mounting, the later type being provided with a long ebonite handle to keep down hand capacity effects. The panel mounting type is fitted with a conical metal sheath, and the spindle is in two parts joined by an ebonite link. This method of construction enables the condenser to be attached to a metal panel without first bushing the holes with insulating material.

H.F. Choke.—Low-frequency oscillation in a multi-valve set is often caused by H.F. oscillations finding their way into the L.F. portion of the amplifier, and the high-frequency choke made by the Igranic Company will prove an effective filter when included in the anode circuit of the detector valve, with the usual by-pass condenser to negative filament.

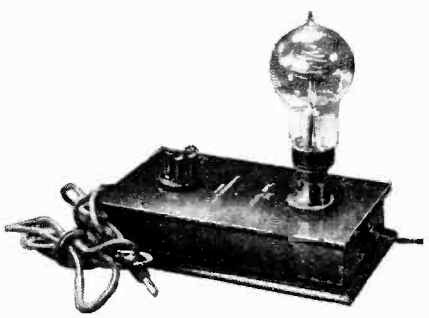
H.T. Supply Units.—Included in the range of battery eliminators for A.C. mains is an auto-charger H.T. unit which supplies the required anode potential to the valves of the receiver, and charges the L.T. accumulator when the set is not in use. A special cut-out is incorporated which switches off the charging current when the accumulator is fully charged. The advantage of this is that the unit requires no personal attention and the accumulator cannot be damaged by overcharging should this be left connected to the supply for a longer period than would otherwise be necessary. A red lamp glows when the unit is supplying H.T. and L.T. to the receiving set and a green lamp is alight when the accumulator is being charged. When the automatic cut-out comes into operation and disconnects the accumulator from the charging circuit the green lamp is extinguished. An ammeter indicates the rate of charge and discharge of the L.T. accumulator.

Supersonic Heterodyne Outfits.—When it is desired to receive distant stations under the shadow of a main broadcasting station a receiver possessing a very high degree of selectivity is called for. The supersonic heterodyne receiver enables distant stations to be received under these conditions, even though their wavelengths are closely related to that of the local. The Igranic six-valve and seven-valve supersonic outfits will therefore be of interest to all who desire to achieve this in similar circumstances. The six-valve outfit was shown at last season's exhibition, but the seven-valve outfit makes its first appearance this year, and employs a circuit similar to that used in the Neutrosonic Seven, namely, a stage of H.F. amplification before the first detector valve, a separate oscillator, second detector, and one stage of low-frequency amplification.



Henderson Portable Receiver, with Celestion Loud-speaker built in.

Short-wave Outfit.—An exhibit of outstanding interest is a kit of parts from which a three-valve short-wave receiver, embodying a high-frequency amplifier, can be constructed. The question of H.F. amplification on wavelengths in the region of 20 metres has always been one of considerable controversy, but by the careful design of the H.F. transformer and special attention to perfect neutralisation of the circuit this company have overcome the difficulty. The essential parts, consisting of two special short-wave H.F. transformers (20-40 metres), two mounting bases, aluminium screens, and three special H.F. chokes, are priced at £2 5s. The wavelength can be extended to 80 metres if desired, and for this purpose two additional H.F. transformers, which cover the wavelengths 40-80 metres, are available at 19s. the pair.



The Henderson "Kwik Tester" is extremely simple.

Stand to Stand Report.—

Daventry Portable Set.—A 5-valve portable receiver for the reception of Daventry, 5XX, employs a circuit consisting of two H.F. valves, a detector, and two L.F. stages, the first being resistance-capacity coupled and the second transformer coupled.

5-Valve Neutralised Set.—For distant reception using an elevated aerial and the usual earth connection a five-valve neutralised receiver has been designed. This incorporates two stages of stabilised H.F. amplification, and the construction is in accordance with the usual high standard linked with the name Igranic.

Igranic Electric Co., Ltd., Elstow Works, Bedford.

A popular two-valve outfit, a product of the H.T. Electrical Co.

(49) INDURITE.

The average wireless user will not be familiar with the moulding material produced by this firm. Nevertheless, in spite of the fact that it has been only recently introduced on the wireless market, it is already used by several well-known manufacturers. Its insulation resistance is high, mechanical strength is good and mouldings are exceptionally clean. The fact that it is fireproof is conclusively demonstrated, and its colour is stated to be unaffected by sunlight. Eighteen different colours are supplied, as well as grained surfaces. Two-colour mouldings may be produced at a single operation.

Indurite, Ltd., 430, New Stone Buildings, 52, Chancery Lane, London, W.C.2.

(229) J. R. WIRELESS.

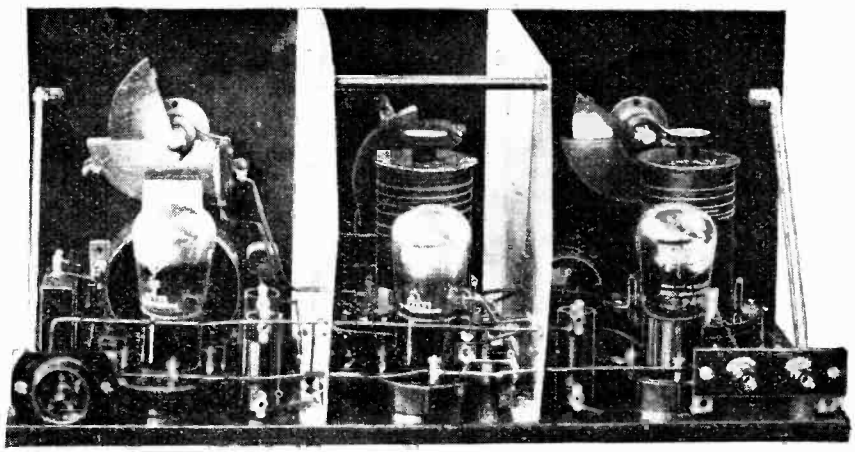
Several attractive articles are shown, including a wavetrap and a three-valve receiver. In view of the fact that electrical reproduction of gramophone music is becoming popular the visitor should not fail to examine the electrical pick-up and amplifier. A large number of plug-in coils and six-pin type coils complete with screen are also shown.

The J.R. Wireless Co., 6 and 8, Rosebery Avenue, Clerkenwell, E.C.1.

(230) JUNIT.

Those amateurs who find difficulty in soldering could not do better than pay a visit to this stand, where Junit wire, which requires no solder and no flux, is shown. This wire carries its own supply of solder in a groove on each side of the wire, and all that is needed is the touch of a hot iron and the job is done. For those, however, who prefer to make use of ordinary solder and flux, the Junit Pearpoint soldering iron is available. This device, by a very ingenious arrangement, reduces the troubles of ordinary soldering by the novice to a minimum.

Junit Manufacturing Co., Ltd., "Napier House," 24-27, High Holborn, London, W.C.1.



The Igranic Short-wave Outfit assembled.

(85) JACKSON BROS.

Neutralising Condenser.—The electrodes of this condenser take the form of concentric cylinders with a dielectric of glass. A smooth control is arranged by the inner cylinder having a fine threaded control rod to which is fixed an ebonite knob. This condenser is for baseboard mounting only. The minimum capacity is 1.5 and the maximum 20 micro-microfarads.

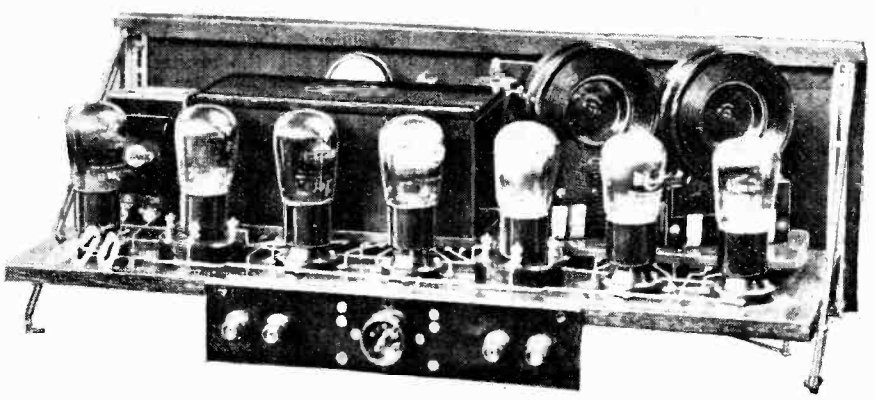
Log. Condensers.—A good range of logarithmic condensers is being shown both as single condensers and ganged multiple condensers. The spindles are all arranged with ball bearings at either end, and slow-motion devices having friction drives are fitted as optional. In the ganged condensers slight differential movement is obtained by allowing small latitude of movement between individual condensers, which can be arrested at will by a grub screw.

Jackson Bros., 8, Poland Street, Oxford Street, W.1.

(221) L.E.S.

The principal attraction shown by this firm is an interesting radio-control clock designed for switching the wireless receiver on or off at any predetermined time. Being wholesalers, most of their stand is devoted to the products of various manufacturers which are dealt with elsewhere.

London Electric Stores, Ltd., 9, St. Martin's Street, Leicester Square, W.C.2.



Receiver assembled from the Igranic seven-valve Supersonic Outfit.

Stand to Stand Report.—

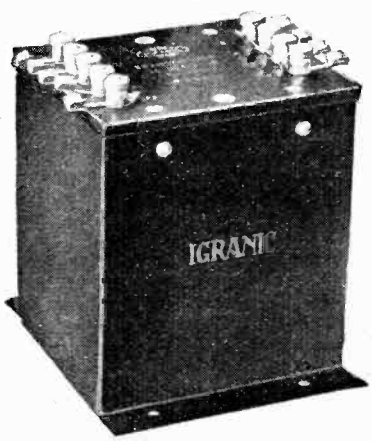
(117) LAMPLUGH.

Panel Plate.—It seems probable that the average amateur welcomes any device which relieves him of the less interesting and mechanical side of home construction. If this opinion is correct, this component should appeal to those who are about to make up simple detector-L.F. receivers. It comprises a tuning condenser, tuning unit with switch to short-circuit the long-wave section, and a swinging reaction coil. These components are mounted on a nicely-finished oval metal plate (gilt or silvered) measuring 8in. by 4in. This may be mounted on a wooden panel in the easiest possible manner, as the plate itself serves as a drilling template.

Auto-charger and H.T. Battery Eliminator; an Igranic product.

An excellently finished but low-priced two-valve set selling at £6 5s., with royalty included, is also exhibited. The above-mentioned panel plate is used in its construction.

Lamplugh, Ltd., S. A., King's Road, Tyseley, Birmingham.



Igranic Power Transformer for Battery Eliminators.

(105, 106) LANGHAM.

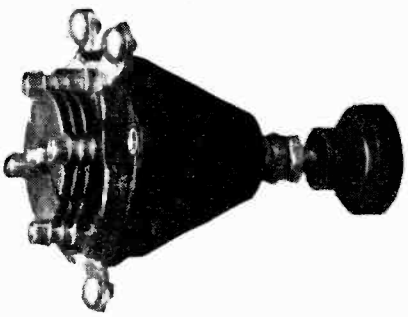
The Transatlantic Portable.—A good example of the increasingly popular 5-valve self-contained receiver. It includes two semi-aperiodic high-frequency amplifying stages of special design. There is thus a single tuning control only, the condenser dial being of the "edgewise" type. The built-in loud-speaker is a Celestion, and waveband change is by means of a simple switch. In fact, the designers have made every effort to avoid unnecessary complexity. A phone jack is fitted, whereby the loud-speaker is automatically cut out of circuit. The set is contained in a well-made leather case and weighs only 27 lb. complete. A somewhat similar model, but with four valves, is also produced.

The glass-enclosed receivers exhibited by this firm at last year's exhibition attracted considerable attention, and a complete range of improved models is now shown. The five-valve set (2 H.F., det., 2 L.F.) is a particularly good-looking instrument, being mounted on a pedestal base, standing some 3ft. high, and containing a Celestion loud-speaker and all batteries. Interchangeable screened aerial-grid and intervalve H.F. transformers are fitted.

Langham Radio, 9-11, Albion House, New Oxford Street, W.C.

(113) LEWCOS.

Ganged Matched Coils.—These H.F. transformers, with a linked switching device, are entirely novel. By operation of a single knob mounted on the face of a panel the necessary switching operation for transferring from one waveband to another is effected with a minimum of trouble. Two separate transformers are contained in each sealed screening case; these are mounted in line on an ebonite base, with a suitable spacing to permit of short and direct connection to adjacent sections of an ordinary "gang" condenser.

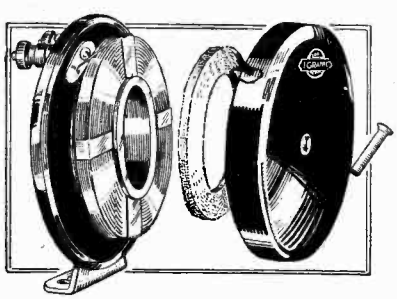


Igranic Panel Mounting Balancing Condenser.

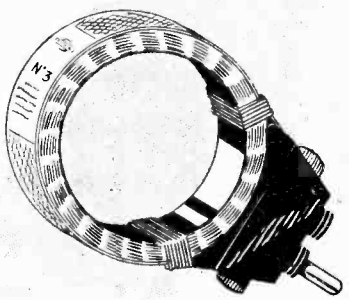
New Lewcos Coils.—These deservedly popular components have been completely redesigned, and are now wound in an efficient single-layer "pancake" form, the necessary number of single coils being assembled side by side in a moulded container. Litz wire is used, and all coils now have a centre tap socket, for which a plug with shrouded head is provided.

There are also special coils with two tappings, the position of which is suitably arranged with a view to their being used in "untuned" aerial circuits, etc.

A very wide range of Litz high-frequency cables, in various gauges and coverings, is produced by this firm, and all their deservedly popular and well-known specialities are exhibited.



Igranic H.F. Choke dissembled.

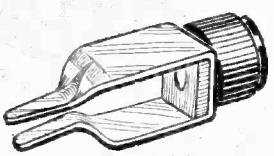


Igranic Plug-in Coil with two intermediate tappings.

London Electric Wire Co., and Smith's, Ltd., 7, Playhouse Yard, Golden Lane, E.C.1.

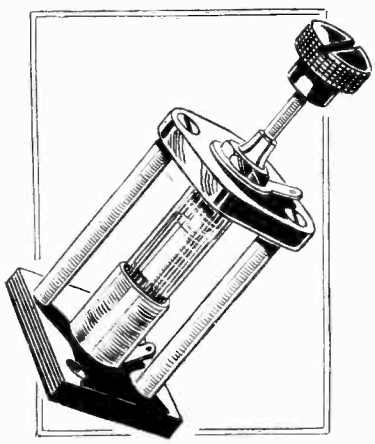
(242) LEWIS.

H.T. and L.T. chargers in great variety are a leading feature, these instruments being of an unusually compact and pleasing appearance. They are obtainable both for A.C. and D.C. mains. A unique pole finder of a chemical pattern selling at 5s. 6d. should appeal to many visitors, but possibly the most intriguing device shown is the "Quixo" battery tester. It is well known that using an ordinary voltmeter for accumulator testing a false impression is often obtained of the true condition of the battery. This instrument, however, when put in contact with the accumulator cell automatically places a suitable electrical load on the cell so that voltage



Igranic "Springmore" Wander plug.

Stand to Stand Report.—reading is obtained under working conditions. In addition the dial of the meter is marked in various colours to indicate full charge, half charge, and



Jackson's Neutralising Condenser, with glass dielectric.

so on, so that it can be used even by those devoid of all technical knowledge.

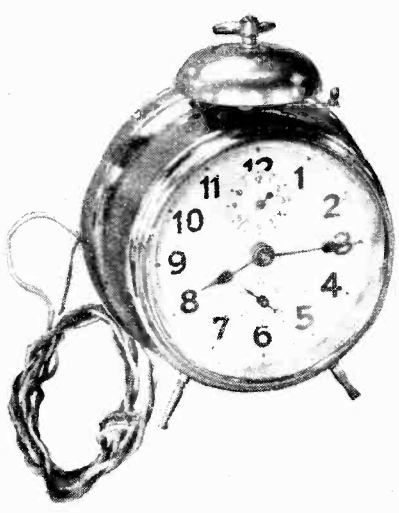
S. W. Lewis and Co., 39, *Victoria Street, London, S.W.1.*

(3) LIBERTY.

Two-stage R.C. Unit.—As the amplification from a single resistance-coupled stage is usually insufficient, two inter-valve coupling units are often employed. The values of the resistances, however, in the two stages should not be similar, and consequently the manufacture of a two-stage unit would seem desirable. Thus, in the Liberty unit the apparatus for two resistance-coupled stages is provided resulting in simplifying the external wiring and a saving in cost, the double unit being sold at 10s. 6d.

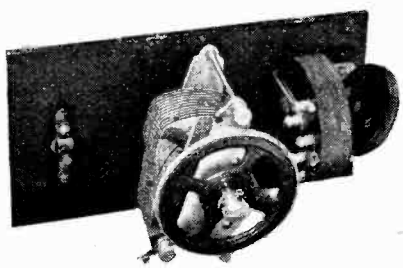
H.T. Battery Eliminators.—Making use of full-wave rectification with a U5 valve, the Liberty A.C. eliminator is capable of giving a heavy output. Ten voltage tappings give potentials up to 120 volts and three wander plugs provide three voltage outputs. An aim in design is to produce a universal instrument for use on all supplying voltages, and an internal adjustment renders it suitable for use on A.C. mains potentials for 100 to 250. It retails at £5 5s., plus cost of valve and Marconi royalty.

A D.C. eliminator is also available fitted with a similar liberal smoothing equipment to that fitted in the A.C. model. It is suitable for use on all D.C. supplies from 100 to 250 volts, the ten voltage tappings giving up to 130 volts at 10 mA. The D.C. eliminator sells at £2 5s. and is fully guaranteed.



The L.E.S. Radio Control clock.

Heterodyne Wavemeter.—An unusual



An aid to home constructors: back view of the Lamplugh Panel Plate.

yet useful accessory is a calibrated wavemeter. This instrument is fitted with three plug-in range coils covering wavelengths of 200 to 3,000 metres, calibration being indicated by chart. It is fitted with a two-volt valve operated from external batteries.

Radi-Arc Electrical Co. (1927), *Ltd., Bennett Street, Chiswick, London, W.4.*

(158 & 160) LISSEN.

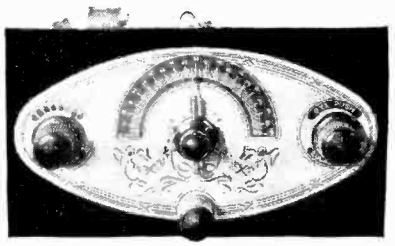
Cone Loud-speaker.—This loud-speaker, selling at the popular price of 29s. 6d., is designed with a reed drive; at the same time there is a small horn attached to the electro-magnetic apparatus, so that the sound emitted from this is reflected from the concave surface of the cone. The loud-speaker is mounted in an artistically finished wooden frame.

Headphones.—Owing to the fatigue usually associated with wearing heavy headphones the wireless listener will welcome the Lissen extra light headphones, by reason of the fact that their weight is only 4 ozs. including headband, but without cord. The price is extremely moderate at 8s. 6d.

R.C.C. Coupler.—A compact unit designed so that the grid and anode resistances are easily interchangeable sells at the popular price of 4s. The value of the mica condenser is 0.01 mfd. in all of these units.

High Voltage Mansbridge Condensers.—These are essentially designed for work with battery eliminators; they are contained in a neat moulding and are tested at 1,000 volts D.C., and are supplied in 1, 2 and 4 mfd.

Laboratory Demonstrations.—The Lissen Company have arranged some interesting demonstrations on their stand to show the more elementary student the value of grid bias, the method of depolarising in dry cells, etc. All those who have not a clear understanding as to the effect the



Lamplugh Panel Plate.

grid bias has on the high tension battery's life should not fail to visit this stand.

To show that the small Lissen L.F. transformer is watertight about twenty of these are placed in a tank of water, and can be taken out and tested at will for ingress of water. These transformers are completely shrouded in a moulding of Bakelite, and sell at 8s. 6d.

Lissen, Ltd., 18-22, *Friars Lane, Richmond, Surrey.*

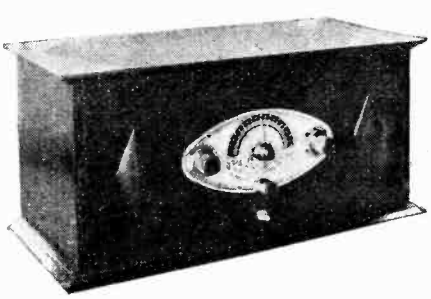
(204) LITHANODE.

Batteries for all purposes and in all capacities are shown in bewildering array. A special form of construction is adopted, with which it is claimed that vastly increased life is obtained, and also that the battery is capable of standing up to a heavy overload for a far longer period than is the case with an accumulator employing a "pasted" positive plate. One of the most interesting features is a substantial-looking double-duty battery, which is designed so that it can be used for car lighting and starting in addition to ordinary use on the wireless set, it being far less cumbersome than the ordinary type of car accumulator.

The Lithanode Co., Ltd., 190, *Queen's Road, Battersea, S.W.8.*

(220) LOCK.

The products of this firm are too well known to wireless users to need emphasis. A large selection of high-class cabinets are shown, including not only the almost universal upright panel type, but also de luxe models with fall fronts and cabinet type doors which are carried out in various woods. Cabinets of suitable



The Lamplugh Two-valve Popular receiver.

Stand to Stand Report.—dimensions for use with most of the published receiver designs may be examined. Cabinets having doors with decorated lacquer panels are worthy of special mention.

W. and T. Lock, Ltd., St. Peters Works, Bath.

(13) LONDON METAL WAREHOUSES.

Aerial Wire.—An efficient aerial contributes largely to the results obtained from any receiver, but unfortunately this portion of the receiving equipment is so often ignored. This firm provides an assortment of aerial wires from which the wireless user can make a choice. Copper or phosphor-bronze stranded wires are supplied either bare or enamelled, and, for use in cases where weight must be considered, a special aluminium stranded aerial wire is available.

Ellem Terminals.—A range of insulated terminals in two colours (red and black),

The Lamplugh Inter-stage Screen.

each terminal being clearly marked with appropriate lettering.

*The London Metal Warehouses, Ltd., Hill Street, London, S.E.*1.

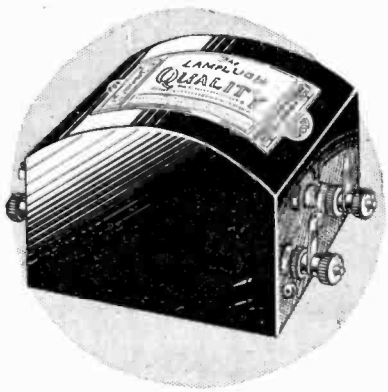
(225) LORIOSTAT.

A large variety of components were shown, including the "Maluzoto" H.T. unit, which is extremely compact and is fitted with two positive tappings. It is claimed that the output from the instrument is 35 milliamperes. The well-known "Loriostat" baseboard type of fixed-variable filament resistance is also shown. In addition, there is a very attractive show of smaller components such as coil plugs and mountings, fixed pin bases, ebonite wall plugs, phone extension boards and other articles too numerous to mention.

*A. W. Stapleton, 19a, Lorrimore Buildings, Lorrimore Street, Walworth, S.E.*17.

(93) LOTUS.

The principal exhibit is the Lotus remote control relay and loud-speaker extension system. An additional relay unit has now been developed for sets working from battery eliminators. These units and their associated plugs and jacks are well made and have obviously been carefully designed for the purpose they serve. Free use is made of mouldings.



The Lamplugh Shrouded L.F. Transformer.

The Lotus range of jacks, coil holders and spring valve-holders is again shown.

Garnett, Whiteley and Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.

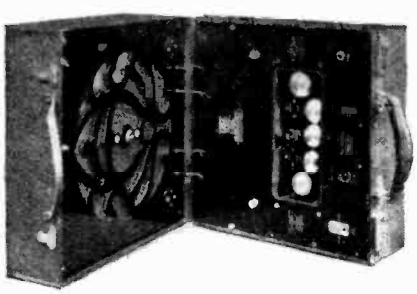
(57) M.P.A.

It is in the M.P.A. receiver that the trend in design to meet the demand for an entirely self-contained set is evidenced. Although there are no external accessories, it makes no pretence of being portable, the aim being to provide simplicity of adjustment from a single unit in the form of an attractive piece of furniture. The operating panel is recessed, and easy to manipulate, the loud-speaker being accommodated behind a grille. Styled the Transportable Three and Transportable Five, two models are available selling at 25 guineas and 35 guineas complete in every way, including batteries, valves, waterproof cover and the payment of royalties. These sets are best examined in operation at the demonstration room opposite the Addison Road Station.

*M.P.A. Wireless, 62, Conduit Street, Regent Street, London, W.*1.

(123) MAGNUM.

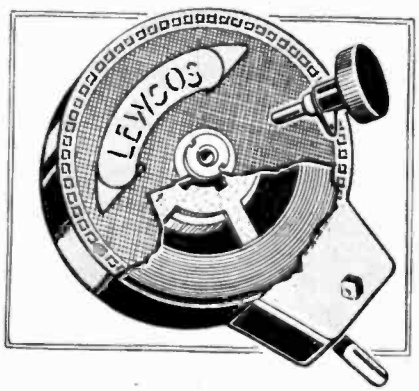
The principal exhibit on this stand is a combined gramophone and wireless receiver in a handsome cabinet. This is divided into three sections; the top contains the gramophone motor and pick-up, the middle a four-valve receiver-amplifier, and the lower compartment is reserved for batteries, records, etc. The electrical pick-up is sold separately for 35s. and incorporates a volume control which takes the form of adjustable mechanical damping.



The Langham Transatlantic Portable.

Another interesting receiver is the "Cube," which is entirely self-contained, requires no aerial and earth, and works a loud-speaker within ten miles of a B.B.C. main station.

Among the numerous components, the new R.C. coupling unit may be singled out for comment. In appearance it resembles a large valve holder; indeed, it incorporates a Magnum "Vibro" valve holder, and all resistances and condensers are contained in a circular moulded base with terminals and soldering tags marked for appropriate connection to the external circuit. The complete unit costs only 10s. 6d. Other components worth examining are the H.F. choke, a



The new Lewcos Centre-tapped coil with cover cut away to show internal construction.

calibrated rheostat for baseboard mounting and a series of multiple battery cords.

*Burne-Jones and Co., Ltd., Magnum House, 288, Borough High Street, London, S.E.*1.

(128-135) MARCONIPHONE.

The "Round Six."—It need hardly be stated that the name of this receiver refers to its designer. Indications are not lacking that this is generally (and rightly) regarded as one of the most interesting features of the Exhibition. Unfortunately, more space than is available would be required to do full justice to its many points, but, briefly, it may be stated that it has three high-frequency stages, using the new Marconi S.625 shielded valves. These are coupled by means of tuned anode circuits with astatic cells, two sets of which are mounted in screening cases; the long- or short-wave sets are thrown into circuit by operation of a switch. There are four separate tuning condensers, but as they are arranged in pairs, with adjacent edgewise dials, the set may be looked upon as having two controls, with provision for final adjustment of indivi-

Stand to Stand Report.—dual circuits. Every precaution is taken against interaction between output and input ends of the H.F. chain; although the interior of the set is visible when the lid is lifted, an electrical "seal" is provided when it is closed.

The detector operates on the anode bend principle, while both L.F. stages are coupled by resistances. A small frame, measuring about 18in. × 12in., is mounted on a bracket attached to the "input" end of the set in such a way that it may be rotated. An opportunity to test this set, which is the latest product of the Marconi-

The H.T. Battery Charger for A.C. mains manufactured by S. H. Lewis & Co.

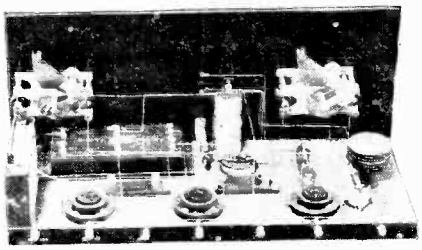
phone Co., is eagerly awaited, as a high degree of sensitivity, combined with the highest quality of reproduction, is confidently expected.

Type 51 5-valve Receiver.—This set is more or less typical of the new range of Marconiphone receivers, and embodies several outstanding features. The two H.F. amplifiers are coupled by neutralised tuned anodes, and all three circuits are tuned by interconnected condensers, with balancers for final adjustment, which are seldom required over the greater part of the tuning scale. An elaborate switching arrangement, operated by a single knob (which also controls the filaments) throws long- or short-wave coils into circuit at will. Screening is complete, and the assembly is built up on a metal chassis.

Provision is made for operating the set on batteries or mains supply (A.C. or D.C.) in a particularly ingenious manner. The filament connections, etc., are brought out to a row of small screw terminals, to which a multi-way supply cable is connected. The various alterations, such as series connected filaments (for D.C.) extra leads for indirectly heated A.C. valves or parallel connections for batteries, are automatically effected by using the appropriate type of connecting cable.

The dial of this set is calibrated in wavelengths as well as in arbitrary units, while provision is made for pencil markings showing the setting for favourite transmissions. The receiver is also supplied with a pedestal base containing either a reed-driven cone or an R.K. moving coil loud-speaker.

The type 32 receiver, with a regenerative detector and two L.F. stages, includes



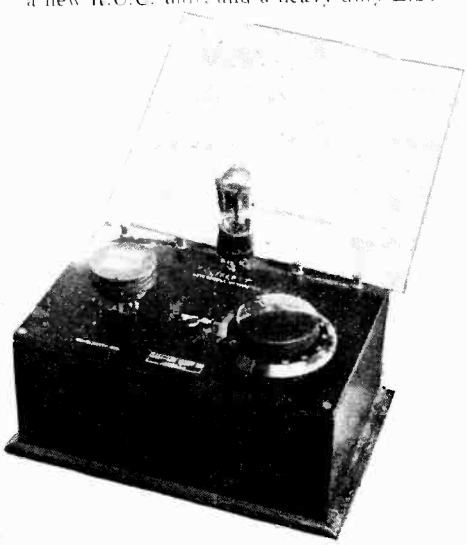
A set for the home constructor showing the application of the Liberty Two-stage R.C. Unit.

many of the novel features of the five-valve set, and will appeal to those whose requirements are less ambitious. Provision for alternative battery, A.C., or D.C. supply is retained.

R.K. Loud-speaker.—This moving-coil loud-speaker is another new and interesting production. It is mounted in a pedestal cabinet, the front of which acts as a baffle; an output single-stage amplifier, with two L.S.5a valves in parallel, is included. Models for A.C. or D.C. supply are available; the former includes a rectifying system in which the field magnet winding serves as a smoothing choke. Volume and "pitch" controls are fitted.

Components.—The new cone loud-speaker is distinctly promising, and is sold at a popular price, model No. 75 costing £3 15s. This instrument is of particularly good appearance, and has a small baffle. The cone is reed driven and its edge is practically "free," as it rests lightly on a ring of very soft felt.

Other new components include sets of parts for A.C. and D.C. receivers, astatic coils, screens for the new shielded valves, a new R.C.C. unit, and a heavy-duty L.F.



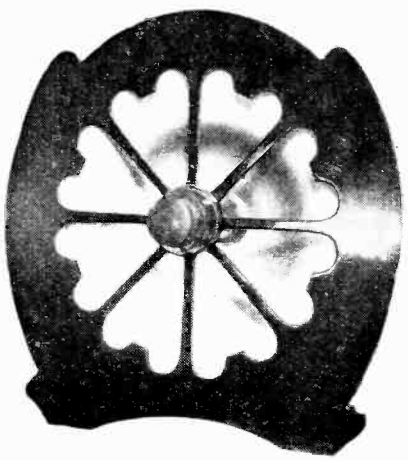
Liberty Heterodyne Wavemeter.

choke with a current-carrying capacity of 150 milliamps.

Marconiphone Co., Ltd., 210-212, *Tottenham Court Road*, *W.1.*

(120) McMICHAEL.

Screening Case.—The well-known "Dimic" coils lend themselves admirably for use as tuned-anode couplings in connection with the new screened valves, and it is not surprising that a special screening case has been produced for accommodating one of these coils, together with a Marconi-Osram S.625 valve, one end of which projects through a suitably-arranged hole. A demonstration receiver, incorporating this device, is shown. It has a single stage of H.F. amplification and a detector which may be made to function either as a grid circuit or bottom-bend rectifier, the latter will give the best selectivity, so the negligible amount of extra complication introduced by this refinement is justified in the



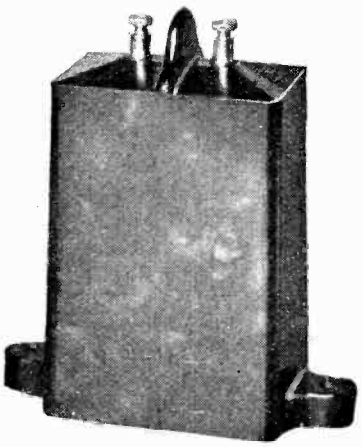
Lissen Cone Loud-speaker, with reed-drive and small horn to give added volume.

immediate vicinity of a transmitting station. The L.F. amplifier is coupled by means of a transformer. The firm issues circuit diagrams and a leaflet giving constructional information.

Supersonic Receiver.—The method of converting this receiver (built up round the McMichael intermediate frequency unit) by means of a special adaptor, giving a form of autodyne circuit, is clearly shown on a demonstration receiver.

Portable Five-valve Receiver.—The two H.F. stages included in this set are coupled by means of chokes arranged to "peak" at something under 2,000 metres, and wound in such a manner that self-capacity is reduced to a minimum, in order that the falling off in amplification on the short waves shall not be too severe. The arrangement is one which tends to simplify a receiver very considerably. Reaction is provided between the detector and first grid circuit. It is noticed that Duralumin fittings are used extensively; this accounts for the fact that the weight is less than that of the majority of self-contained sets of the same

Stand to Stand Report.—class. The appearance is particularly "clean," as no loose wires are visible; connections between the set proper and the lid, which contains the frame and loud-



Lissen 4 mfd. Mansbridge type Condenser, tested at 1,000 volts D.C. and suitable for use in eliminators.

speaker, are concealed in the supporting straps.

L. McMichael, Ltd., Hastings House, Norfolk Street, W.C.2.

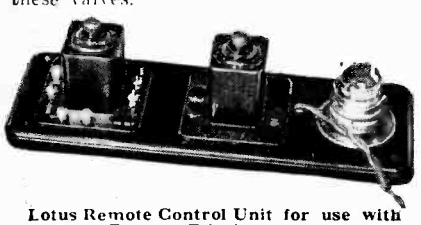
(231) MELHUISH.

A high-grade fixed condenser of a rather unusual shape selling at a really low price is one of the leading features. A vernier dial of unique construction is also worthy of more than passing attention. The makers claim that it is the first dial produced which has three speeds, and back-lash is conspicuous by its absence. This component sells at 8s. 6d. and should be examined by every set constructor. Some extremely well-designed variable condensers of the S.L.F. and square law types are also on show.

C. D. Melhuish, 8, Great Sutton Street, Goswell Road, E.C.1.

(164, 165, 166) MULLARD.

New Valves.—A visit to the valves section of the Mullard stands discloses important advances in filament construction resulting in still further economies in filament current consumption. Three new valves are to be seen for the first time, equivalent in characteristics to the P.M.3 and 4, P.M.4A, and the P.M.5B. Where in the past each of these valves passed a filament current of 0.1 ampere, it is now reduced to 0.075 ampere, a saving of 25 per cent. without change of filament voltage and yet retaining the amplification and impedances formerly possessed by these valves.

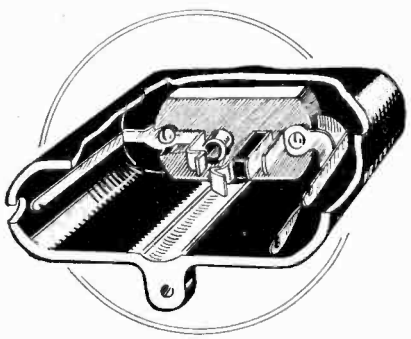


Lotus Remote Control Unit for use with Battery Eliminators.

A welcome announcement is the reduction in price of the D.U.2, a popular full-wave rectifying valve for use in A.C. battery eliminators. Formerly 30s., it is now to be 22s. 6d.

For the transmitting amateur two new valves are shown for the first time, specially designed for short-wave work. The S.W.2, suitable for an anode dissipation of 150 watts, possesses the moderately high impedance of 11,000 ohms with an amplification factor of 20, and can be used on H.T. potentials of between 1,500 and 3,500 volts. The filament passes 10 amperes at 11 volts. The other is a 40-watt transmitting valve, styled the S.W.50, has an impedance of 11,000 ohms with an amplification factor of 15, and is suitable for use with anode potentials of between 800 and 1,600 volts. The manufacturers state that both of these valves have been specially designed for operation on wavelengths down to 20 metres, and the method of assembling the internal parts permits of easy filament renewal at small cost, giving a long insulation path between the electrodes.

The introduction of a new two-volt super-power valve will be welcomed by those desirous of obtaining the best quality in their loud-speakers. The anode impedance is as low as 2,800 with an amplification factor of 3.8, giving a

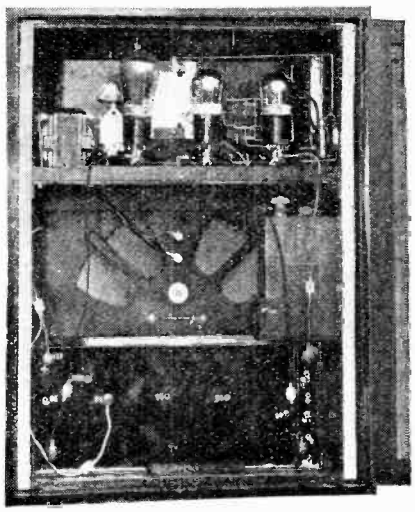


Lotus Loud-speaker Jack for remote control system.

mutual conductance of 1.0 with a filament current of no more than 0.3 ampere at 2 volts. This valve is supplied with the American form of base if required.

R.C. Unit.—The P.M. resistance-capacity-coupling unit, an entirely new component, is of unusual outline, the resistances being mounted vertically under a pressed metal cover, and supported on a cleanly moulded insulating base. The terminals, which are fitted with tinned tags, are suitably arranged for baseboard wiring. The unit is some 3in. in height and of good appearance, and sells at 17s. 6d.

P.M. H.T. Supply Unit.—For use with an A.C. supply and provided with full-wave rectification, the P.M. H.T. supply unit is very similar to that formerly marketed by the Philips Company, and therefore carries the reputation of being thoroughly reliable. A modification is the provision of four H.T. tapping points effected by potential dividing across a resistance. The top of the instrument is a clean moulding, there are no parts of the circuit exposed from which shocks



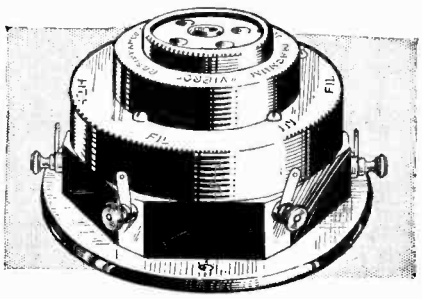
The internal assembly of the M.P.A. Transportable Three.

might be obtained, and the containing box is of metal supported on rubber feet. The price of the complete unit is £7 10s. A maximum potential of 180 volts is obtained on a load of 10 milliamperes, a reduction of about 2.5 volts occurring for an increase of 1 milliampere load up to the permissible load of 40 mA.

A trickle charger is also available using an arc rectifying valve giving a charging rate of 1.3 amperes for a 2-, 4- or 6-volt battery.

New Type Grid Leak.—A new form of construction is adopted for the P.M. grid leak of orthodox dimensions and external appearance. Internally it consists of a glass core upon which the resistance material is deposited, making actual contact with the metal end caps. The grid leak is guaranteed to be capable of passing 0.5 mA. without deterioration or change of resistance value.

As demonstrations are not permitted in the exhibition, readers are recommended to visit the demonstration quarters taken by Mullard adjoining the Exhibition at 81, Hammersmith Road. In particular, they will find the P.M. loud-speakers of interest, being edge-driven cones of rather unusual design. All Mullard products now bear a label setting out the terms of full guarantee, while twenty maintenance engineers equipped with transport and testing facilities are available to advise listeners in regard to difficulties



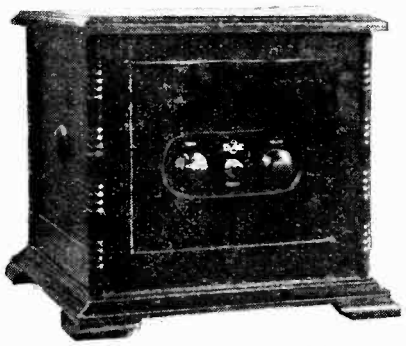
Magnum (Burne-Jones) R.C. Unit.

Stand to Stand Report.—
concerning receiver set operation, no charge being made for their services.

Mullard Radio Valve Co., Ltd., Nightingale Lane, Balham, London, S.W.12.

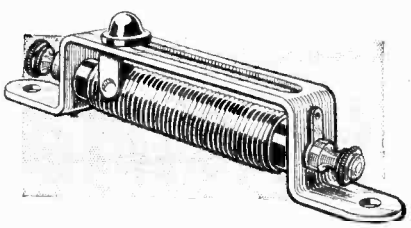
(216) MULTIFORMER.

On this stand is displayed an interesting L.F. coupling device consisting of an iron core of substantial design into which



The Magnum "Cube" Self-contained Receiver.

various units reminiscent of a small plug-in coil can be inserted. The device can in the first place be used as an L.F. transformer. One of these "coils" is, of course, the primary winding, and the other the secondary winding. By purchasing additional plug-in units at a relatively small cost either the inductance of the primary or the ratio of the transformer can be varied as desired. Thus several primary winding units are available, each having a different inductance value, and by inserting a suitable value of secondary coil any primary inductance or any turns ratio within the limits of L.F. transformer design are obtainable. Other units are obtainable which can be plugged in for the purpose of converting the coupling to either



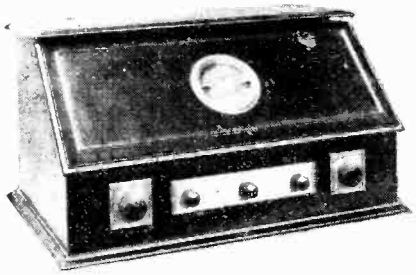
Burne-Jones (Magnum) Calibrated Resistor for baseboard mounting.

the resistance-capacity or the choke-capacity system. In addition, units are provided enabling the device to be used as an output transformer for either high- or low-resistance loud-speakers and as a choke capacity output unit

George E. Pohu, 16, Colville Road, London, W.11.

(53) NIFE.

In spite of the fact that a lower voltage per cell is delivered by nickel-iron-alkaline accumulators, there are growing indications that these cells are increasingly popular, especially where extreme durability is of first importance. For instance, they are not damaged by short-circuiting. Of special interest to wireless users is the H.T. unit, containing 24 cells and giving 30 volts. Each cell may be tapped by means of a spring clip, and the battery can be recharged at any



The Marconiphone Five-valve Receiver; adaptable for D.C., A.C., or battery supply.

reasonable rate. The cylindrical glass containers are fitted into rubber-lined depressions in a substantial moulded base.

It is interesting to learn that 20-volt 140 ampere hour batteries of this type have been supplied for ships' lifeboat emergency wireless installations.

Batteries, Ltd., Crabbs Cross, Redditch.

(55) NULLI SECUNDUS.

Five-valve Portable Receiver. This set has two high frequency stages, one being tuned and the other untuned. The latter comes first, and, as the sequence of resonant circuits is broken, neutralising is unnecessary. Reaction control is by capacity, and there is provision for an external aerial-earth system, which is optional; otherwise the set is normally quite self-contained, as a Mullard loud-speaker unit is included. A pilot lamp is mounted on the front panel, and serves

A new Moving Coil Loud-speaker: the Marconiphone R.K.

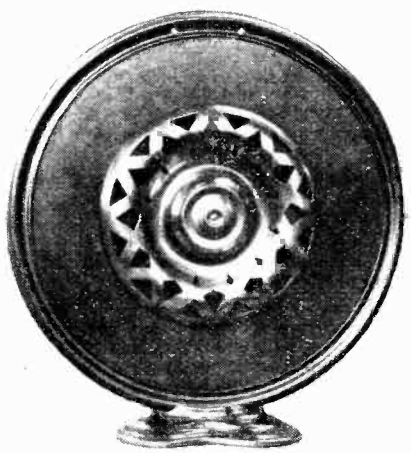
to show whether the filaments are "on" or "off." The set weighs under 40 lb. Another model, described as "Transportable," weighs about 50 lb., and is of similar design, but has a slightly longer range, due to the larger frame aerial which is used.

A demonstration model, contained in a Japanese lacquer case, has space for a 6-volt L.T. accumulator and a mains unit. It is thus suitable for use with valves having a large power-handling capacity.

C. Cresswick Atkinson, M.I.R.E., 35, High Street, Bedford.

(71) OLDHAM.

Type I.V.D. L.T. Accumulator.—A special type of slow discharge L.T. accumulator for low-consumption valves in which the positive and negative plates are each built up of three separate plates welded together. This method of construction enables the accumulator to be discharged at a very low rate over a long



The new Marconiphone Loud-speaker with free-edge Cone.

period but re-charged at the normal rate for a cell of the same ampere-hour capacity. To facilitate transport, a carrying device in oxydised metal can be attached to the glass container on which ridges have been moulded for this purpose. The cell is provided with a double top, the inner being of bitumen and the outer a polished ebonite lid. The top surface of this is about $\frac{1}{8}$in. above the sides of the glass container and can be easily cleaned. The outer lid is held in position by a knurled nut run down each stem before the moulder terminal top is screwed on.

60-volt H.T. Units.—An interesting feature of the 60-volt units is that they can be added to and built up on the expanding bookcase principle, the whole making a very neat battery assembly.

Unspillable Accumulators.—The range of L.T. batteries in celluloid cases include two types of unspillable accumulators, the OL.4 and the S.M.V7. The former is a 2-volt 14 ampere-hour capacity cell and the latter a 2-volt 20-ampere hour. These are intended for employment in self-contained and portable receivers.

Charging Equipment.—This has been designed for use in battery charging

Stand to Stand Report.—

stations, and provision is made for a number of cells to be charged simultaneously.

Oldham and Son, Ltd., Denton, Manchester.

(72-73) ORMOND.

5-valve Self-contained Receiver.—A receiver designed for portability or use where an elevated aerial cannot be erected. A handsome mahogany cabinet houses the receiver which embodies a circuit consisting of 2 H.F. valves, a detector and 2 L.F. valves. The control panel carries one tuning condenser, one reaction condenser and a three-position switch. With the switch in the uppermost position the receiver will cover a band of wavelengths of from 1,200 to 2,000 metres, and in the lower position 250 to 500 metres, the intermediate position switches off the valves. A frame aerial is included in the cabinet, and under average conditions a range of 30 to 40 miles from a main broadcasting station is obtained. On the longer wavelengths it is estimated that Daventry can be received at good loud-speaker strength up to 400 miles. A Celestion loud-speaker is housed in the lower part of the cabinet behind a fretworked front panel.

R.F. Choke and R.C.C. Unit.—The high-frequency choke is a very compact unit and is designed for baseboard mounting. This has a high inductance and can be advantageously employed in all circuits where a choke of this nature is required. The resistance-capacity-coupling unit is similar in appearance to the R.F. choke but is provided with four terminals appropriately marked. This unit is primarily intended for use in the anode circuit of high impedance valves and is supplied with a baseboard mounting attachment.

Fixed Resistors.—In certain circuits a fixed resistor of definite value can be used in place of a variable rheostat to control the current to the filament of a valve. The ohmic value of those made by the Ormond Company has been carefully calculated for the various types of valves most commonly used in present-day circuits, and a suitable resistor for practically every standard valve can be obtained.

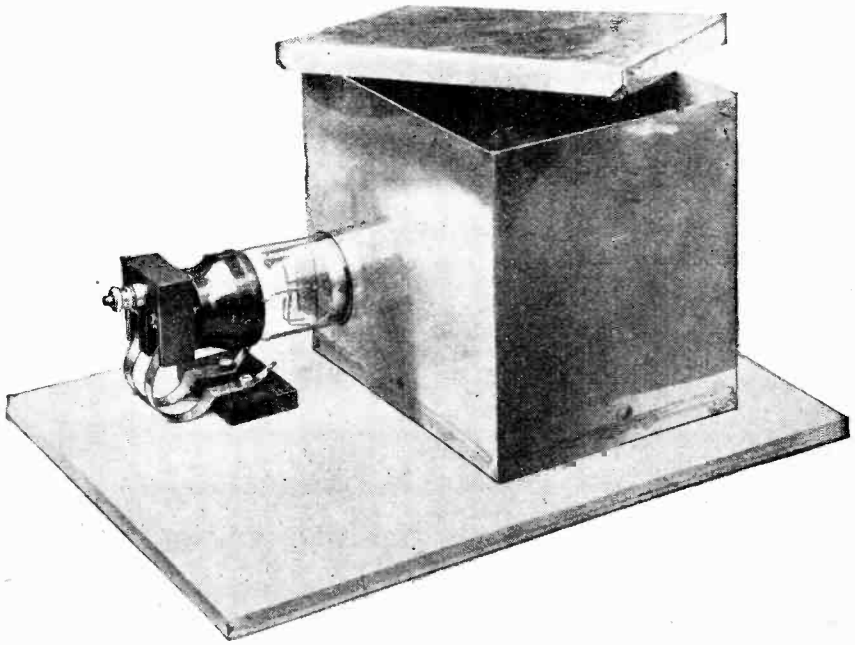
Neutrocondenser.—This has been specially designed for use in neutralised high-frequency circuits and has the very low minimum capacity of 3 micro-microfarads and a maximum of 50 micro-microfarads. It is adaptable to either panel or baseboard mounting and is provided with a long ebonite handle to reduce hand capacity effects. One complete revolution of the spindle varies the capacity by approximately 2 micro-microfarads.

Ormond Engineering Co., Ltd., 199-205, *Pentonville Road, King's Cross, London, N.*1.

(261) ORPHEAN.

Some extremely attractive loud-speakers are to be seen on this stand, both of the horn and of the cabinet type. The most attractive of them is undoubtedly the Orphean Gem, which at the very reasonable price of 30s. should prove a firm favourite. The finish of the instrument is of the same high class as the more expensive 50s. and 70s. models. The new cabinet instrument is also well worthy of attention.

*London Radio Manufacturing Co., Ltd., Station Road, Merton Abbey, London, S.W.*19.

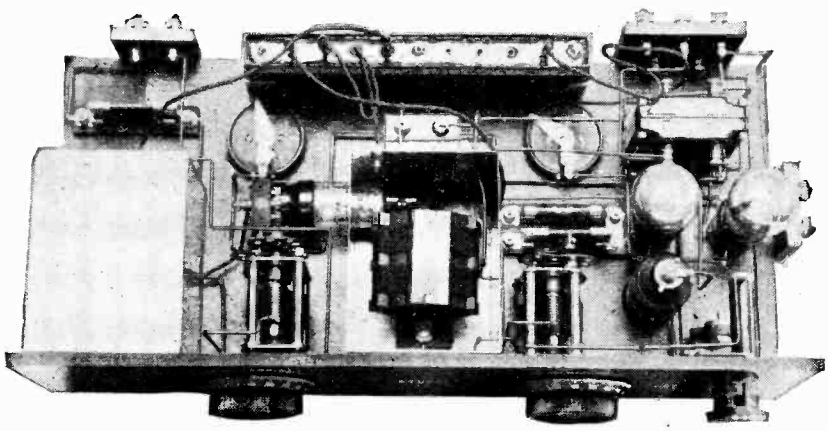


For the new screened grid valves: The McMichael screening box designed to accommodate Dimic Coils. Note the supple mount which compensates for small errors in the fitting of the valve caps.

(52) PEERLESS.

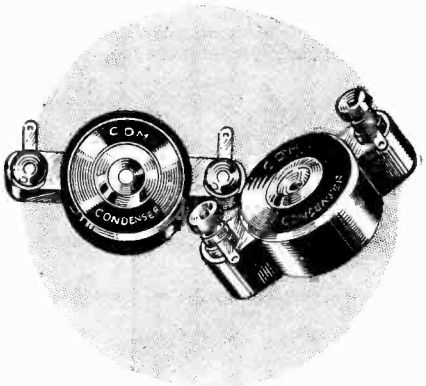
"Resonic" H.F. Transformers.—A form of high-frequency coupling device very much on the general lines of the "Everyman Four" transformers. The secondary of the medium-wave coil is wound with 27/42 Litz on a ribbed ebonite former, and the primary-neutralising section is carried in narrow slots cut in the ribs. It is thus inside the secondary, from which it is separated by air dielectric. Consequently, interwinding capacity should be low, and a high degree of amplification may be expected. A six-pin base is fitted as standard, and one of the pins is normally "dead," although it could be connected to an extra reaction winding when this addition is desirable, as it often is when grid circuit rectification is used. Alternatively, a tapping on the secondary could be joined to the idle pin. The long-wave coils are of similar construction, except that the secondary is wound with solid wire of a sufficiently fine gauge. The end plates are of Paxolin, as is the base, which is fitted with terminals for easy connection.

Neutralising Condenser.—This component is enclosed in a neat aluminium case, with a diameter of approximately 1¾in. It is of the compression type with a mica dielectric. The vane is moved in relation to the fixed plate by means of a screw operated by the control knob. The



A McMichael Demonstration Receiver showing the use of screened Dimic coils with the new shielded valves.

Stand to Stand Report.—insulation is of Paxolin, and the condenser has minimum and maximum capacities of 3 and 22 micro-microfarads

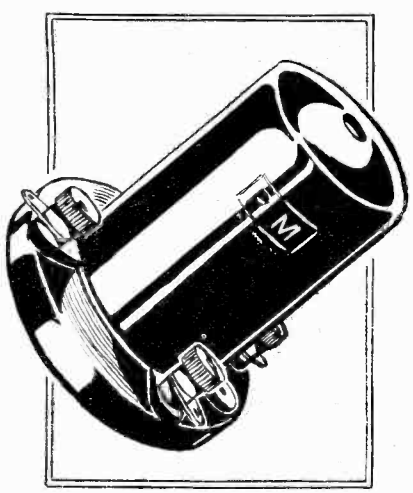


Note the novel construction of this condenser by C. D. M., Ltd. (Melhuish).

respectively. Another pattern, with a maximum of 0.0001 mfd., is primarily intended for reaction control, and is sold at the same price (2s. 6d. for panel mounting and 3s. with baseboard attachment).

Filament Resistances.—The new rheostat for baseboard mounting is of particularly sensible design. The former, on which the resistance element is wound, is bent to a semi-circular shape, the contact arm being fitted with an operating knob. It occupies a minimum of space, and is suitable for use with all modern valves which do not require constant adjustment of filament brilliancy. The well-known Peerless rheostats, of the panel-mounting type, are now reduced in price to 2s. 3d., and are fitted as standard with a neat knob and silvered indicating scale.

Peerless type 102 2-valve Receiver.—This set has obviously been designed for those whose primary object is the reception of the local station (and also possibly of Daventry) with a minimum of trouble. The circuit is a detector-L.F.



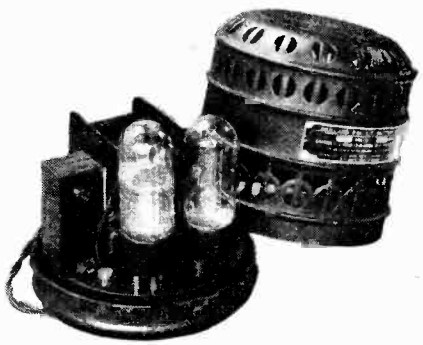
The Mullard P.M. Resistance-capacity-coupling Unit. The components are housed under a metal container.

combination, with transformer coupling, and a switch change-over from long to short waves. A cone loud-speaker is housed inside the cabinet, which is of large size, with ample space for batteries. The complete set, with all accessories, aerial equipment and royalty, is priced at the very low figure of £10.

Bedford Electrical and Radio Co., 22, Campbell Road, Bedford.

(260) P.D.

Users of the famous P.D. wire-wound volume control will need no introduction to this firm. This unit is obtainable either boxed or otherwise, and can also be had complete with filter unit. Other components include an interesting double wavelength reaction unit, a 0.0005 mfd. midget variable condenser having a mica dielectric, and the P.D. loud-speaker extension lead unit. A complete range of receivers is also available, including a



Mullard P.M. Battery Charger fitted with Arc Rectifying Valve.

very attractive specimen of portable receiver, complete with leather cover, provision being made for an outdoor aerial. This instrument employs five valves, but smaller models are available. One of the most interesting receivers is the Mark 17 instrument employing four valves, one being a neutralised high frequency amplifier. The wavelength covered is 250 to 550 metres and 1,000 to 2,000. This instrument is housed in an attractive cabinet with fall front and sells at £19 9s. complete with valves. One of the most interesting features of the stand, however, is undoubtedly the P.D. engraving machine.

Automobile Accessories (Bristol), Ltd., 93, 95 and 99, Victoria Street, Bristol.

(101) PELICAN.

The portable sets shown on this stand are adaptable for use in conjunction with lighting mains for home use, batteries being used for out of doors.

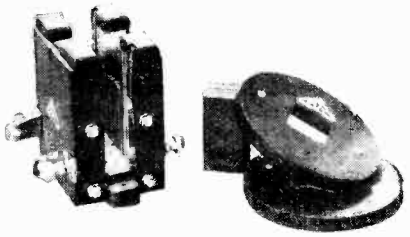
Detachable filament connections are provided inside the set and series connections are used for mains, parallel for batteries. The D.C. eliminator fits inside the set in place of the batteries, but an external unit is necessary for A.C. mains.

The sets incorporate five valves and the prices are as follows: With batteries, £27 10s.; for D.C. mains, £28; for A.C., £33.

Cahill and Co., Ltd., 63, Newman Street, London, W.1.

(163) PETO-SCOTT.

Model 5-50-1 Receiver.—A 5-valve receiver with two H.F. stages stabilised by means of loose-coupling in the interstage transformers, which are tuned by a 3-gang condenser. There are two sets of

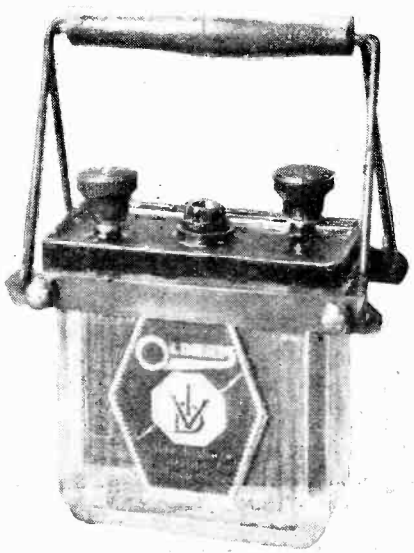


The Pohu " multiformer " is here shown dissembled.

these transformers (for long and short waves) arranged symmetrically on each side of the condenser. Necessary alterations for waveband change are effected by a switch. An ingenious arrangement for balancing individual circuits is included in the Peto-Scott " gang " condensers. The reception of 50 stations is claimed for this receiver, hence its title (5 valves, 50 stations, 1 dial).

Unit Gang Condensers.—These components, which are used in the above-mentioned receiver, are worthy of special mention. They are made up in such a way that, commencing with a single unit, other interconnected condensers may be added one by one, with the help of inexpensive fitments which are supplied. The condensers are fitted with taper trunnion bearings, which are independent of the main spindle; this can be obtained in any length.

A rough adjustment for balancing individual circuits is obtained in the usual manner by turning the rotor, while a fine setting is made by means of a milled edge ebonite disc, which moves the inside fixed plate with respect to the end vane of the rotor.



Oldham Type 1VD. Accumulator.

Stand to Stand Report.—

The condenser is designed in accordance with the logarithmic principle, and the rotor is insulated from the end plates; this small detail facilitates constructional work when a metal panel is used in circuits employing negatively biased valves.

The New Everyman Four.—This receiver, recently described in *The Wireless World*, is manufactured by the Peto-Scott Company, which also supplies well-

Oldham C.L.G. Slow Discharge Accumulator.

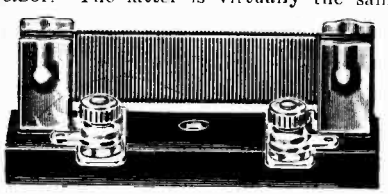
made copper screening boxes for it, constructed in accordance with the designer's specification.

Peto-Scott Co., Ltd., 77, City Road, London, E.C.1.

(7) PETTIGREW & MERRIMAN.

Battery Eliminators.—Three D.C. models of battery eliminators are manufactured by this firm, the Junior, Popular and Senior. The Senior model allows for two variable output H.T. voltages, one fixed H.T. voltage of 150, and a grid bias variable in steps from 3 to 25 volts. A switch is incorporated which, when in one position, gives the full available voltage at the output terminals, and in the other position 60 per cent. of the total voltage is delivered. All resistances in the unit are wire wound and sectionalised, and a difference in potential of 15 volts only exists between the two ends of any one section.

The supply units for A.C. mains are made in two models, the Popular and the Senior. The latter is virtually the same



Ormond Fixed Resistor and base.

as its D.C. prototype, but with the addition of a rectifying valve.

5-valve Portable Set.—This receiver employs resistance - capacity coupling throughout and embodies two stages of H.F. amplification, a detector and two stages of L.F. amplification. A switch is provided to enable both long- and short-wave broadcasting stations to be received. The whole is enclosed in a handsome mahogany case with self-contained frame aerial and loud-speaker.

Pettigrew and Merriman, Ltd., 122-124, *Tooley Street, London, S.E.1.*

(67) POLAR.

R.C.C. Units.—The anode resistance is non-inductively wire wound and assembled on a bakelite moulding housing the condenser. The grid leak fits into a hollow recess in the centre of the anode resistance and results in a neat and compact unit. Three models are made, the yellow seal with an anode resistance of 150,000 ohms, the red seal 80,000 ohms, and the green seal 40,000 ohms.

Polar Three Receiver.—This receiver has been redesigned and the two separate coil units are now housed inside the case. Coils suitable for the reception of a long-wave station and a short-wave station can be inserted in each coil unit and by moving the change-over switch from one position to the other, an alternative programme can be easily tuned in. The circuit employed is a regenerative detector followed by two stages of low frequency amplification. The first stage is transformer coupled, and in the second resistance-capacity coupling is used.

Cam Vernier Condensers.—This condenser has a built-in slow motion device which is operated over a 10-degree movement of the tuning dial. For initial adjustment a direct drive to the moving vanes is available and for fine adjustment the cam vernier device becomes operative. The fixed plates are insulated from the metal end plates, which are constructed on the low-loss principle.

Wingrave and Rogers, Ltd., Arundel Chambers, Strand, London, W.C.2.

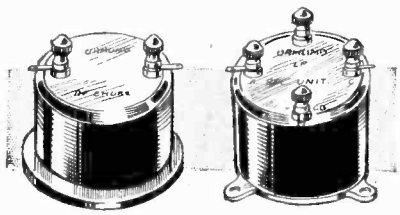
(97) PORTADYNE.

The neat portable receivers manufactured under this name are made in two types, the standard model in oak or mahogany, and a leather attaché case model. Only one main tuning control is used and provision is made for an external aerial or an external loud-speaker, although there is a loud-speaker incorporated in the set itself. The back is completely removable, giving easy access to valves and batteries.

Whittingham, Smith and Co., 110, *Kew Green, Kew, London.*

(136) PYE.

The Dual Portable.—The Pye 5-valve portable, arranged for reception of Daventry only, was justly considered as one of the outstanding features of last year's show. The set, with minor improvements, is still sold, and a new model, with provision for long- as well as short-wave reception, has now been introduced. It has two H.F. stages (reactance coupled), detector, and two transformer-coupled L.F. amplifiers, with a switching device to make appropriate changes to frame and H.F. circuits for changing wave-bands. Reaction is provided between the detector and frame circuit. There is only one tuning control (for the frame), while the set is completely self-contained, including a large-capacity "Ever-ready"

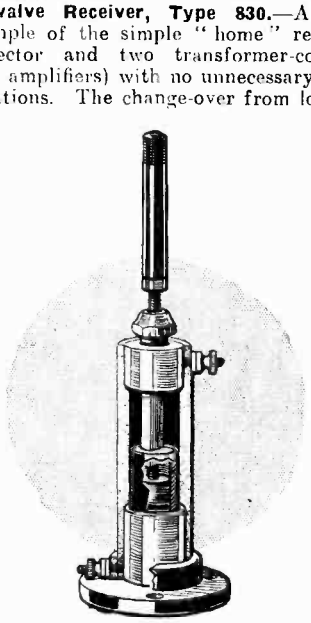


Ormond H.F. Choke and R.C.C. Unit.

H.T. battery and 2-volt unspillable L.T. accumulator. An interesting feature is the method of securing the valves, which are clamped between strips of sponge rubber.

5-valve Receiver, Type 750.—This set comprises two tuned and balanced high-frequency stages, with interchangeable transformers, which appear to have been carefully designed. Regeneration is provided in the detector circuit, and the L.F. side is transformer coupled. The set would appear to possess a high degree of sensitivity and selectivity, and, due to the fact that coils are carefully matched, the readings of the three tuning condensers should be almost identical, thus facilitating operation. Space for batteries is provided.

3-valve Receiver, Type 830.—A good example of the simple "home" receiver (detector and two transformer-coupled L.F. amplifiers) with no unnecessary complications. The change-over from long to

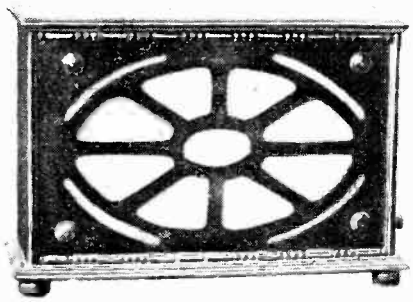


Ormond Neutrocondenser.

short waves is by an anti-capacity switch, and, again, space for batteries is provided inside the cabinet.

L.F. Chokes.—The range of L.F. chokes has been extended by the addition of one having an inductance of 20 henries and a current-carrying capacity of 130

Stand to Stand Report.—milliamps, which will prove useful for choke-output circuits with super-power valves in parallel, for smoothing purposes in heavy-duty eliminators, and also for filament circuits of series-connected valves fed from D.C. mains, etc.



The new Oriel Loud-speaker.

Anti-capacity Switch.—An examination of the new anti-capacity switch, made in various types with up to 10 poles, gives the impression that it could be relied upon to function for years without trouble; the space between opposite pairs of nickel-silver springs is bridged by a suitably shaped metal piece carried on an insulated rotor. Single-hole panel mounting is provided, also a neat dial. The insulating material is Bakelite.

L.F. Transformers.—A new design, enclosed in a metal shroud, has now been produced. Terminals are fitted on a Bakelite strip mounted on the top. Other components include the well-known logarithmic variable condensers, which are substantially reduced in price (0.0005 mfd., 18s. 6d.), and also made in capacities of 0.0001 and 0.0002 mfd. Their porcelain insulation should render them particularly suitable for short-wave work in tropical countries.

W. G. Pye and Co., Granta Works, Montague Road, Cambridge.

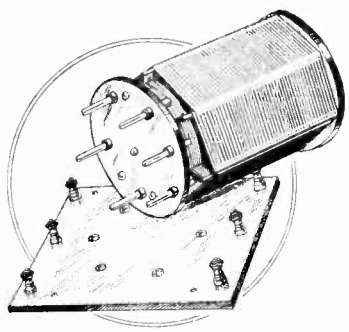
(214) QUARTZ.

Keen experimenters will not fail to pay a visit to the stand occupied by this firm,

The Orphean Gem Loud-speaker.

who are perhaps better known under the name of Hinderlich. One interesting exhibit shows the process of cutting and preparing the quartz from the natural rough state to the time when it is ready for electrical testing. The chief application of the quartz crystal is to control the frequency of a wireless transmitter. A quartz crystal suitable for the frequency to be controlled is introduced into the tuning circuit in a suitable manner, and by its peculiar oscillatory properties holds the frequency of the circuit under control constant, and thus enables the wavelength of the transmitting station to be kept absolutely steady. This has a marked effect in increasing the clarity of transmission and the effective range of the station. In addition, the quartz crystal may be used in conjunction with suitable instruments to determine the frequency of a variable source of radio-frequency oscillation, the accuracy being of the order of a few parts in a million.

Another exhibit on this stand which attracts considerable attention is the Paul D. Tyers microphone. Ordinary crystals for wireless reception are also



The Peerless Resonic H.F. Transformer.

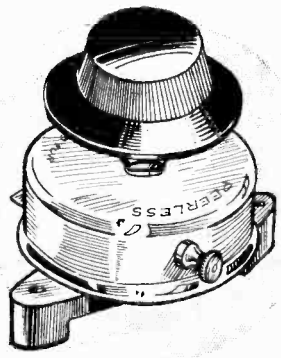
shown in great variety, together with an extremely interesting trouble-free crystal detector.

No visitor should leave the stand without obtaining a copy of "Quartz," by A. Hinderlich, M.A., which has only just been published. In addition to a complete and masterly summary of all available information on the subject of quartz crystal, the book gives useful practical advice on the construction of quartz-controlled units. A very complete bibliography, which should be valuable to the experimenter, is also given.

Quartz Oscillators, Ltd., 1, Lechmere Road, London, N.W.2.

(9) RATHBOURNE ELECTRIC CO.

Eckersley's Detector De Luxe.—A crystal detector of unique design in which the catwhisker carrier can be moved to enable the whole available surface of the crystal to be searched for sensitive faces. The vertical and lateral movement is carried out with one knob attached to the end of a hollow spindle through which passes a rod to control the pressure of the catwhisker on the crystal. The crystal cup and catwhisker holder are easily removed and can be replaced by either other crystals and catwhiskers or, alternatively, a Perikon crystal combination can be employed. The complete detector is enclosed in an ebonite case fitted with



The Peerless Neutralising Condenser.

a standard size of watch glass to keep out dust.

The Rathbone Electric and Eng. Co., 18, Sylvester Road, East Finchley, London, N.2.

(42) RAYOL.

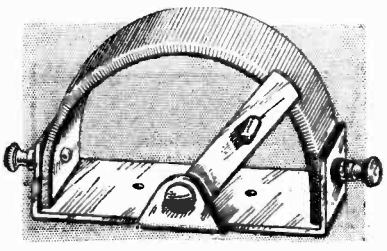
Portable receivers are the principal interest on this stand, and two main types are shown. There is the "Rayol II," a two-valve set in a narrow, upright case with tuning controls at one end, which works a self-contained loud-speaker and can be operated without opening the case. Then there are the "Rayol V.S.C." and "Rayol V.R.C.," two more expensive models which work with the lid open. This lid, which contains the loud-speaker and frame aerial, is pivoted and rotatable for direction without moving the base of the set.

A self-contained cabinet receiver for use in flats is also shown.

Engineering Works (Electrical and General), Ltd., 7 and 8, Great Winchester Street, London, E.C.2.

(210) RED DIAMOND.

The instability of the ordinary catwhisker type of crystal detector has led many listeners to employ the more stable Perikon combination wherein two crystals are kept tightly in contact by a spring, a disadvantage, however, exists in that a battery to bias the detector to about 1.5 volts is usually necessary. The Red Diamond Zincite-Tellurium Perikon detector has the advantage of stability, and avoids the disadvantage of requiring a biasing battery. Those who have studied tuning coil construction will appreciate that there are certain winding



The Peerless baseboard mounting rheostat.

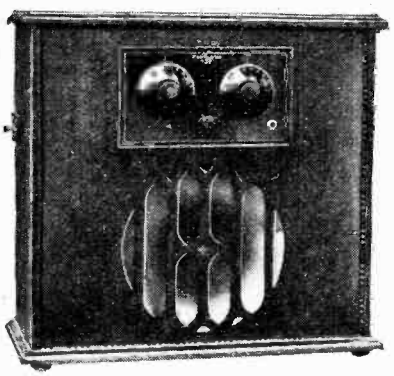
Stand to Stand Report.—

diameters which give the lowest high frequency resistance for a given winding length; it is therefore very interesting to find on this stand a skeleton coil former in which it is possible to vary the mean diameter of winding from 2⅝in. to 4½in. by an ingenious control which causes ebonite bars to move up or down on radius rods. These expansible coil formers are made in 4in. or 6in. models. Among the other accessories shown are well designed H.F. chokes and multiple battery connectors.

Jewel Pen Co., Ltd. (Radio Department), 21-22, Great Sutton Street, Clerkenwell, London, E.C.1.

(84) REDFERNS.

All-rubber Valve Holder.—Great interest will undoubtedly be focussed on this component as it provides a valve mounting in which insulation from shock should be of the highest order. A rubber moulding



The Peerless Self-contained Receiver for open aerial.

holds the four valve sockets, and a further moulding separated from the first by an air space gives a means for providing terminals and metal-bushed holes for inserting screws into the baseboard. Fine stranded wires connect the valve sockets to four nickel-plated terminals and soldering tags are provided. The whole valve holder being elastic, any vibrations which occur are quickly damped down. The price is 2s. 6d.

H.F. Choke Former.—Selling at 2s. 6d. this former gives scope for experiment in choke winding. It is cut from solid ebonite, and has six slots ¼ inch deep by ⅛ inch in width, and is screwed to a moulded base with two terminals. If a number of chokes have been wound and it is desired to interchange them, their bases can be removed and end terminals screwed in so that they can be suspended between grid leak clips.

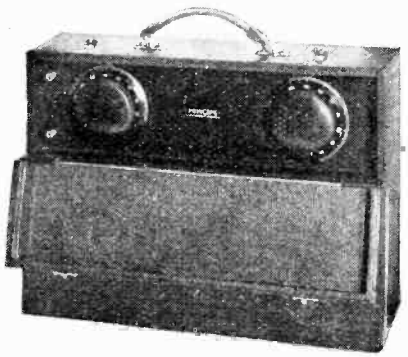
Seven-pin Ebonite Coil Former.—This component provides a means for the constructor to wind air-spaced low loss coils to his own specification. There are eight ribs, seven of which are provided with pins to allow of connections being taken to tappings, reaction windings, etc., and the whole former has an overall diameter of 2⅞ inches. A seven-socket base is supplied, which provides a means of quickly interchanging coils.

Redfern's Ebonart panels in matt, polished and mahogany finish, and cut to standard sizes, are one of the chief features of this exhibit.

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

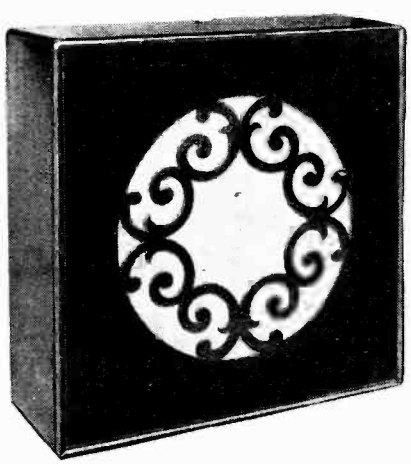
(249 & 250) REES MACE.

As was the case last year, portable sets of attractive and high-class designs are a



The Princeps 3-valve Portable.

feature of the stand. It will be remembered that this firm was one of the first to bring out a completely self-contained receiver. This was over three years ago, and as a result of their experience they are now able to produce instruments which are designed as the result of real practical experience. A two valve set is obtainable for 16 guineas, a three valve instrument costing 20 guineas, whilst for 28 guineas it is possible to purchase the well-known Rees Mace "Super Four" receiver, with which it is claimed that both Daventry and Continental stations can be received anywhere in Great Britain. An attractive feature is that a twelve months'



Cone-type Cabinet Loud-speaker; a product of Pettigrew & Merriman.

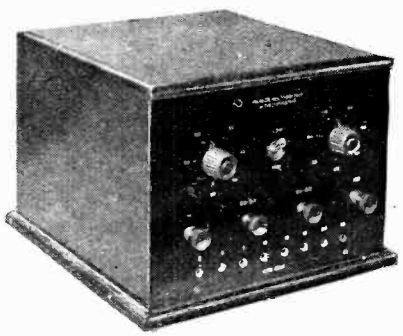
guarantee is given with each instrument.

Rees Mace Mfg. Co., Ltd., 39a, Welbeck Street, London, W.1.

(257) REGENTONE.

One of the main exhibits on this stand is, as might be expected, the Regentone range of eliminators, of which over 24 models are available, with outputs ranging from 60 volts 10 mA. to 400 volts at 130 mA. The Regentone Midget, which sells at the low price of 27s. 6d., gives two voltage outputs, and is intended for one or two-valve type receivers. In addition to the ordinary models, De Luxe models mounted in handsome cabinets are available. The De Luxe No. 1 gives a very large number of tappings, and is capable of supplying multi-valve sets. The A.C. mains user is catered for by similar high-class instruments. A junior model giving three positive tappings and a maximum voltage of 140 at 15 mA. may be obtained for 87s. 6d. Complete power units and some very attractive receivers capable of operating direct from the mains are also shown.

One of the most valuable features from the point of view of the home constructor is the large range of apparatus for home assembly of eliminators. Power transformers, chokes, potential dividers, and



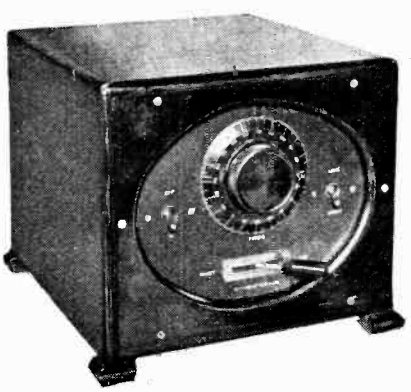
Complete Battery Eliminator, A.C. mains model, Pettigrew & Merriman.

also half- and full-wave rectifying valves are being shown. It is possible to obtain a transformer giving a voltage of 900 with a centre tapping for full wave rectification. This latter component, as might be expected, is of extremely generous proportions.

Regent Radio Supply Co., 21, Bartlett's Buildings, Holborn Circus, E.C.4.

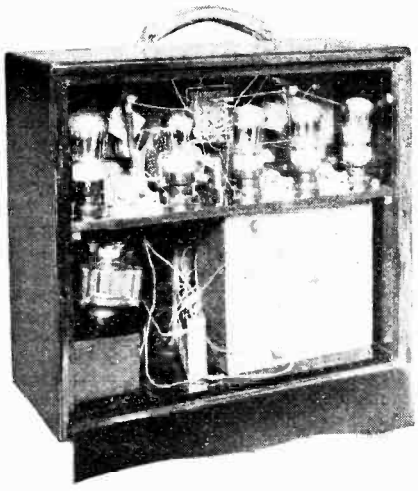
(34) RHAPSODY.

The Rhapsody-Twin is well designed and extremely lavishly equipped. Built into an artistically-designed cabinet it consists of three units, a central loud-



Pettigrew & Merriman Receiver for connecting to A.C. supply mains.

Stand to Stand Report.—



Pettigrew & Merriman's Portable Receiver with back removed.

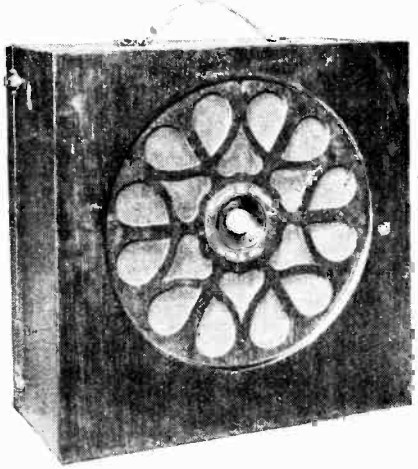
speaker with an eight-valve superheterodyne receiver on one side and a gramophone motor and turntable on the other. In some types the gramophone is a separate instrument working independently, but in the more expensive model the amplifier in the receiving set is used in conjunction with an electrical pick-up to reproduce the record *via* the loudspeaker. These are really high-class productions and fully justify the prices asked, which range from 90 to 126 guineas.

Reproduction, Ltd., 5, 6 *and* 7, *Dysart Street, Finsbury Square, London, E.C.*2.

(143 & 5) R.I. and VARLEY.

New Straight Line Super Transformer.—Intended essentially as an intervalve transformer, terminals are provided to increase its application. The primary inductance is understood to be of the order of 100 henries when passing a normal current of between 2 and 3 mA., the primary and secondary ratio being 1 to 3.25. The iron content is particularly liberal, and a good feature is the use of various stampings to produce a circular cross-section of core through the spool. To limit self-capacity in relation to the high value of primary inductance the windings have been sectioned, and N.P.L. curves show that good amplification is obtained with frequencies as low as 25 cycles under normal working conditions. As a super transformer it is well finished and offered at the popular price of 25s.

The Multibalancer.—For use in connection with the tapping points provided on this transformer, a new component has been created, which, with its 16 terminals, may at first sight seem somewhat bewildering. The perusal of the instructive pamphlet, which is strongly recommended, shows the device to consist of two resistances of 2 megohms and 0.5 megohm and two condensers, 0.01 mfd. and 0.0005 mfd., combined with two three-point switches giving thirteen different circuit arrangements, such as a variable ratio of transformer coupling, the loading of the transformer and resistance, the push-pull arrangement, and choke coupling with the provision of volume control. In view of the fact that the price of this component is considerably lower than the price of the resistances, condensers and switches bought separately, and its many useful applications, it is an accessory well worth adopting for use with the transformer.

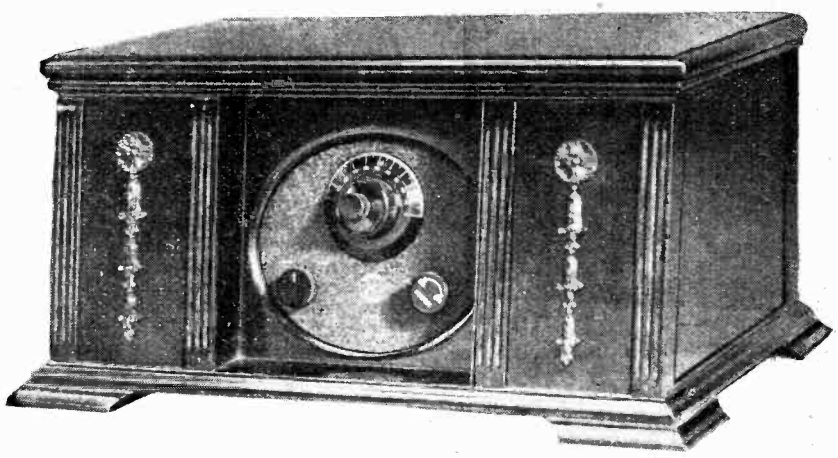


A new Pye Self-contained Receiver; the Dual Portable.

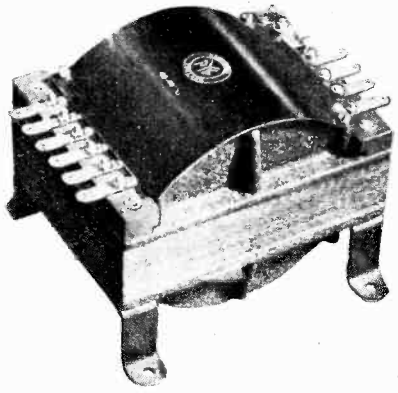
New Output Filter Choke.—The increasing demand for an output choke of liberal current carrying capacity is met by this new component. Liberal iron cross-section with large spool of moderae inductance are the essentials. It will comfortably handle a current of 20 to 25 mA., and has a working inductance of 20 henries. One-piece stampings are used instead of interleaving the core; they are thin and particularly well assembled. Of similar external appearance is an output transformer giving ratios of 1 to 1 or 25 to 1, both ratios being available in the one component. The increasing use of power output valves, as well as the use of supply mains as a source of H.T., has created a big demand for a component of this type. Its price is 21s.

A transformer is also shown for the construction of H.T. battery eliminators, the associated special apparatus also being listed. Transformers are now available for operating valves of the indirectly heated cathode type and carrying windings, if required, for giving H.T. rectifier potentials as well.

Retroactive Tuners.—Receiver construction, but the tapping switch is suitably a complete tuning unit. A tapped inductance with indicating scale and incorporating variable reaction coupling built as a unit demands little work for wiring up as a receiver. The Standard model is such a unit and consists of a large diameter solenoid inductance tapped with a switch to give a wave range of 200 to 2,800 metres with a 0.0005 mfd. tuning condenser and a rotating reaction coil working through bevel pinions. The switch action is accommodated behind a well-finished circular plate, a scale on the front showing the settings. The model A, in addition, incorporates the tuning condenser and is a really compact unit. A third type, model B, is of similar general construction, but the tapping switch is suitably arranged so that it serves as an H.F. transformer for intervalve or aerial coupling giving aperiodic excitation, a Reinartz circuit and other arrangements.

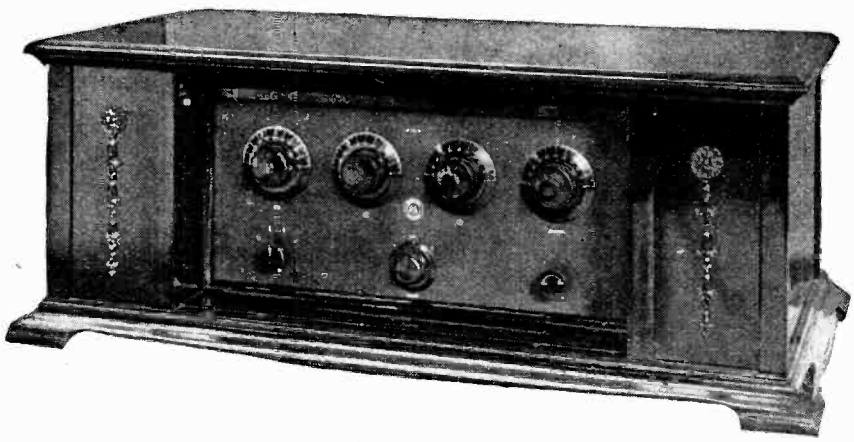


A Handsome "Home" Receiver—the Pye type 830.



The Pye shrouded transformer for A.C. mains units.

D 38

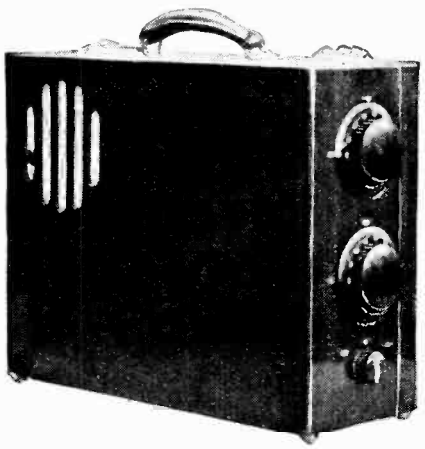


Designed for selectivity and sensitivity—the Pye type 750 with 2 H.F. stages.

Interdyne Receivers.—An important new method of preventing regeneration in the H.F stages is employed in these receivers, the special type of valves adopted being virtually self-stabilising. By means of two separate anodes, a double grid, connected with symmetrical primary and neutralising windings, effective stabilising is produced without the use of auxiliary apparatus. Two H.F. stages are employed, the three transformers being enclosed in the compartments of a copper screening box. A wave range of 250 to 600 metres is obtained with adjustable aerial tappings to compensate for various aerial constants. The valve detector is followed by two L.F. stages employing a combination of both resistance-capacity and transformer coupling. Tuning is effected by a single knob operating a three-section condenser arranged laterally behind the panel so that each condenser is closely associated with its transformer winding. The condensers are logarithmic and can be individually adjusted. The tuning scale is viewed through an aperture in the panel. Another control regulates volume, and rotation past the minimum position switches off the H.T. and L.T. batteries. Capacity reaction is provided, effectively increasing the performance of a properly neutralised H.F. amplifier. The set presents a simplicity of adjustment not usually associated with a long-range loud-speaker equipment.

Another model includes H.F. tuning for long- as well as short-wave reception, and the change over is effected by multi-contact switches linked together, arranged close to the screening boxes, and near the bases of the valves, giving short direct wiring. A good feature is that only one H.T. potential is required.

R.I. and Varley, Ltd., 103, *Kingsway, W.C.*2.

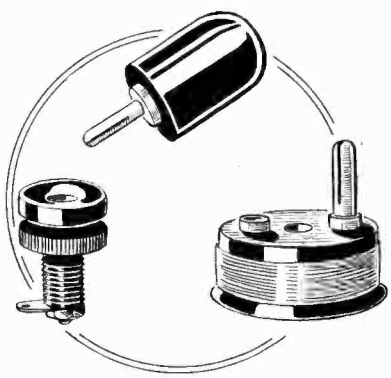


The Rayol II. 2-valve Portable Set with Self-contained Loud-speaker.

(14) "ROLLS."

Portable Receivers.—The "Rolls" portable receivers are made in 2-, 3- and 5-valve models, and can be obtained with or without loud-speakers. The 5VLS is a 5-valve model with loud-speaker and frame aerial incorporated. The "on" and "off" switch can be used also for the purpose of cutting out two valves when the receiver is in close proximity to the local broadcasting station or when telephones are used. The receiver is built into a well-finished leather carrying case which when closed has the appearance of an ordinary suit-case.

Hoare and Jagels, Ltd., 28-29, *Great Sutton Street, Clerkenwell, London, E.C.*1.



A Plug and Socket and a Fixed Filament Resistance by the Jewel Pen Co. (Red Diamond).

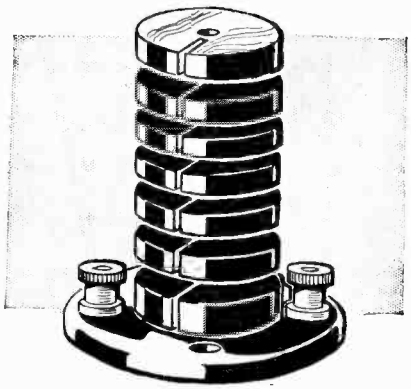
(215) ROOKE.

The most interesting exhibits shown are the Faradex H.T. and L.T. trickle chargers for A.C. mains. These instruments employ an electrolytic rectifier which is neither of the ammonium phosphate nor the tantalum type. The disadvantages associated with the ordinary chemical rectifier are well known, such as corrosion, heating up, the need of frequent examination and electrolyte renewal. A completely new electrolyte, which is the subject of a patent, is employed, and it is claimed that the useful life of this electrolyte continues for an indefinite period. It is entirely non-corrosive. Both rectifiers are extremely cheap, the high-tension model selling at 30s. and the low-tension model at 35s.

In addition, variable rheostats having a maximum of 5, 15 or 30 ohms are shown, each instrument being supplied with an adjustable stop which renders them invaluable for safeguarding the delicate filament of a dull-emitter valve. Several different models of coils are shown, including the well-known six-pin type, and in addition an extremely robust type of centre-tapped plug-in coil in which the terminal associated with the tapping is affixed in a new and reliable manner rendering the whole component extremely robust without in any way sacrificing efficiency.

Undoubtedly, however, the rectifiers already mentioned are the most interesting feature of the stand, and should attract widespread attention from those visitors who have suffered at the hands of the old type of electrolytic cell.

Rooke Bros., Ltd., 55, *Cardington Street, London, N.W.*1.



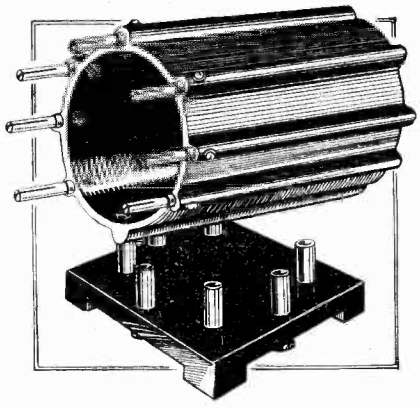
Redfern's high frequency Choke Former.

(110) SELECTORS.

The Selector Super is a portable super-heterodyne with combined oscillator-detector, three I.F. stages and two L.F. amplifiers, with transformer and choke coupling. The set is completely self contained and is mounted on a turntable. A 60-volt high-tension accumulator is fitted as standard, with the novel arrangement of a vent tube led out to the exterior of the case. A jack is fitted so that this battery may be charged *in situ* by inserting a plug connected to a source of D.C. with suitable limiting resistance.

A demonstration model is ingeniously arranged so that when the calibrated dials

Stand to Stand Report.—



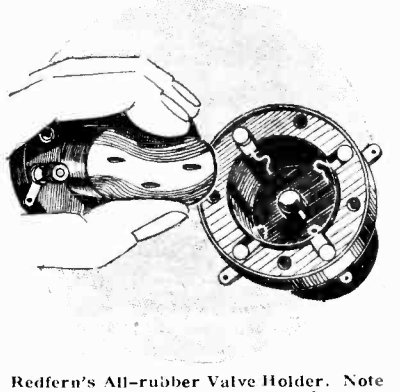
Redfern's Seven-pin Coil former.

coincide with the settings for a given station a coloured view of the city where the station is situated is automatically shown on the surface of a mirror mounted behind the set. Fifty different views, equal to the number of stations guaranteed, are shown in this way. This exhibit is attracting a good deal of attention.

Selectors, Ltd., 1, *Dover Street, London, W.1.*

(15) SHORE.

The "Shore Portable Five" is a self-contained receiver built into a solid oak cabinet. Two high frequency amplifiers are employed, and the change from short to long wave is accomplished by the movement of a switch. The short wave



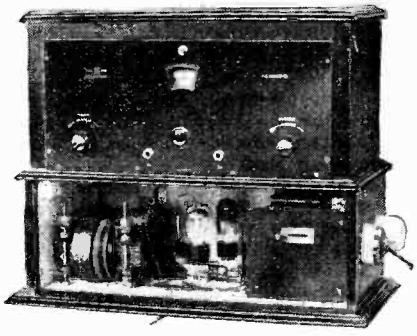
Redfern's All-rubber Valve Holder. Note the flexible stranded connectors between valve sockets and terminals.

range is approximately 250 to 550 metres, and the long wave 900 to 2,500 metres, thus effectively covering the broadcast band of wavelengths. Two-volt valves are used throughout, and a large capacity accumulator is included for filament heating. The H.T. battery is of generous dimensions, and a reasonably long period should elapse before renewal becomes necessary. The frame aerial consists of two separate windings, one for the short wavelengths and the other for long wave reception. Two terminals are provided on the left of the control panel, and these permit the use of aerial and earth should it be desired to increase the range of the receiver.

G. C. Shore, 28, Neuman Street, Oxford Street, London, W.

(150) SIEMENS.

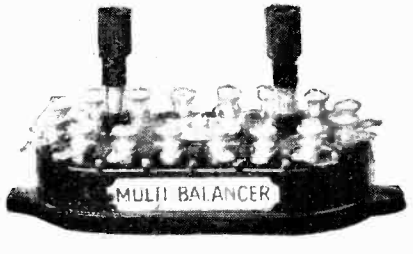
"Super-Radio" Dry Battery.—This is a 50-volt battery consisting of 36 cells of extra large size and is fitted with nickelled spring clips in place of the usual sockets. Intermediate tappings at 25 and 36 volts are provided, and inside the lid of each battery is pasted a slip giving the general instructions for use. Special attention has been given to the insulation between individual cells of the battery, and a longer working life thereby obtained. This battery is primarily intended for use with



The Regentone Receiver, made by the Regent Radio Co., operates entirely from the mains.

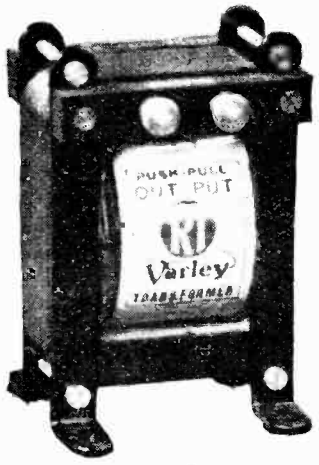
multi-valve receivers where current in the order of 15 to 20 milliamps is required, but this figure can be exceeded without damaging the battery. However, this will result in the period over which it will function satisfactorily being more than proportionately reduced. At the price of 25s. for a 50-volt unit, this battery compares very favourably with other sources of H.T. supply.

Standard H.T. Batteries.—For users of one- or two-valve receiving sets, the small capacity H.T. battery should appeal, and these are made in units varying from 15 to 120 volts. Intermediate voltage can be obtained in steps of 3 volts in the 15- to 36-volt batteries, and in steps of 6 volts in the larger sizes. When initial outlay is not the primary consideration, the large capacity type of standard H.T. battery will be found more economical, and these are made in three sizes, viz., 18 volts, 36 volts, and 72 volts. Spring clips replace the sockets employed in the



The ingenious Multi-balancer, of R.I. Varley, for use with the new transformer, for giving various circuit arrangements.

small capacity types of batteries, and these have many obvious advantages. Experimenters are well aware of the difficulties that arise due to high resistance contacts, especially in the H.T. circuit



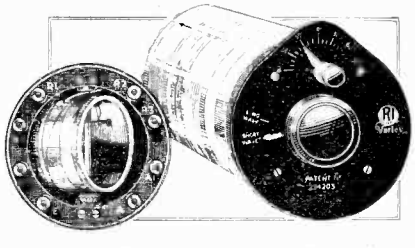
The large Output Transformer of R.I. Varley.

of a multivalve receiver, and owing to the more certain electrical connection that can be made with the spring clip, this is one less possible cause of trouble.

Grid Bias Batteries.—These vary in voltage from 1½ to 16½ volts, and the models G1, G2, and G3 are variable in steps of 1½ volts.

To facilitate fixing, the grid batteries are fitted with a cover flap provided with two eyeletted holes and can be fastened to the cabinet by means of small wood screws.

Testing Instruments.—Type 650A, priced at £2 14s., is a two-range voltmeter with readings 0 to 7.5 volts and 0 to 150 volts.



R.I. Two-range Tuning Unit, with variable reaction coupling operated through bevel pinions.

Three terminals are provided and suitably marked to indicate the correct pair to use for the different ranges.

For a full scale deflection, a current of only 3.3 milliamps is required, and the instrument has a resistance of 300 ohms per volt.

The type 650B is a combined volt-milliammeter with six ranges, 3, 15, and 150 volts, and 7.5, 75, and 750 milliamps.

There are two terminals for connecting up purposes and the range in use is determined by inserting a plug into the appropriate socket of six provided. When used as a voltmeter, this instrument has a resistance of 150 ohms per volt. The

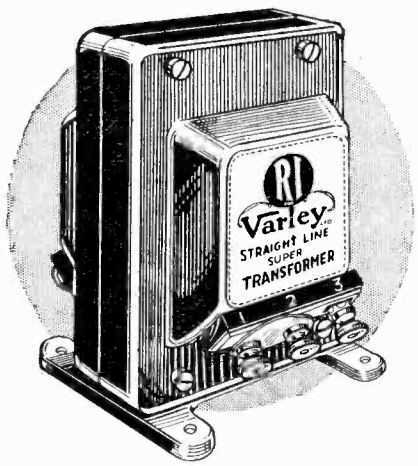
Stand to Stand Report.—

price of the combined instrument is £4 5s. 6d., and this includes flexible connecting leads.

*Siemens Bros. and Co., Ltd., Woolwich, London, S.E.*18.

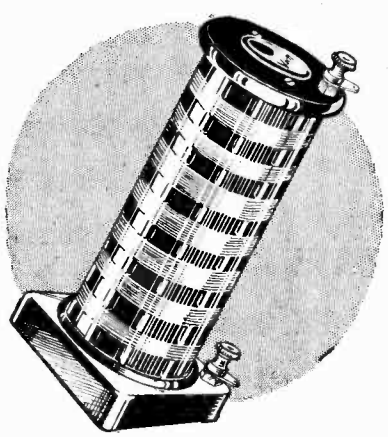
(141) "SIX-SIXTY."

A perusal of the booklet available at this stands reveals that "Six-Sixty"



In the new R.I. Super Transformer additional terminals are provided to extend the application of this component.

valves are fitted with filaments which classify them among high-grade valves. All usual types are manufactured of the 210, 410, and 610 classes with power and super-power valves of the 215, 425, and 625 types for use with 2, 4, and 6-volt accumulators. Of importance are the new S.S.4075, H.F., S.S.4075, R.C., S.S.6075, H.F. and S.S.6075 R.C. Although particularly economical as regards filament consumption, these valves are of high performance, for in the case of the S.S.6075 H.F. an amplification factor of



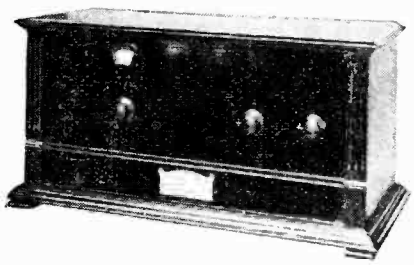
The section-wound Radio-frequency Choke of R.I. Varley.

20 is obtained with an impedance of 20,000, showing the mutual conductance to have reached as high a value as 1.0.

A new range of "Six-Sixty" non-microphonic valves is now in production. To screen the entire envelope of the valve, as well as its mounting, from microphonic effects it is enclosed in an outer glass container which, it is understood, is evacuated by air, the inside valve unit being both rubber supported and the connections made with supple leads. High frequency and resistance coupling valves being more particularly susceptible to microphonic noise, are now available in this new form of mounting.

For the home construction of loud-speakers an envelope is to be had at this stand containing a selected form of paper suitable for making the cone diaphragm marked out to the required shape and accompanied by brief working instructions.

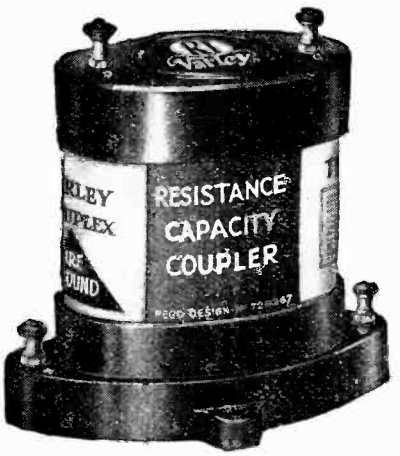
Electron Co., Ltd., 122-124, *Charing Cross Road, London, W.C.*2.



Simplicity of control is a feature of the new R.I. Interdyne Receivers although two H.F. stages are incorporated.

(39) SOLIDITE MOULDINGS.

The exhibits on this stand are indicative of the high degree to which the technique of moulding in bakelite and synthetic resin has been developed. No shape seems to be too intricate for this medium, and the various methods of mottling and graining are most pleasing.



The wire-wound Resistance-capacity-coupling Unit of R.I. Varley.

*Solidite and Synthetic Mouldings, Ltd., Albion Works, North Street, Clapham, London, S.W.*4.

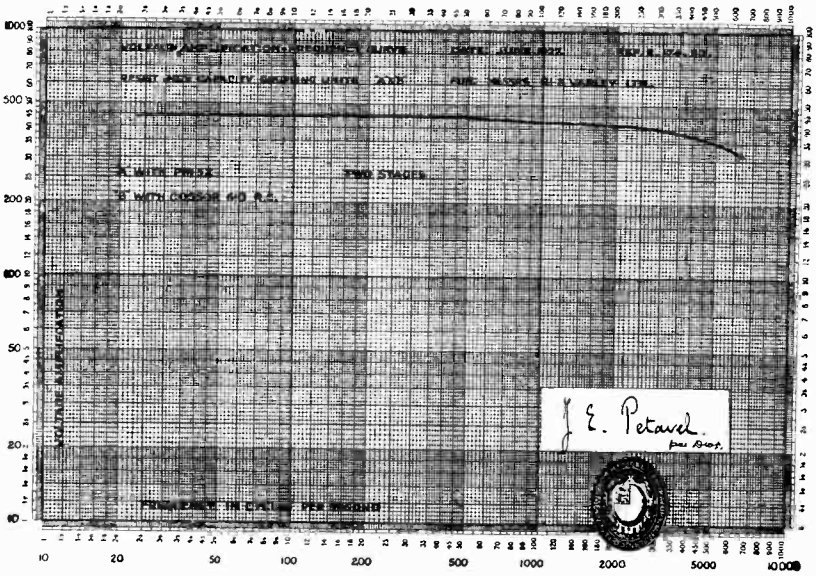
(43) SPAULDINGS.

This firm specialises in insulating materials, and a varied display of fibre, leatheroid, Bakelite, etc., is shown, illustrating the many uses to which these materials may be applied in wireless receivers.

Spauldings, Ltd., 90, *Gloucester Street, Clerkenwell, London, E.C.*1.

(228) SYLVEX.

The well-known Sylverex crystal is, as might be expected, again to the fore on this stand; in addition some extremely attractive coils are shown. These are the Reactone coils, in which by a special method of mounting and winding it is claimed that losses have been reduced to an absolute minimum.

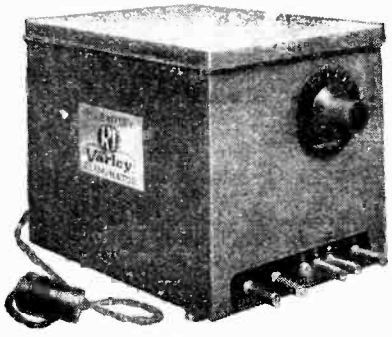


N.P.L. curve showing amplification plotted against frequency obtainable when using two stages of R.I. Varley resistance coupling.

Stand to Stand Report.—

R.I. Varley Variable Anode Resistance. The value is changed by rotating in the holder.

No one visiting this stand should fail to observe the Serenada loud-speaker which presents a very attractive appearance, the horn having been designed



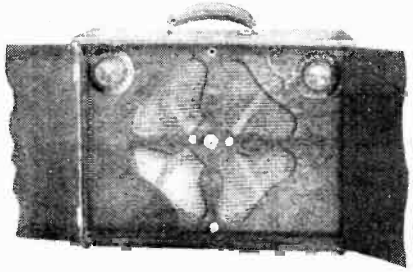
R.I. Varley Battery Eliminator in an all-metal container.

with attention more to acoustic principles than is the case with many instruments.

Sylvex, Ltd., 144, *Theobalds Road, London, W.C.*1.

(115) T.C.C.

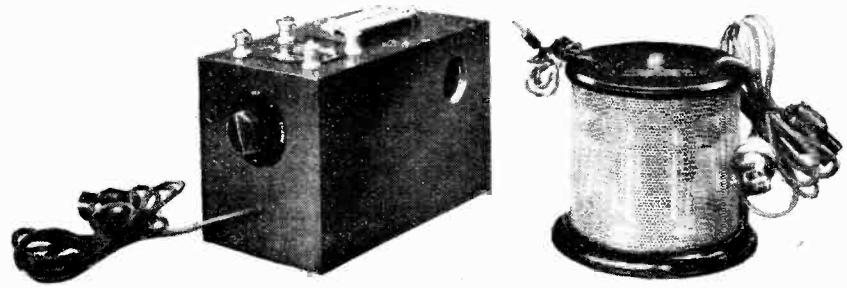
The manufacture of fixed condensers is probably nearer to reaching finality than



The Selector Three with enclosed batteries.

that of any other important wireless component, so it is hardly to be expected that any radical departure from current practice can be introduced. However, there is one change which is always welcomed, namely, a reduction in price. As an example, the 2 mfd. Mansbridge type is now sold at 3s. 10d., while the popular 0.1 mfd. mica-insulated L.F. coupling condenser is reduced to 8s.

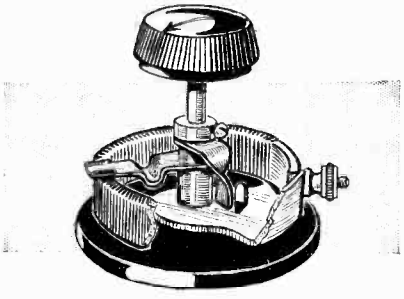
*The Telegraph Condenser Co., Ltd., Wales Farm Road, North Acton, W.*3.



The "Faradex" (Rooke Bros.) Battery Chargers employ an entirely new form of rectifier.

(108) TELSEN.

Radio Grand L.F. Transformer.—Most readers of *The Wireless World* are familiar with this component, which has been favourably reviewed as being well designed and excellent value for the price charged. It has recently been modified in minor details, as has the lower-priced "Ace" model, which sells for 8s. 6d.



Note the safety stop on this Rheostat by Rooke Bros.

Several well-known sets which use these transformers are exhibited. The two models are available in ratios of 3 : 1 and 5 : 1, and are also made to special requirements. An L.F. choke is also produced.

Telsen Electric Co., Ltd., 207, *Aston Road, Birmingham.*

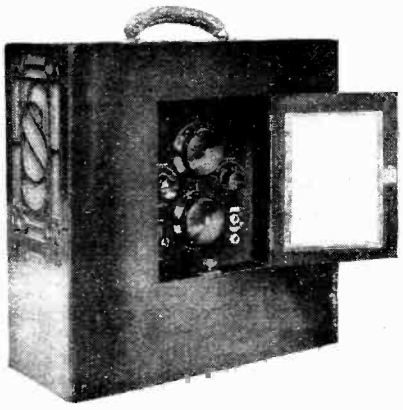
(81) TRELLEBORG.

Some excellent examples of machining in high-class ebonite are to be seen on this stand. In addition to the well-known electrical properties of Trelleborg ebonite it is evident that this material is capable of taking a high polish.

*Trelleborg Ebonite Works, Ltd., Union Place, Wells Street, London, W.*1.

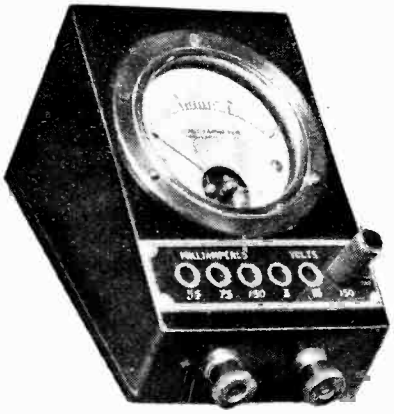
(82) TRUPHONIC.

Portable Super-Five.—This set is entirely self-contained, with Celestion loud-speaker built in. The cabinets are beautifully finished and can be obtained in oak, mahogany or crocodile finish. There is only one tuning control, which is across the frame, and the condenser dial is set edgewise to the panel so that it is thumb-driven. The two high-frequency valves are aperiodically choke-coupled and reaction is condenser-con-



The Selector Super, a 7-valve self-contained superheterodyne.

trolled by the Remartz method. A key switch provides for long- or short-wave tuning, and a socket is arranged so that an extra external loud-speaker may be plugged in. Should greater volume be required, there are terminals for an external aerial and earth. The low-frequency portion of the set consists of a transformer

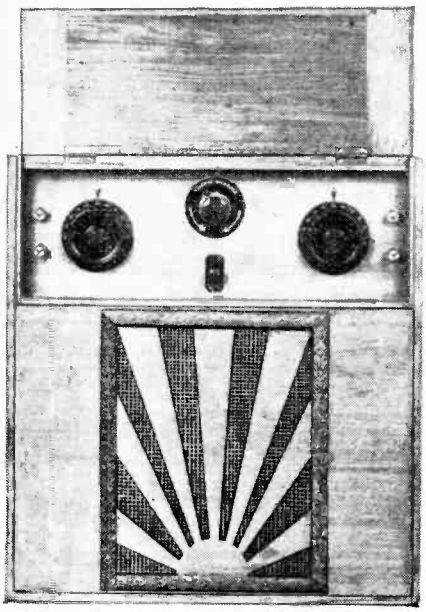


Siemens combined Volt and Milliampere-meter provided with six ranges.

Stand to Stand Report.—

stage followed by resistance-capacity-coupling and the price of the receiver complete in every respect, including royalties, is £33 10s.

Truphonic Wireless Co., 189, *Regent Street*, W.1.

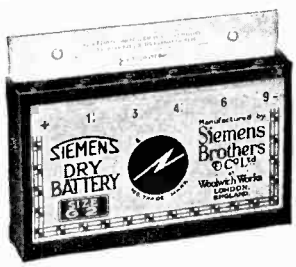


The Shore 5-valve Portable Receiver.

(98) TUNGSTONE.

The types of accumulators shown on this stand are too numerous and varied for detailed description here, but a fund of information will be found in the Tungstone handbook which is full of information.

Low-tension batteries are shown in glass and die-cast cases, and among the H.T. batteries the "Popular" and "De Luxe" should prove of interest to listeners.



Siemens Grid Battery with fixing attachment.

A corner of this stand is occupied by the Caxton Wood Turnery Co., Market Harborough, who are showing a selection of cabinets.

Tungstone Accumulator Co., Ltd., 3, *St. Bride's House, Salisbury Square, London, E.C.*4.

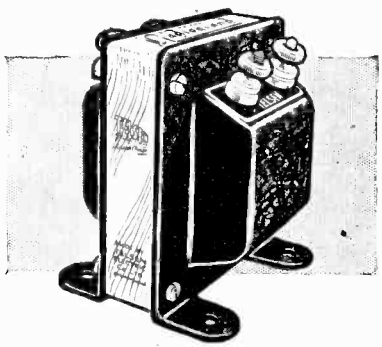
(36) TUNOMETER.

The Nick-o-Time Tunometer is a spiral-wound inductance with a continuously variable tapping which has been produced to displace the variable tuning

Siemens Large-capacity 50-volt H.T. Unit.

condenser in receiving sets. In addition to individual examples of this tunometer together with its sliding tuning stand, a series of complete receivers incorporating this component are on view.

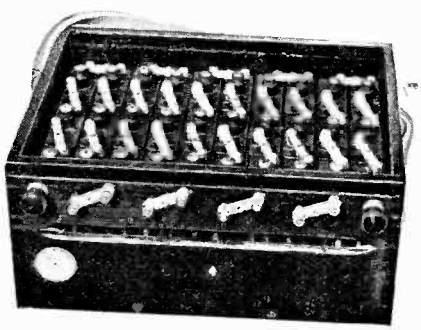
*I. Cooklin and Co., Oaklands Road, Cricklewood, London, N.W.*2.



The Telsen L.F. Transformer, with crystalline-finished metal shroud.

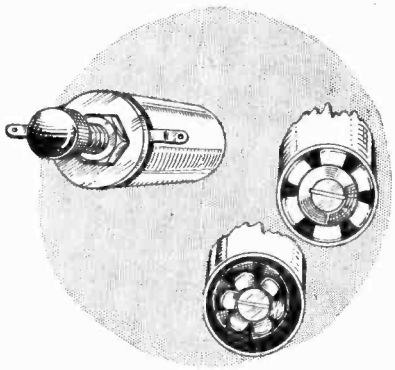
(224) TURNER.

The chief feature is the Pressland Tunewell Unit which covers the complete range from 200 to 2,000 metres without the necessity of changing coils. At 25s. this instrument is well worthy of attention, more especially as it is fitted with the well-known Tunewell types of coil, which are also shown in great variety



Tungstone 60-volt "De Luxe" H.T. Battery.

on the stand. Tandco coils and Tandco Litz coils are exhibited, and the price of the Litz wound coils is most reasonable.

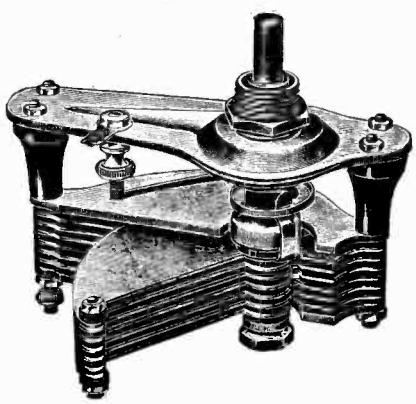


Utility L.T. Switch, showing contacts open and closed.

Turner and Co., 54, *Station Road, New Southgate.*

(209) UNIVERSAL BRACKET.

Those who have experienced difficulty in the matter of erecting an efficient aerial cannot do better than to pay a visit to this stand, where all types of aerial fixing devices are shown in great profusion. Of particular interest are several types of chimney bracket and eaves bracket, in addition, of course, to the more usual pulleys and other aerial mast fittings. Undoubtedly, however, the most interesting item is a combined safety switch and lead-in of special design. By means of a stout spring a very positive and defi-

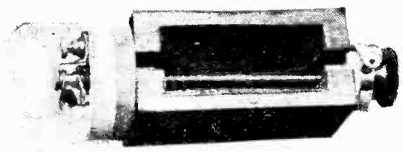


Utility Logarithmic Condenser with new hollow moulded insulating supports.

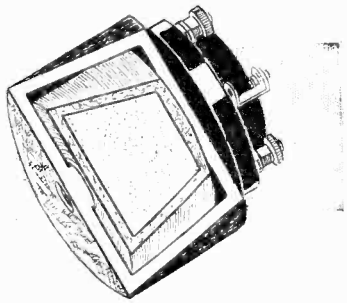
nite connection to earth is made, and, moreover, when receiving, a small spark gap between aerial and earth still remains, the width of this gap being adjustable from inside the house. This gives a large factor of safety in summer time when a sudden storm might cause the aerial to be struck at a time when it was not definitely earthed. Special arrangements are made so that the veriest tyro can mount the device in the window frame without damage.

The Universal Bracket Co., Feltham Avenue, East Moseley.

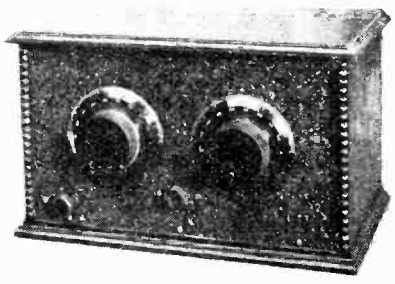
Stand to Stand Report.—



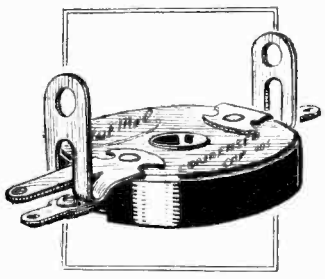
The weatherproof lightning switch and lead-in made by the Universal Bracket Co.



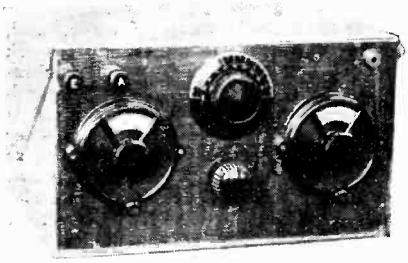
Sectioned view of the Watmel L.F. choke coupling unit showing the large machine-wound wire spool.



A popular-priced 2-valve set. The Watmel receiver which employs a Reinartz circuit.



New Watmel grid condenser with spring clips for accommodating the grid leak.

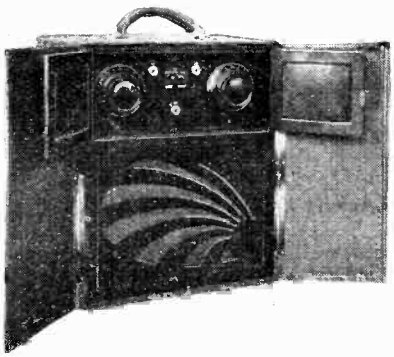


The Wearite short-wave set in metal cabinet.

(96) UTILITY.

The first thing to catch the eye on approaching this stand is the frosted aluminium screen case for *The Wireless World* "Empire Broadcast Receiver." The case is drilled ready for assembling components and costs 30s.

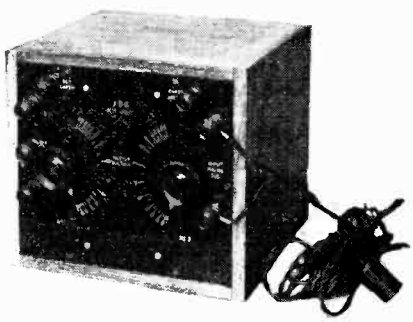
Push-Pull L.T. Switch.—Connection is made through a series of six phosphor bronze leaves assembled inside a cylindrical metal barrel. A plunger, operated by the push-pull knob, forces these out-



The Waverley portable is of exceptionally neat appearance.

wards until they press against the sides of the barrel. Each spring makes contact in two places, giving a total of twelve wiping contacts which ensure a low effective resistance. This is a great advantage in 2-volt circuits.

Condensers.—All the old types, which have proved so satisfactory in the past, are being continued and a logarithmic condenser with hollow ebonite insulators is being shown. Two types of "Micro



Variable voltage D.C. battery eliminator of Wholesale Components.

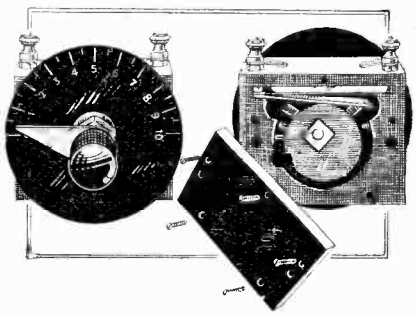
Dial" are supplied for use with these condensers, one with bevelled ebonite dial and a new one with aluminium dial and hair-line cursor.

There is also a gang condenser with variable couplings, the adjustment of each circuit being carried out simply by turning a knurled ebonite knob on the coupling of the condenser concerned.

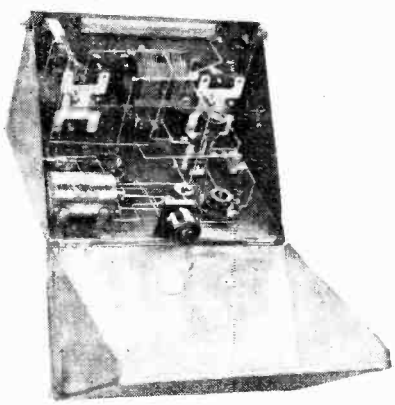
"Utility" change-over switches in varying degrees of complication will gladden the hearts of "circuit wizards."

Wilkins and Wright, Ltd., Utility Works, Kenyon Street, Birmingham.

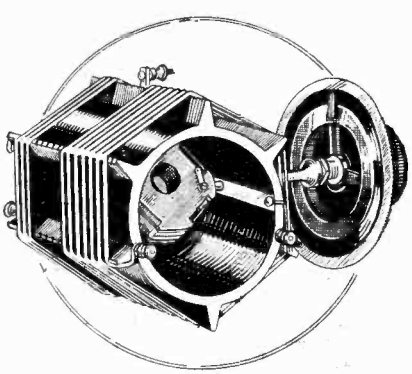
Sixty-cell Wet H.T. Battery (Wet H.T. Battery Co.).



Cam-operated neutralising condenser—a new Wearite product.



The Wearite receiver showing short-wave tuner.



Wearite short-wave tuner with rotary reaction coil.

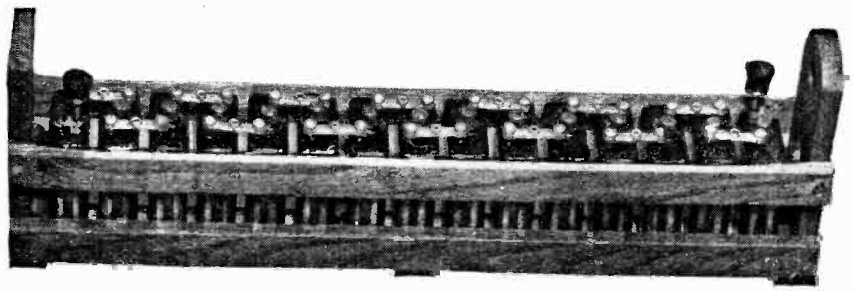
Stand to Stand Report.—

(99) W.B.

The "Desertune" open diaphragm loud-speaker will be the first item to attract attention on this stand, first because of its striking appearance, and second, on account of the type of diaphragm employed. It is best described as a fluted cone, and is built up of a parchment-like substance. A spare diaphragm is on view, which clearly shows the method of construction.

In addition to a range of "All-Wood" horn and diaphragm type loud-speakers, there is a cabinet for home constructors of portable sets. An "All-Wood" loud-speaker horn is built into the construction, and partitions for batteries and components are provided. The makers supply blue prints and sets of parts for home receiver construction.

Walker Brothers (Guildford), Ltd., St. Joseph's Works, Bramley, Guildford.



Tungstone 30-volt "Popular" H.T. unit.

(1) WATMEL.

Popular 2-valve Receiver.—To meet the popular demand for a cheap and reliable two-valve set giving local station loud-speaker operation, the "Imperial Two" has been added to the apparatus seen at the Watmel stand. It is a two-range set and tunes with a solenoid coil in the base of which is a thoroughly efficient change range switch which short circuits as well as disconnects the long range coil when tuning on the normal broadcast band. Two dials appear on the black crystallite metal panel for tuning and capacity reaction, the circuit being the favourite Reinartz arrangement. The two valves are L.F. choke coupled and the internal equipment includes a section wound high-frequency choke coil. Enclosed in a good quality polished oak cabinet with terminal strip at the back and internal grid bias battery the set is offered at the modest price of £3 15s., or complete with loud-speaker, valves, all accessories and royalties paid, 10 guineas.

Watmel Grid Condenser.—A modified form of grid condenser is of interest being fitted with hollow spring clips engaging on the ends of the leak resistance.

Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex.

The Zampa Portable (Mic Wireless Co.).

(217) WAVEMASTER.

This stand is entirely devoted to the exhibition of high class condensers which are obtainable in either the square law or the logarithmic types. The end plates and vanes are made of stout aluminium. The condensers are fitted with ball bearings and pig tail connections, and can be recommended as a thoroughly reliable proposition.

The Webb Condenser Co. (B.C.M. Wavemaster), 42, Hatton Garden, London, E.C.1.

(238) WAVEOLA.

This stand is devoted solely to the show of the "Waveola" sound amplifier, which consists of a number of tubes of different diameters connected together by a patent reflecting elbow. These horns are applicable to a gramophone no less than to a wireless set, and indeed, they were on the market a long time before the advent of broadcasting; thus it may be said that they are by no means a hastily designed article. Extremely good reproduction is the claim made for these instruments, more especially in the matter of adequately treating the lower end of the musical scale.

The K.T.B. Mfg. Co., Ltd., 210, Hammersmith Road, London, W.6.

(243) WAVERLEY.

This stand is entirely devoted to the exhibition of a highly attractive self-contained portable receiver, including a Celestion loud-speaker. A novel point which one does not usually meet with in a portable receiver is that it is fitted with a special gramophone attachment and amplifier which can be used with any type of gramophone. The whole instrument is very well finished.

Cecil Sharp, 188, Blythe Road, W.14.

(253) WEARITE.

Duplex Automatic Coil Holder.—A component of quite new design. Provision is made for mounting long- and short-wave aerial tuning coils with their axes at right angles to the baseboard, while the reaction coil is carried in the moveable holder, which operates a switching device through cams. In the upright position, aerial and earth are short-circuited, and the L.T. circuit is broken. When the coil is moved to the right, the short-wave aerial inductance (with which the reaction coil is now in relation) is automatically connected and filament circuits are completed. Rotation to the left connects the long-wave coil. A circuit diagram which is provided shows that an "untuned" aerial arrangement may be used on the short waves.

Neutralising Condenser.—This component is fitted in a rectangular ebonite case, and is suitable for panel or baseboard mounting: an extension handle is optional. Variation of capacity between 2.5 and 25 mmfd. is obtainable by a 180-degree rotation of the knob, which actuates a cam moving a vane with respect to a fixed plate. The dielectric is of mica, and examination shows that there is no risk of accidental short-circuit.

Coils and H.F. Transformers.—A number of special H.F. coupling devices recently described in connection with *Wireless World* sets are available; they are well made, and a critical examination fails to reveal any departure from specification which would tend to prejudice operation. Among other exhibits are coils for the "Everyman Four," the Empire Short-Wave Receiver, the "Regional," and the "All-Wave Four." It

Pe ind Le apparatus panels of the new type Standard broadcast station equipment rated at 11kW. closed circuit energy.

Stand to Stand Report.—
is noticed that a new and promising type of pin is used in interchangeable transformers; it is in tubular form, with a longitudinal cut to give springiness.

A special shortwave tuner has been developed. This comprises a 6-turn grid coil with a loosely-coupled aerial winding and an internal rotating reaction coil, fitted with an indicating dial. The whole is mounted on a ribbed ebonite former, and soldering tags are provided. In conjunction with a 0.0002 mfd. tuning condenser, all the interesting short wavelengths would be covered; the component is priced at 10s. 6d.

Short-wave Receiver.—A 2-valve detector L.F. set, including the above-mentioned tuner, is also manufactured; it is mounted in an all-metal case similar to that recently described in connection with the "Empire" receiver. A departure from standard practice is the use of combined "swinging coil" and capacity reaction. As smooth regeneration is all-important in short-wave work, this innovation has much to recommend it.

Wright and Weaire, Ltd., 740, *High Road, Tottenham, N.17.*

(16) WET H.T.

The Standard wet H.T. battery is built up from a number of small primary cells embodying the principle first introduced by Leclanché in 1868. A special electrolyte used in conjunction with a new type of sac has overcome the tendency to polarise which was so prevalent with this type of cell in its original state when subjected to a continuous discharge. The outstanding advantage possessed by the primary cell type of H.T. (or L.T.) battery is the ability of the user to recharge this at home without having access to an electric supply. The required quantity of the two chemicals comprising the electrolyte should be obtained, and after adding the necessary water this is poured into each cell. To prevent the liquid creeping and attacking the terminal connections, a thin layer of oil should be poured on the top of the electrolyte. A current up to 20 milliamps can be taken without seriously affecting the condition of the cells, and this output should be found ample for average reception purposes.

L.T. Battery.—Extra large capacity cells are made and intended for the supply of low-tension current to the valves in a receiver. The safe discharge for this cell would be about 0.5 amp., and if the 0.1 amp. type of valve is used in the receiver it will supply sufficient current for a 5-valve set. A booklet is supplied giving full instructions for use and maintenance.

Wet H.T. Battery Co., 12, *Brownlow Street, High Holborn, London, W.C.1.*

(256) WHITELEY, BONEHAM.

It cannot be doubted that the horn type of loud-speaker is slowly but gradually giving place to the more attractive cabinet type, and it is very evident that Messrs. Whiteley, Boneham & Co. have appreciated this point to the full, judging by the very attractive display of loud-speakers on their stand. Particular mention should be made of the instrument selling at £3, which represents really good value. The W.B. valve-holders form another very interesting exhibit.

Whiteley, Boneham and Co., Ltd., Nottingham Road, Mansfield, Notts.

(6) WHOLESALE COMPONENTS.

J.B.S. H.T. Unit.—A continuously variable H.T. potential is a useful feature and can be obtained, in the case of a D.C. battery eliminator, by means of a sliding contact across a potential divider. This eliminator includes two continuously adjustable potentiometers with operating knobs, pointers and scales indicating the approximate potential obtained. A fine adjustment is obtained in this way, particularly useful in the case of H.F. valves operating near the oscillating point as well as anode bend detectors. The smoothing equipment is liberal. An output of 50 mA. can be obtained over a range of voltages from 20 to 150. The vertical insulating panel is fitted with shrouded terminals. The price of this model, type A2, is £3 5s.

Wholesale Components and C.Z. Auckland and Son, 8 and 8a, Cross Street, Islington, N.

(246) ZAMPA.

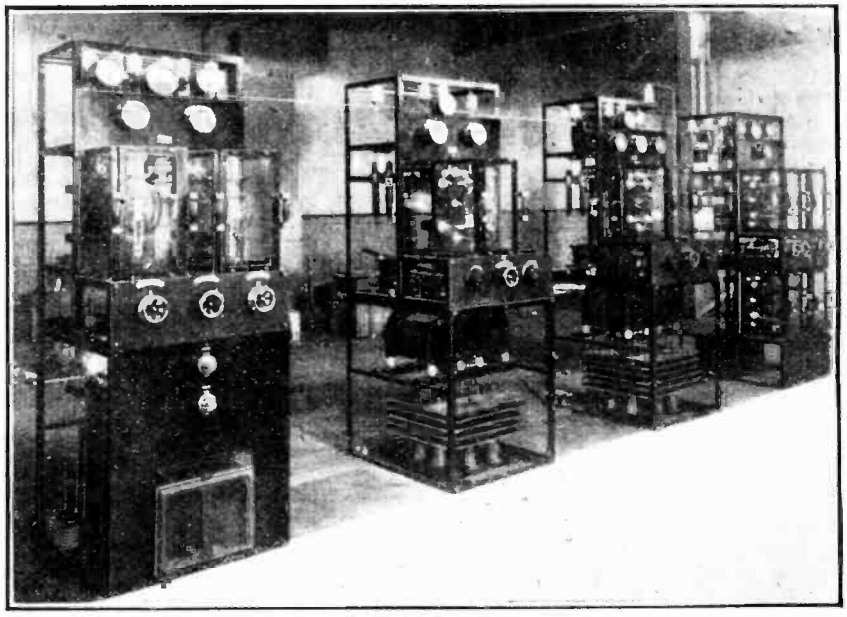
A large variety of useful and well-designed components are seen here. A tapped H.F. choke covering both the broadcast and the long wave band is one of the interesting features among the smaller of the components shown. The choke is supplied with a small stud switch, and therefore a quick change from one point to the other can be made in case any resonance troubles occur on the long wavelengths which is not infrequently the case with the ordinary type of choke whose resonant frequency often occurs in the neighbourhood of the Daventry wavelength, thus producing uncontrollable oscillation. This device is specially recommended to users of the Reinartz type of circuit who have experienced trouble on the long wavelengths. A very well designed tuner and reaction unit is also shown, together with a neat and efficient stud switch. Resistances of the heavy duty type are shown, their main function being for voltage reduction in a battery eliminator where a resistance of inadequate design often causes trouble. Another interesting instrument is a "variable-fixed" condenser somewhat resembling an ordinary grid condenser. This should prove extremely useful when building a receiver having two separate tuning circuits to enable an instantaneous change-over to be made from the local station to Daventry.

Mic Wireless Co., Market Street, Wellingborough.

* * * *

International Exhibit of Wireless Apparatus.

An interesting exhibit which is to include foreign apparatus as well as that of some representative British manufacturers is to be held at Messrs. Whiteley's, Queen's Road, Bayswater, opening on Monday, October 3rd. The display will be on the third floor of that store. We understand that the principal importers of American apparatus have been invited to show and that in addition to the exhibits of other British manufacturers representative British valve producers will show valve-testing apparatus in operation. Entrance to the exhibit will be free.



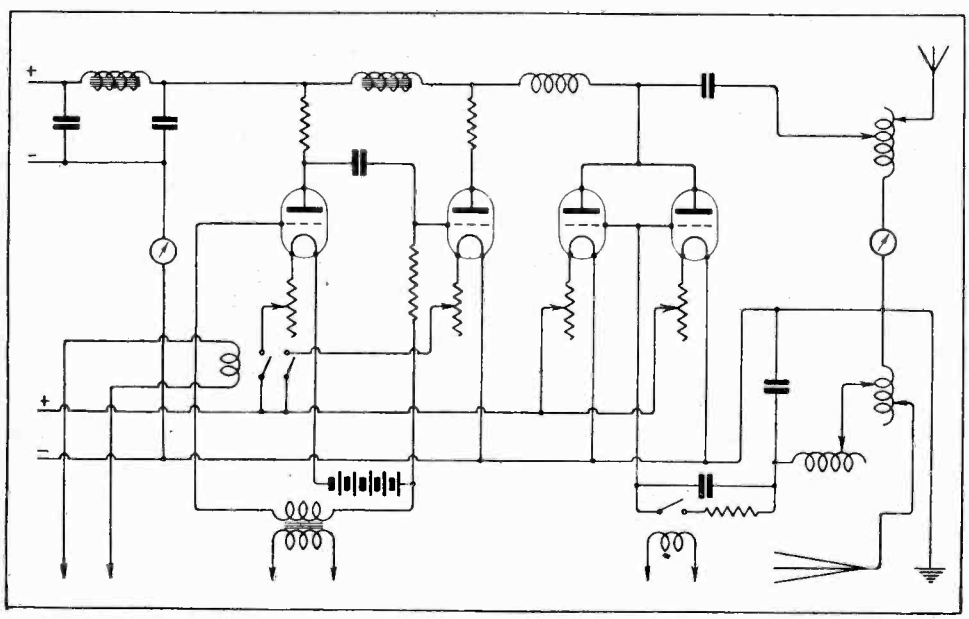
An opportunity is afforded of examining a typical broadcast transmitter. The Marconi set to be seen in the B.B.C. exhibit.

SAINT-HUBERT AERODROME WIRELESS STATION

A Well-designed Transmitter Operated by Remote Control from the Receiving Station.

THE Saint-Hubert Aerodrome Wireless Station, which has recently been opened by the Belgian Department of Aeronautics, was constructed to deal with the traffic of two important international air routes, viz., Amsterdam-Brussels-Basle and Paris-Cologne-Berlin. The Saint-Hubert Aerodrome is situated at the point of intersection of these two routes.

Owing to the danger to navigation of the high masts necessary for a powerful transmitter, the station has been divided into two units—the receiving station with a small aerial being situated on the edge of the aerodrome, and the transmitter in a separate building at a distance of about one kilometre from the aerodrome. Such an arrangement permits the use of a much higher transmitting aerial than would otherwise be possible.



Choke modulated speech transmitter suited for communication with aircraft.

D 47

Power Supply.

The power supply for the transmitter is taken from the power station at Saint-Hubert over a special overhead line just over 3 kilometres in length. The supply is 220 volts D.C., and in order to compensate for voltage drop in the overhead line a special booster has been installed at the power station end of the line. At the transmitter power is converted for supplying H.T. and L.T. to the valves by a motor generator set comprising the following machines:

Saint-Hubert Aerodrome Wireless Station.—

(1) 8.5 h.p. self-starting D.C. motor.

(2) Two 2,500-volt 0.5 amp. D.C. generators for anode current supply.

(3) 18-volt 30-amp. D.C. generator for filament current supply.

(4) 110-volt D.C. generator for field excitation.

(5) Dynamo-tachometer for remote indication of r.p.m.

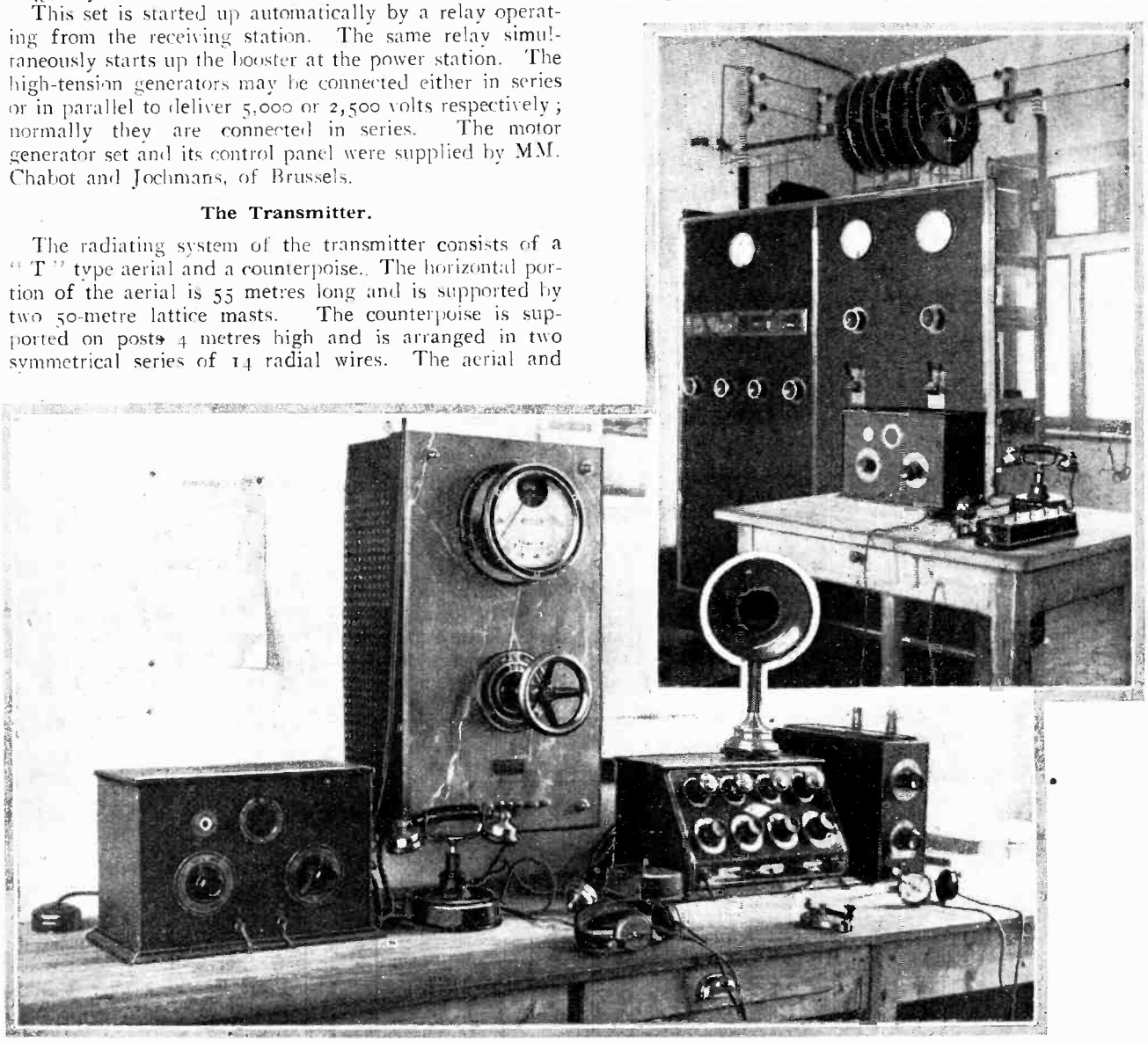
This set is started up automatically by a relay operating from the receiving station. The same relay simultaneously starts up the booster at the power station. The high-tension generators may be connected either in series or in parallel to deliver 5,000 or 2,500 volts respectively; normally they are connected in series. The motor generator set and its control panel were supplied by MM. Chabot and Jochmans, of Brussels.

The Transmitter.

The radiating system of the transmitter consists of a "T" type aerial and a counterpoise. The horizontal portion of the aerial is 55 metres long and is supported by two 50-metre lattice masts. The counterpoise is supported on posts 4 metres high and is arranged in two symmetrical series of 14 radial wires. The aerial and counterpoise circuits are tuned by separate adjustments and their common point earthed.

The wavelength range of the transmitter is continuously variable from 800 to 2,000 metres, the international wavelengths for use on aircraft being fixed at 900, 1,400 and 1,680 metres.

The transmitter may be used either for telegraphy or telephony. Modulation is obtained through the usual choke control circuit, the microphone and speech amplifier being supplied direct from the 220-volt D.C. mains. The transmitter is capable of feeding one kilowatt of H.F. energy into the aerial, but the normal power in the aerial is from 500 to 600 watts only. Although the transmitter and motor generator are normally controlled from the receiving station a switch is provided for local control.



The receiving station: in the centre is a voltmeter for indicating the speed of the motor generator, and immediately below is the rheostat for regulating the motor speed. (Inset above) General view of the transmitter, showing the control units for local working.

The receiving station building which is situated on the outskirts of the aerodrome is connected by an underground cable with the transmitter. A small aerial 15 metres in height is used for reception and is connected to a four-valve receiving set. This set may be supplied with H.T. and L.T. either from batteries or from the mains through a special battery eliminator

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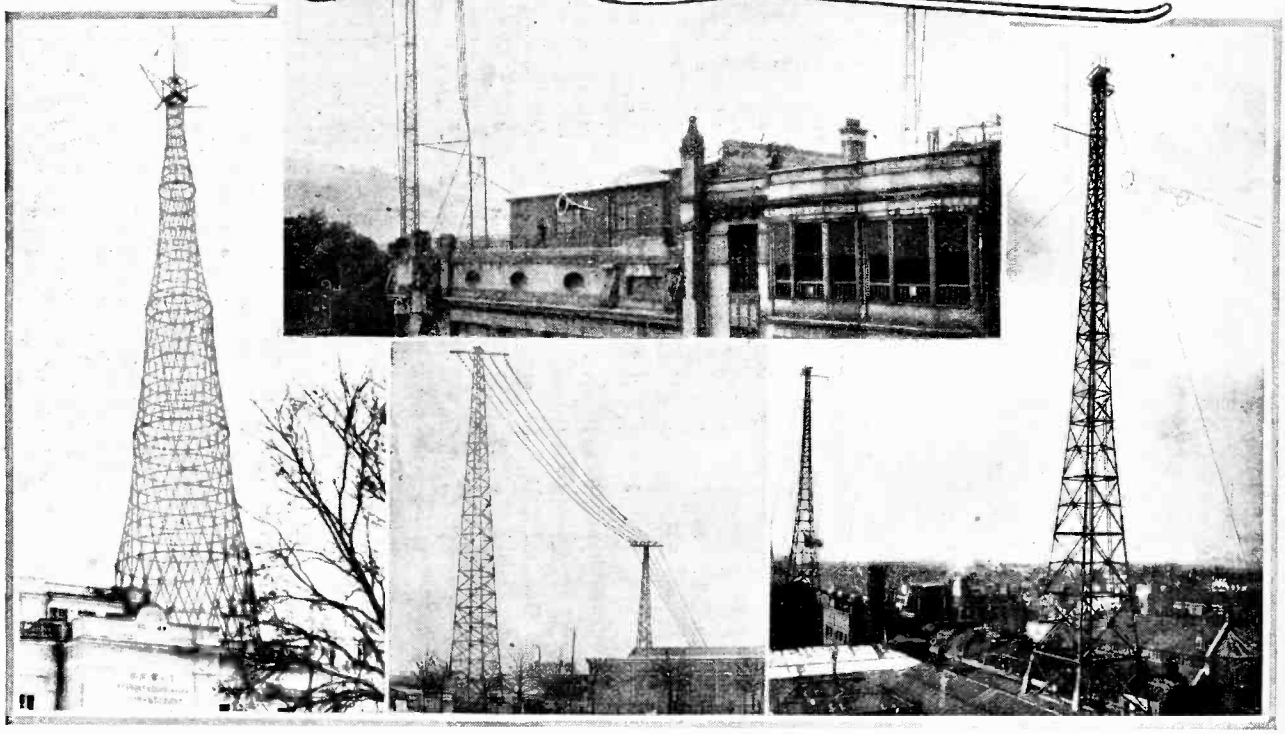

Wavelength and Power of European Stations.

The following list of European broadcasting stations in order of wavelength has been carefully compiled from the latest information available up to the time of going to press. The times of transmissions given are those generally in use on weekdays, but these, of course, vary slightly at times. We have included for the sake of completeness several stations which only work occasionally, and a few that are not yet opened but of which the proposed wavelengths and nominal power are obtainable. The geographical position of all the stations in this list may be found by reference to the map presented with this issue.

Königswusterhausen, Berlin, AFP. Wavelengths, 4025 and 2865 metres (74 and 105 kilocycles). Nominal Power, 20 and 10 kW.
Press Messages.

Eiffel Tower, Paris, FL. 2,650 metres (113 kC.), 5 kW.
6.45 p.m. News, 8.0 p.m. Weather, 8.15 p.m. Concert, etc. Time Signals in code at 0926 and 2226 G.M.T. and S.T.

Montesanto, near Lisbon, CTV. 2,450 metres (122 kC.), 1½ kW.
Government Station.

Berlin (Wolff's Bureau). 2,525 metres (119 kC.), 5 kW.
Intermittent news during the day.

Kovno, Lithuania. 2,000 metres (150 kC.), 15 kW.
7.30 p.m. Concert, 8.30 p.m. Time, Weather and News.

Scheveningen, Holland. 1,950 metres (154 kC.), 2½ kW.

Kosice (Kassa), Czecho-Slovakia. 1,870 metres (160 kC.). 5 kW.
7.30–10.0 p.m. Concert, etc.

Norddeich, Germany. 1,780 metres (168 kC.).
Weather reports 1.0 a.m. daily.

Paris (Radio Paris), CFR. 1,750 metres (171 kC.), 3 kW.
12.30 p.m. Concert, 1.50 and 4.30 p.m. Market Prices and News. 7.30 p.m. onwards Concerts, etc. Preliminary signal: gong at 12.30 and 8.30 p.m.

Kharkov. Russia, RA43. 1,700 metres, 176 metres, 4 kW.

Daventry, 5XX. 1604.8 metres (187 kC.), 25 kW.
10.30 a.m. Greenwich Time Signal and Weather Forecast. 12.0 noon Concert, etc. 3.0 p.m. onwards, London Programme. 6.30 p.m. Time Signal, 9.30 p.m. Shipping Forecasts.

Moscow (Komitern), Russia, RDW and RA1. 1,450 metres (207 kC.), 40 kW. Transmissions from 2.0 p.m. onwards. Closes down with chimes to denote hour and the "Internationale."

Karlsborg. Sweden, SAJ. 1,365 metres (220 kC.), 5 kW.

Motala, Sweden. 1,320 metres (227 kC.), 30 kW.
Relays Stockholm.

Königswusterhausen, Berlin, AFT. 1,250 metres (240 kC.), 8 kW.
12.0 noon, Lecture, News, etc. 3.0 p.m. to 8.0 p.m. Lectures, etc. 8.0 p.m. onwards, Programmes from Berlin. Opening and Interval signals: Metronome.

Hjorring, Denmark. 1,225 metres (245 kC.).
Relay Station.

Boden, Sweden, SASE. 1,200 metres (250 kC.), 1½ kW.
Relays Stockholm.

Stamboul, Constantinople. 1,200 metres (250 kC.), 10 kW.
4.0 p.m. Concert. 7.30 p.m. Concert, etc.

Kallundborg, Denmark. 1153.8 metres (260 kC.), 7½ kW.
Relays Copenhagen.

Soro, Denmark. 1,150 metres (261 kC.), 1½ kW.
Relays Copenhagen.

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Ryvang, Denmark. 1,150 metres (261 kC.), ½ kW.

Novosibirsk, Russia, RA33. 1,117 metres (268 kC.), 4 kW.

Warsaw, Poland, AXO. 1,111 metres (270 kC.), 10 kW.
6.35 p.m. and 7.35 p.m. News. 8.30 p.m. Concert, etc. 10 p.m. Time Signal, Weather Report and News.

Kbely (Prague), Czecho-Slovakia, OKP. 1,110 metres (270 kC.), 1 kW.
Programmes 7.0 to 8.30 p.m.

Viburg, Denmark. 1,110 metres (270 kC.), 1 kW.
Relay Station.

Basle, Switzerland. 1,100 metres (273 kC.), ½ kW.
Programmes 8.30 p.m. Usually relays Berne or Lausanne.

De Bilt, Amsterdam, PCFF. 1,100 metres (273 kC.), 1½ kW.
9.15 p.m. Weather Reports.

Hilversum, Holland, ANRO. 1,060 metres (283 kC.), 5 kW.
11.40 a.m. News. 12.15 p.m. Concert. 5.40 p.m. Concert, etc. Announcements frequently given both in Dutch and English.

Veliky Ustjuk, Russia, RA16. 1,010 metres (297 kC.), 1½ kW.

Leningrad, Russia, RA42. 1,000 metres 300 kC.), 10 kW.
6.0 p.m. Lecture. 7.0 p.m. News. 7.30 p.m. Concert, etc. Opening signal: gong or chimes. Closes down with "Internationale."

Odessa, Russia, RA40. 1,000 metres (300 kC.), 1½ kW.

Ust, Syssolsk, Russia, REG. 1,000 metres (300 kC.), 1½ kW.

Tiflis, Russia. 970 metres (309 kC.), 4 kW.

Tver, Russia, RA44. 965 metres (312 kC.), 1½ kW.

Minsk, Russia, RA18. 950 metres (316 kC.), 1½ kW.

Voronesh, Russia, RA12. 950 metres (316 kC.), 1½ kW.

Leningrad, Russia, RA6. 940 metres (319 kC.), 2kW.

Homel, Russia, RA39. 925 metres (324 kC.), 1½ kW.

Artemesk, Russia. 850 metres (353 kC.), 1½ kW.
Relays Moscow and Kharkov.

Nijni Novgorod, Russia, RA13. 860 metres (349 kC.), 1½ kW.

Rostov-on-Don, Russia, RA14. 850 metres (353 kC.), 1½kW.

Kiev, Russia, RA5. 820 metres (366 kC.), 1 kW.

Odense, Denmark. 810 metres (370 kC.), 1 kW.
Relay Station.

Ivanovo Vosnesensk, Russia, RA7. 800 metres (375 kC.), 1 kW.

Sevastopol, Russia, RA9. 800 metres (375 kC.), 1 kW.

Tashkent, Russia, RA27. 800 metres (375 kC.), 4 kW.

Baku, Russia, RA45. 760 metres (395 kC.), 1½ kW.

Geneva (Radio Geneva), Switzerland, HB1. 760 metres (395 kC.), ½ kW.
8.30 p.m. Concert, Weather News, etc. Opening signal: three long whistles.

Bogorodsk, Russia, RA8. 750 metres (400 kC.).

Hekaterinburg, Russia, RA15. 750 metres (400 kC.), ¼ kW.

Ostersund, Sweden. 720 metres (416 kC.), 2 kW.
Relays Stockholm.

Astrakhan, Russia, RA26. 700 metres (428 kC.), 1 kW.

Saratoff, Russia. 700 metres (428 kC.), 1 kW.

Lausanne, Switzerland, HB2. 680 metres (441 kC.), 1½ kW.
7.0 a.m. Weather Forecasts. 1.0 p.m. Time Signal, Weather, Market News. 8.30 p.m. Weather, Concert, etc. Opening signal: Chimes.

Moscow (Soviet Wireless Union), Russia, RA4. 675 metres (444 kC.), ½ kW.

Stavropol, Caucasus, RA20. 655 metres (465 kC.), 1½ kW.

Zurich, Switzerland, HBZ. 588 metres (510 kC.), 1 kW.
12.28 p.m. Weather, Concert, News. 1.30 p.m. Market News. 3.0 p.m. Concert. 5.45 p.m. Weather Forecast. 7.30 p.m. Lecture. 8.0 p.m. Concert, etc. Interval signal: gong. Announcements in German, except closing farewell in Zurich dialect.

Freiburg, Germany. 577 metres (520 kC.), 1¼ kW.
Relays Stuttgart.

Vienna (Stubenring), Austria. 577 metres (520 kC.), 1½ kW.
11.0 a.m. Music. 4.15 p.m. Concert. 7.0 p.m. Lecture. 8.0 p.m. Concert, etc. Tuning Signal V in Morse. Interval signal: Metronome. Closing signal: SK in Morse.

Saragossa, Spain, EAJ 23. 566 metres (530 kC.), 1½ kW.

Berlin (Magdeburger Platz). 566 metres (530 kC.), 2 kW.
10.10 a.m. Markets, Weather, Reports, etc. 11.0 a.m. Concert, etc. 12.0 noon, Lecture, etc. 1.30 p.m. Weather Forecast. 3.30 p.m. Concert, etc. 5.30 p.m. Music. 7.30 p.m. Concert, etc. 10.0 p.m. News. Closes down with "Deutschland über alles."

Bloemendaal, Holland. 566 metres (530 kC.) ¼ kW.
10.40 a.m. and 5.40 p.m. Religious Service, Sundays only.

Mikeli (St. Michel), Finland. 566 metres (530 kC.), ¼ kW.
Relay Station.

Hamar, Norway. 566 metres (530 kC.), ¾ kW.
Relays Oslo.

Budapest, Hungary. 555.6 metres (540 kC.), 3 kW.
5.30 p.m. Concert. 7.0 p.m. News and Concert. Opening signal: alternation of two notes. Often the announcer is a lady. Closes down with farewell in Magyar, French and German.

Sundsvall, Sweden, SASD. 545.6 metres (550 kC.), 1 kW.

Munich (Deutsche Stunde in Bayern), Germany. 535.7 metres (560 kC.), 4 kW.
11.45 a.m. Weather Forecast. 12.30 p.m. Concert. 1.55 p.m. Weather and News. 3.0 p.m. Talks, Music, etc. 8.30 p.m. Concert, etc. 10.0 p.m. Weather and News. Opening and Interval signals: – – – , – – – , – – – followed by three notes, A, F sharp, D.

Riga, Latvia. 526.5 metres (570 kC.), 1½ kW.
11.35 Weather and Market Reports. 6.0 p.m. Talks. 7.0 p.m. Concert, etc. 9.0 p.m. Weather. 9.30 p.m. News.

Vienna (Rosenhügel). 517.2 metres (580 kC.), 5kW.
Same programme as Vienna, Stubenring (577 metres).

Krasnodar (Kuban), Russia, RA38. 513 metres (595 kC.), 1 kW.

Porsgrund, Norway. 500 metres (600 kC.), 1 kW. Relays Oslo.

Palermo, Italy (Projected), ICP. 500 metres (600 kC.), 2 kW.

Tromsö, Norway. 500 metres (600 kC.).

Aberdeen, 2BD. 500 metres (600 kC.), 1½ kW.
3.0 p.m. onwards, usually relays programmes from London, Edinburgh, or Glasgow.

Uppsala, Sweden. 500 metres (600 kC.), ¼ kW. Relays Stockholm.

Valencia (Reine Victoria Hotel), Spain, EAJ14. 500 metres (600 kC.), ½ kW.

Linköping, Sweden. 500 metres (600 kC.), ¼ kW.
Relays Stockholm.

Daventry, Experimental 5GB. 491.5 metres (610 kC.), 30 kW.
3.0 p.m. Concert, etc. 5.45 p.m. Children's Hour. 6.30 p.m. Greenwich Time Signal, Weather and News. 6.45 p.m. Music and Talks, 8.0 p.m. Concert, 10.0 p.m. Weather Forecast and News.

Brussels (Radio Belgique), SBR. 487 metres (615 kC.), 1½ kW.
5.0 p.m. Concert, etc. 7.45 p.m. News, 8.15 p.m. Concert, 10.15 p.m. News, Announcements sometimes in Flemish as well as French. Closes down with "La Brabançonne."

Berlin (Witzleben). 483.9 metres (620 kC.), 4 kW.
Same programme as Magdeburger Plaz (566 metres).

Lyons (La Doua) P.T.T., France. 476.2 metres (630 kC.), 1 kW.
9.30 a.m. Weather, 8.15 p.m. News, 8.50 p.m. onwards relays Ecole Superieure.

Langenberg, Germany. 468.8 metres (640 kC.), 25 kW.
10.30 a.m. News, 11.0 a.m. Concert, 12.55 p.m. News and Weather Report, 1.10 p.m. Concert, Lectures, etc. 7.0 p.m. News and Weather, 8.10 p.m. Concert, etc.

Barcelona (Radio Catalana), Spain, EAJ13. 462 metres (649 kC.), 1 kW.
10.0 a.m. Concert, 7.50 p.m. Time, 10.0 p.m. Weather Report, 10.30 p.m. Concert, 11.50 p.m. News.

Oslo, Norway. 461.5 metres (650 kC.), 1½ kW.
10.0 a.m. Markets, 1.0 p.m.—7.45 p.m. Intermittent transmissions, 7.45 p.m. News, 8.0 p.m. Concert, etc. 10.0 p.m. News and Weather. Closes with Norwegian National Anthem.

Paris (Ecole Superieure de P.T.T.). 458 metres (655 kC.), ½ kW.
8.0 a.m. News, 10.0 a.m. Talks, 1.0 p.m. Lecture, etc. 2.0 p.m. Concert, 6.0 p.m. News, 8.0 p.m. Talks, etc. 9.0 p.m. Concert. Programmes also relayed from Caen, Grenoble, Lille, Limoges, Lyons P.T.T., Marseilles, Renne and Toulouse P.T.T.

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Vladivostok, Russia, RA17. 456 metres (655 kC.), 1½ kW.

Stockholm, Sweden, SASA. 454.5 metres (660 kC.), 1½ kW.
12.35 p.m. Weather, 12.45 p.m. Exchange, etc. 6.0 p.m. Children's Corner, 6.30 p.m. Concert, 7.0 p.m. Lecture, etc. 7.30 p.m. Concert, etc.

Rome (Unione Radiofonica Italiana), IRO. 450 metres (666 kC.), 3 kW.
1.0 p.m. News, etc. 5.10 p.m. News, Weather, etc. 9.0 p.m. Time, News, Weather and Exchange, 9.10 p.m. Concert, etc. 11.25 p.m. News. Opening signal: sustained note followed by the word "Pronto." Closes down with Italian National Anthem.

Moscow (Trades Union), RA2. 450 metres (666 kC.), 4 kW.
Transmits at intervals from 9.0 a.m. to 9.0 p.m.

Rjukan, Norway. 448 metres (670 kC.), ¼ kW.
Relays Oslo.

Brueun (Brno), Czecho-Slovakia. 441.2 metres (680 kC.), 2½ kW.
12.15 p.m. Concert, 2.30 p.m. News, 5.35 p.m .German transmission, 6.0 p.m. Time Signal, 7.0 p.m. Concert, etc. 10.0 p.m. News.

Bilbao (Radio Club de Vizcaya), Spain EAJ9. 434.8 metres (690 kC.), 1 kW.

Fredrikstad, Norway. 434.8 metres (690 kC.), ¾ kW.
Relays Oslo.

Frankfurt-on-Main, Germany. 428.9 metres (700 kC.), 4 kW.
6.45 a.m. Morning exercises, 11.55 a.m. Chimes from Darmstadter Schloss, News and Weather, 12.55 p.m. News, 3.25 p.m. Market Reports, Talks, etc. 4.5 p.m. News, etc. 4.30 p.m. Concert, 6.5 p.m. Market Reports, Talks, etc. 8.0 p.m. Concert, 9.15 p.m. News.

Notodden, Norway. 423 metres (709 kC.). Relays Oslo.

Cracow, Poland. 422 metres (711 kC.), 1½ kW.
Generally relays Warsaw.

Moscow (Peredacha). 420 metres (715 kC.), 2 kW.

Bilbao (Radio Vizcaya), Spain, EAJ 11. 418 metres (708 kC.), 2 kW.

Göteborg, Sweden, SASB. 416.7 metres (720 kC.), 1 kW.
Relays Stockholm.

Berne, Switzerland. HBA. 411 metres (730 kC.), 1½ kW.
1.0 p.m. News, Weather, Exchange and Concert. 3.56 p.m. News. 4.0 p.m. Concert, etc. 8.0 p.m. News and Weather Report, Concert, etc. 9.50 p.m. News and Weather; announcements in German, French and English. Interval signal: two strokes on gong.

Glasgow, 5 SC. 405.4 metres (740 kC.), 1½ kW.
12.0 noon, Gramophone Records. 3.15 p.m. Music. 4.15 p.m. Concert. 5.15 p.m. Children's Corner. 5.58 p.m. Weather forecast for farmers. 6.0 p.m. Concert, etc. 8.0 p.m. onwards, usually relays programmes from London and other stations.

Salamanca, Spain, EAJ22. 402.5 metres (746 kC.), ½ kW.
9.30 p.m. Concert. 10.30 p.m. Dance Music.

Aix la Chappelle, Germany. 400 metres (750 kC.), ¾kW.

Cork, Irish Free State, 6CK. 400 metres (750 kC.), 1½ kW.
2.30 p.m. Weather, Market Reports and Gramophone Music. 6.30 p.m. onwards, Programme relayed from Dublin.

Cadiz, Spain, EAJ3. 400 metres (750 kC.), ½ kW.
7.0 p.m. onwards. 8.0 p.m. Time Signal. Preliminary signal: Metronome.

Madrid (Radio España), EAJ2. 400 metres (750 kC.), 3 kW.

Mont de Marsan, France, 400 metres (750 kC.), ¼ kW.

Plymouth, 5 PY. 400 metres (750 kC.), ¼ kW.
Relay Station.

Seville (Union Radio) Spain, EAJ17. 400 metres (750 kC.), 1 kW.

Tammerfors, Finland. 400 metres (750 kC.), ¼ kW.
Relays Helsingfors.

Hamburg (Norag), Germany. 394.7 metres (760 kC.), 4 kW.
6.20 a.m. Weather. 7.10 a.m. Weather and News. 8.0 a.m. Talks to Women. 10.15 a.m. News. 11.0 a.m. Concert. 12.10 p.m. Weather. 12.30 p.m. Relays Hanover or Bremen. 6.0 p.m. Concert, Talks, etc. 8.0 p.m. Concert, etc. Opening signal: H.A. (in Morse.) Interval signal: stroke on gong. Closes down with German National Anthem.

Toulouse (Radio du Midi), France. 391 metres (767 kC.), 3 kW.
10.15 a.m. News, Markets, etc. 12.30 p.m. Weather, News, Concert. 1.0 p.m. Chimes. 1.45 p.m. News. 5.30 p.m. Exchange and Agricultural News. 8.0 p.m. Chimes, News, etc. 8.25 p.m. Automobile Club Report. 8.45 p.m. Concert, etc.

Falun, Sweden, SMZK. 387 metres (775 kC.), ¾ kW.
Relay Station.

Manchester, 2ZY. 384.6 metres (780 kC.), 1½ kW.
3.0 p.m. to 5.15 p.m. Music, Talks, etc. 5.15 p.m. Children's Corner. 6.0 p.m. Music. 6.30 p.m. onwards as London Programme.

Stuttgart, Germany. 379.7 metres (790 kC.), 4 kW.
12.30 p.m. Weather and News. 3.0 p.m. Music. 4.15 Concert. 6.0 p.m. Weather and Agricultural News. 6.15 p.m. Talks, etc. 7.45 p.m. Weather and News. 8.0 p.m. Concert, etc. Preliminary signal: 3 notes, C.D.G. Closes down with German National Anthem.

Helsingfors, Finland. 375 metres (800 kC.), 1¼ kW.
12.0 noon Exchange, News, Weather. 6.0 p.m. Lectures. 6.50 p.m. News, Time, Weather. 8.0 p.m. Concert, etc.

Madrid (Union Radio), EAJ 7. 375 metres (800 kC.), 1½ kW.
12.0 noon Time Signal, Weather and News. 2.0 p.m. Concert. 10.0 p.m. Monday, Thursday and Saturday, Time, Exchange and Concert. Opening signal: three or four notes or a few chords. Closes down with Spanish National Anthem.

Bergen, Norway. 370.4 metres (810 kC.), 1½ kW.
11.15 a.m. Markets, Weather. 12.15 p.m. Weather and News. 6.30 p.m. Children's Corner. 7.55 Fishing News. 8.0 p.m. Concert. 10.0 p.m. Weather and News.

Paris (Lucien Levy). 570 metres (811 kC.), ½ kW.
10.0 p.m. Concert Monday, Wednesday and Friday.

Leipzig, Germany. 365.8 metres (820 kC.), 4 kW.
10.0 a.m. Markets, News, Weather, etc. 12.0 noon, Concert. 12.55 p.m. News. 1.15 News. 4.0 p.m. Lecture, etc. 8.0 p.m. Weather and Time. 8.15 p.m. Concert, etc. 10.10 p.m. Press and Sports News, Interval signal: Metronome.

Nice. 362 metres (830 kC.), 1 kW.

London, 2LO. 361.4 metres (830 kC.), 3 kW.
12.0 noon to 2.0 p.m. Concert, etc. 1.0 p.m. Time Signal "Big Ben." 3.0 p.m. Music. 5.0 p.m. Talk. 5.15 p.m. Children's Corner. 6.0 p.m. Music. 6.30 p.m. Greenwich Time Signal, Weather and News. 6.45 p.m. to 8.0 p.m. Music, Talks, etc. 8.0 p.m. Concert. 9.0 p.m. Weather, News, Talk. 9.35 p.m. Concert continued.

Graz. Austria. 357.1 metres (840 kC.), ½ kW.
Generally relays Vienna. Preliminary and closing signal: series of V's (in Morse). Interval signal: Metronome.

Cardiff, 5WA. 353 metres (850 kC.), 1½ kW.
12.0 noon onwards, Programmes similar to London.

Prague (Strasnice), Czecho-Slovakia. 348.9 metres (860 kC.), 5 kW.
10.50 a.m. Concert. 11.35 a.m. Agricultural News. 12.0 noon, Time Signal, News, Concert. 1.15 p.m. Trade Notes. 1.30 p.m. Market Prices. 5.0 p.m. Concert, etc. 8.0 p.m. Time Signal, Weather and News. 8.10 p.m. Concert. 10.0 p.m. Time, News, etc.

Barcelona (Radio Barcelona), Spain, EAJ1. 344.8 metres (870 kC.), 2 kW.
12.0 noon to 9.0 p.m. Transmits at intervals. 9.0 p.m. News, etc., Music. 10.0 p.m. Chimes and Weather Forecast. 10.10 p.m. Concert. Closes down with Spanish National Anthem.

Paris (Petit Parisien). 340.9 metres (880 kC.), ½ kW.
9.0 p.m. Concert Sunday, Tuesday, Thursday and Saturday. Closing down announcement in French and English.

Copenhagen. 337 metres (890 kC.), ¾ kW.
3.0 p.m. Concert. 6.0 p.m. Chimes from the Town Hall. 7.0 p.m. News, etc. 7.15 p.m. Time Signal. 7.30 p.m. Talk. 8.0 p.m. Concert. 10.0 p.m. News, Opening signal: three strokes of a gong. Closes with Danish National Anthem.

Cartagena, Spain, EAJ16. 335 metres (895 kC.), 1 kW.
8.30 p.m. Concert.

Naples, 1NA. 333.3 metres (900 kC.), 1½ kW.
1.0 p.m. Official News. 2.0 p.m. Exchange News. 5.0 News Markets, etc. 5.10 p.m. Music, Talks, etc. 7.30 p.m. Official News. 8.55 p.m. News. 9.0 p.m. Concert, etc.

Reykjavik. Iceland. 333.3 metres (900 kC.), 1 kW.

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Limoges, France. 330 metres (910 kC.), ¼ kW. Relay Station.

Koenigsberg, Germany. 329.7 metres (910 kC.), 1 kW. 10.15 a.m. Local News. 11.0 a.m. Weather and News. 11.30 a.m. Concert. 1.0 p.m. Weather and News. 3.0 p.m. Agricultural and Exchange News. 4.0 p.m. Concert. 6.30 p.m. Talks. 7.55 p.m. Weather. 8.0 p.m. Talk. 8.45 p.m. Concert.

Birmingham, 5 IT. Temporarily closed.

Bournemouth, 6BM. 326.1 metres (920 kC.), 1½ kW. 12.0 noon, Monday, Wednesday and Friday, Gramophone Records. 4.0 p.m. Music. 5.0 p.m. onwards, programme similar to London.

Malaga, Spain, EAJ 25. 325 metres (925 kC.), 1 kW.

Breslau, Germany. 3226. metres (930 kC.), 5 kW. 11.15 a.m. Weather and News. 12.15 p.m. Concert. 1.30 p.m. Weather and News. 1.45 p.m. Concert. 3.30 p.m. News. 3.45 p.m. Children's Corner. 4.30 p.m. Music. 5.0 p.m. Agricultural News. 6.0 p.m. Talk. 7.0 p.m. Weather. 8.0 p.m. Concert, etc. 10.0 p.m. News.

Paris (Radio Vitus). 322.6 metres (930 kC.), 1 kW. 9.0 p.m. Wednesday, Friday and Sunday, Concert.

Dublin, 2RN. 319.1 metres (940 kC.), 1½ kW. 6.30 p.m. Children's Corner. 7.0 p.m. Gramophone Music. 7.10 p.m. Exchange and News. 7.30 p.m. Talks, etc. 8.0 p.m. Concert. 10.30 p.m. News, Weather, Preliminary signal: Tuning note and call in Erse and English.

Lahtis, Finland. 318 metres (943 kC.).

Milan, Italy, 1MI. 315.8 metres (950 kC.), 1½ kW. 1.0 p.m. News. 4.15 p.m. Concert, etc. 5.20 p.m. Childrens' Corner. 5.45 p.m. Agricultural News. 7.0 p.m. News. 8.20 p.m. Wireless Note, etc. 8.45 p.m. Time. 9.0 p.m. Concert. Preliminary signal: Tuning note. Closes with Italian National Anthem.

Newcastle, 5 NO. 312.5 metres (960 kC.), 1½ kW. 12.0 noon onwards, programme similar to London.

Björneborg, Finland. 311 metres (964 kC.). Relays Helsingfors.

Agen, France. 310 metres (965 kC.), ¼ kW. 9.30 p.m. Tuesdays and Fridays, Concert.

Oviedo, Spain. 310 metres (965 kC.), ¾ kW.

Zagreb (Agram), Yugo Slavia. 310 metres (965 kC.), 1 kW.
1.15 p.m. Announcements. 1.30 p.m. Music. 3.45 p.m. News. 7.0 p.m. Concert, etc. Announcements in Croatian, Slav, German, Italian and Greek. Close down with Croatian National Anthem.

Marseilles, P.T.T., France. 309 metres (970 kC.), ½ kW.
9.30 Weather. 8.15 p.m. News. 8.30 p.m. Concert.

Belfast, 2BE. 306.1 metres (980 kC.), 1½ kW.
12.0 noon, Music. 3.30 p.m. onwards, programme similar to London.

Madrid (Radio Madrileña), EAJ 12. 306 metres (980 kC.), 2 kW.

Nuremberg, Germany. 303 metres (990 kC.), 4 kW.
Relays Munich.

Tomsk, Siberia, RA21. 300 metres (1,000 kC.), ½ kW.

San Sebastian, Spain, EAJ 8. 297 metres (1,010 kC.), 2 kW.

Cadiz (Radio Lehera), Spain, EAJ 10. 297 metres (1,010 kC.), 1 kW.

Liverpool, 6LV. 297 metres (1,010 kC.), ½ kW.
4.0 p.m. onwards, programme similar to London.

Hanover, Germany. 297 metres (1,010 kC.), ¾ kW.
Relays Hamburg.

Jyväskylä, Finland. 297 metres (1,010 kC.), ¼ kW.
Relays Helsingfors.

Varberg, Sweden, SMSO. 297 metres (1,010 kC.), ¼ kW.
Relays Göteburg.

Hull, 6KH. 294.1 metres (1,020 kC.), ½ kW.

Dundee, 2DE. 294.1 metres (1,020 kC.), ¼ kW.

Stoke, 6 ST. 294.1 metres (1,020 kC.), ½ kW.

Swansea, 5 SX. 294.1 metres (1,020 kC.,) ¼ kW.
The above four are Relay Stations. 3.0 p.m. onwards, programme similar to London.

Innsbruck, Austria. 294.1 metres (1,020 kC.), ½ kW.
Relays Vienna.

Uddevalla, Sweden. 294.1 metres (1,020 kC.), ¼ kW.
Relays Göteburg.

Lyons (Radio Lyon), France. 291.3 metres (1,030 kC.), 1½kW.

Broadcast Guide.—

Lyons (*cont.*)
1.15 p.m. Concert. 1.30 p.m. Exchange. 2.15 p.m. News. 2.30 p.m. Exchange News. 7.30 p.m. News. 7.45 p.m. Concert. 8.0 p.m. Financial News. 8.30 p.m. News. 9.0 p.m. Concert, etc.

Edinburgh, 2EH. 288.5 metres (1,040 kC.), ¼ kW.
Relay Station. 3.0 p.m. onwards, programme similar to London.

Tallinn (Reval), Esthonia. 285.7 metres (1,050 kC.). 2 kW.
6.0 p.m. Concert. 8.20 p.m. News, Weather, Time, etc., Concert.

Dortmund, Germany. 283 metres (1,060 kC.), 1½ kW.
Relays Münster.

Posen (Poznan), Poland. 280.4 metres (1,070 kC.), 1½ kW.
1.0 p.m. Agricultural News. 2.0 p.m. Exchange. 5.30 p.m. Concert. 7.0 p.m. Talks, etc. 8.30 p.m. Concert. 10.0 p.m. Time Signal.

Grenoble (Radio Club of Grenoble), France. 278 metres (1,079 kC.), 1 kW.
Transmits on Wednesdays and Saturdays only.

Caen (Radio Club of Caen), France. 277.8 metres (1,080 kC.), 1½ kW.
Relay Station.

Leeds, 2 LS. 277.8 metres (1,080 kC.), ¼ kW.
Relay Station. 3.30 p.m. onwards, programme similar to London.

Stavanger, Norway. 277.8 metres (1,080 kC.), ¼ kW.

Trollhättan, Sweden, SMXQ. 277.8 metres (1,080 kC.), ¼ kW.
Relay Station.

Dresden, Germany. 275.2 metres (1,090 kC.), ¾ kW.
Relays Leipzig.

Jacobstad, Finland. 275.2 metres (1,090 kC.)

Nottingham, 5NG. 275.2 metres (1,090 kC.), ¼ kW.
Relay Station. 3.0 p.m. onwards, programme similar to London.

Norrköping, Sweden, SMVV. 275.2 metres (1,090 kC.), ¼ kW.
Relays Stockholm.

Angers (Radio Anjou), France. 275.2 metres (1,090 kC.), ½ kW.

Sheffield, 6FL. 272.7 metres (1,100 kC.), ¼ kW.
Relay Station. 3.0 p.m. onwards, programme similar to London.

Genoa, Italy (Projected). 272.7 metres (1,100 kC.), 1½ kW.

Hudiksvall, Sweden. 272.7 metres (1,100 kC.), ¼ kW.
Relays Stockholm.

Klagenfurt, Austria. 272.7 metres (1,100 kC.), 1½ kW.
Relays Vienna.

Cassel, Germany. 272.7 metres (1,100 kC.), ¾ kW.
Relays Frankfurt.

Bordeaux Lafayette, P.T.T. (France). 270 metres (1,111 kC.), 1 kW.
1.10 p.m. News. 1.20 p.m. Concert, 8.30 p.m. News. 9.0 p.m. Concert.

Lille, P.T.T. (France). 265.5 metres (1,130 kC.), ½ kW.

Bratislava (Pressburg), Czecho-Slovakia. 263.2 metres (1,140 kC.), ½ kW.
6.0 p.m. Concert. 7.0 p.m. Talks. 8.0 p.m. Relays Prague.

Malmö, Sweden, SASC. 260.9 metres (1,150 kC.), 1 kW.
12.0 a.m. Sunday, Religious Service.

Hankö, Finland. 260 metres (1,154 kC.), ¼ kW.
Relay Station.

Linz, Austria (Projected). 254.2 metres (1,180 kC.).

Kiel, Germany. 254.2 metres (1,180 kC.), ¾ kW.
Relays Hamburg.

Kalmar, Sweden, SMSN. 254.2 metres (1,180 kC.), ¼ kW.
Relays Stockholm.

Pori, Finland. 254.2 metres (1,180 kC.), ¼ kW.

Venice (Projected). 254.2 metres (1,180 kC.), 1½ kW.

Bradford, 2LS. 252.1 metres (1,190 kC.), ¼ kW.
Relay Station. 3.30 p.m. onwards, programme similar to London.

Montpellier, France. 252.1 metres (1,190 kC.), 1 kW.
8.45 p.m. News. 9.0 p.m. Concert, etc.

Bremen, Germany. 252.1 metres (1,190 kC.), ¾ kW.
Relays Hamburg.

Säffle, Sweden, SMTS. 252.1 metres (1,190 kC.), ½ kW.
Relays Stockholm.

Eskilstuna, Sweden, SMUC. 250 metres (1,200 kC.), ¼ kW.
Relays Stockholm.

Gleiwitz, Germany. 250 metres (1,200 kC.), ¼ kW.
Relays Breslau.

Uleaborg, Finland. 250 metres (1,200 kC.), ¼ kW.
Relays Helsingfors.

Lemburg, Poland (Projected). 247.9 metres (1,205 kC.), 1½ kW.

Trondhjem, Norway. 243.9 metres (1,230 kC.), 1 kW.

Muenster, Germany. 241.9 metres (1,240 kC.), 1½ kW.
Relays Langenberg and Dortmund. Preliminary signal: MS (in Morse). Interval signal gong.

Bordeaux, (South-West) France. 238 metres (1,260 kC.), 1½ kW.
Relays Paris Ecole Superieure.

Kiruna Sweden. 238.1 metres (1,260 kC.), ¼ kW.
Relays Boden.

Orebro, Sweden, SMTI. 236.2 metres (1,270 kC.), ¼ kW.
Relays Stockholm.

Stettin, Germany. 236.2 metres (1,270 kC.), ¾ kW.
Relays Berlin.

Vilna, Poland (Projected). 234.4 metres (1,280 kC.), 2 kW.

Beras, Sweden, SMBY. 230.8 metres (1,300 kC.), ¼ kW.
Relay Station.

Juan-les-Pins, France. 230 metres (1,304 kC.), ½ kW.
9.0 p.m.—11.0 p.m.

Halsingborg, Sweden, SMYE. 229 metres (1,310 kC.), ¼ kW.
Relays Malmö.

Umea, Sweden, SMSN. 229 metres (1,310 kC.), ¼ kW.
Relays Stockholm.

Belgrade, Yugo Slavia. 225.6 metres (1,330 kC.), 2 kW.

Leningrad, 223.9 metres (1,340 kC.), 2 kW.

Strasburg, France. 222.2 metres (1,350 kC.), ¼ kW.
10.0 p.m. Tuesdays and Thursdays Concert, etc.

Karlstad, Sweden, SMZZ. 221 metres (1,360 kC.), ¼ kW.
Relays Stockholm.

Halmstad, Sweden. 215.8 metres (1,390 kC.), ¼ kW.
Relays Malmö.

Viborg, Finland. 214.3 metres (1,400 kC.), ¾ kW.

Kiev, Russia, RA5. 211.3 metres (1,420 kC.), 2 kW.

Dijon, France. 207.5 metres (1,450 kC.), 1 kW.

Gävle, Sweden, SMXF. 204.1 metres (1,470 kC.), ¼ kW.
Relays Stockholm.

Reims, France. 204.1 metres (1,470 kC.), ¼ kW.

Kristinehamn, Sweden, SMTY. 202.7 metres (1,480 kC.), ¼ kW.
Relays Stockholm.

Jönköping, Sweden. 201.3 metres (1,490 kC.), ½ kW.
Relays Stockholm.

Biarritz, France. 200 metres (1,500 kC.), ¼ kW.

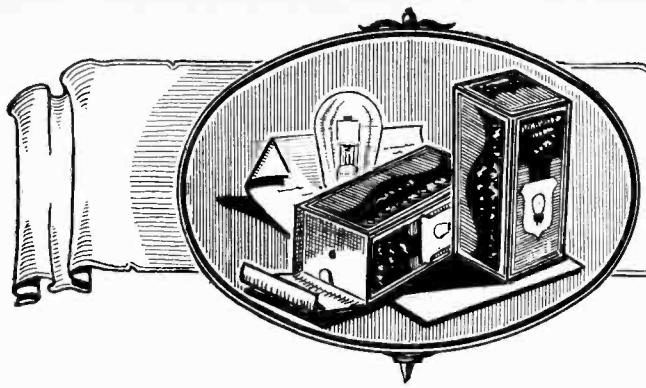
Karlskrona, Sweden. 196 metres (1,530 kC.), ¼ kW.
Relays Stockholm.

Ornskoldsvik, Sweden. 187.5 metres (1,600 kC.), ¼ kW.
Relays Stockholm.

Beziers, France. 158 metres (1,899 kC.), ½ kW.
8.0 p.m. News and Concert.

Berne, Switzerland, EH90C. 32 metres (9,375 kC.). 1 kW.
9.0 p.m. Transmits Berne programmes on Mondays, Thursdays and Saturdays.

Eindhoven (Phillips Lamp Works), Holland, PCJJ. 30.2 metres (9,934 kC.).
5.0 p.m.—8.0 p.m. G.M.T., Experimental Transmissions, Tuesdays and Thursdays.



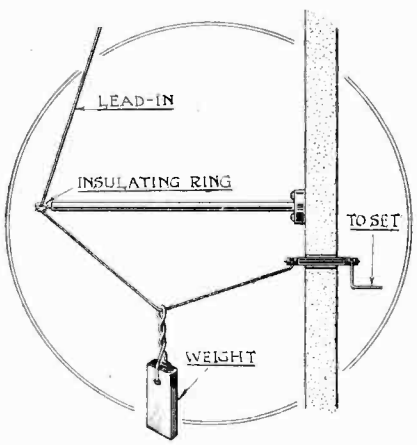
NOVELTIES FROM OUR READERS

A Section Devoted to New Ideas and Practical Devices.

AERIAL LEAD-IN SYSTEM.

In designing a lead-in system the first consideration is perfect insulation under all weather conditions; the second, spacing the lead-in away from the wall to reduce capacity to earth; and the third, suitable tension on the wire to prevent swaying.

An arrangement which satisfies all three conditions is shown in the diagram. A wooden strut is used to space the lead-in away from the wall and is provided at the end with a porcelain-insulated screw eye through which the wire passes. The end of the wire is attached to the lead-in terminal in the usual way, any slack



Efficient method of terminating lead-in wire.

being taken up by a weight suspended below the wooden strut. If the weight is attached by absorbent string, rain running down the lead-in will leave the wire at this point and will not reach the lead-in insulator.

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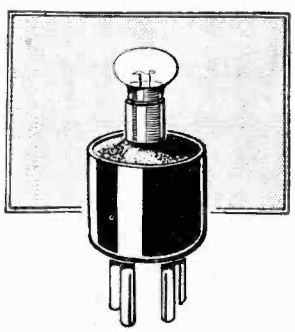
TESTING FILAMENT CIRCUITS.

Before inserting valves into a newly constructed receiver it is always advisable to test the filament circuit to make quite sure that the H.T. voltage is not applied across the filament sockets of the valve holders through some fault in the wiring. A voltmeter connected across the fila-



Testing unit for L.T. circuits.

ment sockets would, of course, indicate any excessive voltage, but such an instrument is not always available to the amateur constructor.

An excellent substitute consists of a flash lamp bulb and holder mounted in an old valve base with the lamp-holder terminals connected by short wires to the filament legs of the valve base. The hollow base should be filled in with some insulating material such as pitch or shellac.

Having connected both L.T. and H.T. batteries, the testing unit is inserted in each valve holder, and if a fault exists the result will be a burnt-out flash lamp bulb instead of an expensive valve. For the purpose of the test, the L.T. voltage may be reduced to suit the rating of the flash lamp bulb.

VALVES FOR IDEAS.

Readers are invited to submit brief details with rough sketches, where necessary, of devices of experimental interest for inclusion in this section. A dull emitter receiving valve will be despatched to every reader whose idea is accepted for publication.

Letters should be addressed to the Editor, "Wireless World and Radio Review," Dorset House, Tudor Street, London, E.C.4, and marked "Ideas."

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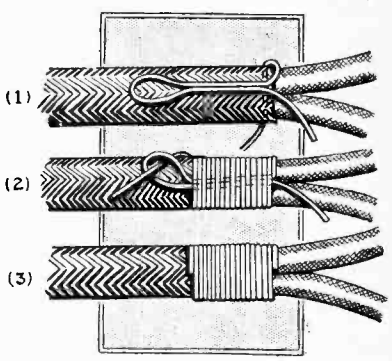
BINDING FRAYED LEADS.

There is a particularly neat method of finishing off the frayed ends of telephone cords and flex leads, the principle of which is illustrated in the diagram. The binding material is waxed thread or thin twine, and there are three stages in laying on the thread.

(1) The end of the thread is formed into a loop which is laid parallel to the wire.



Three stages in the process of binding telephone cords.

(2) Binding is continued over this loop for the required distance and the finishing end of the thread is passed through the end of the loop.

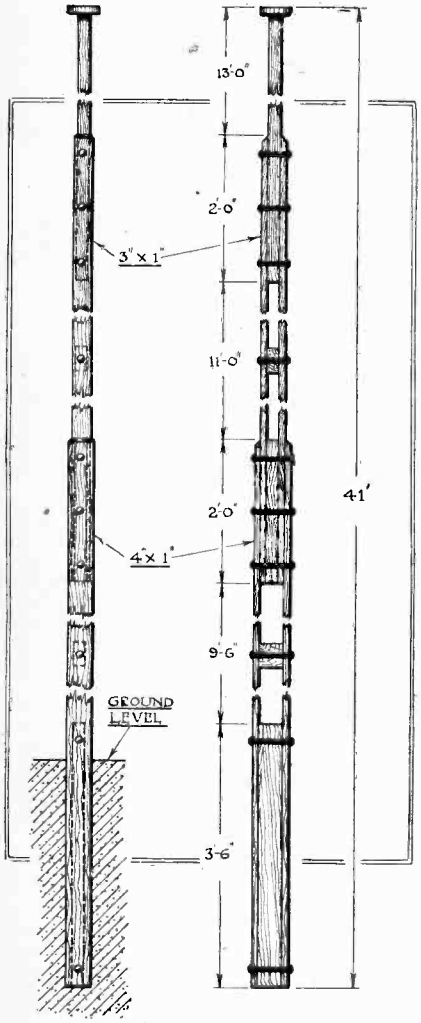
(3) The beginning end of the thread is pulled, thus drawing the finishing end under the binding, and any excess of thread is cut off flush with the ends of the binding.

The art in making a success of this method is to bind over the loop with the correct tension so that the loop can be easily pulled through, yet the act of pulling in the additional thickness of thread will securely tighten up the binding.

AN INEXPENSIVE BUILT-UP MAST.

The material for constructing a mast of this type can be obtained from any timber yard, and is used in the building trade for slate battens, etc. Various cross sections are available, and the cheapest material—unplaned white wood—is quite satisfactory.

The dimensioned drawing shows that the mast is bolted together in



Aerial mast built up of white wood battens.

three sections with spacing blocks at appropriate intervals, the cross sections of the wood in each section being as follows: Base, 4in. × 1in.; middle section, 3in. × 1in.; top, 2in. square.

Each member should be well creosoted before assembling; it is useless to paint the finished mast, as this leaves the interior faces of the joints unprotected from moisture.

When erecting the mast it should be well guyed in a plane at right angles to the flat sides of the wood sections. It will not flex, however, under the pull of the aerial if this is applied in a direction "edge-on" to the strips. For this reason a mast of this type is particularly well suited for erection in a small garden, as it can be bolted and guyed to a wall or fence at the bottom of the garden without taking up space for guys fore and aft.

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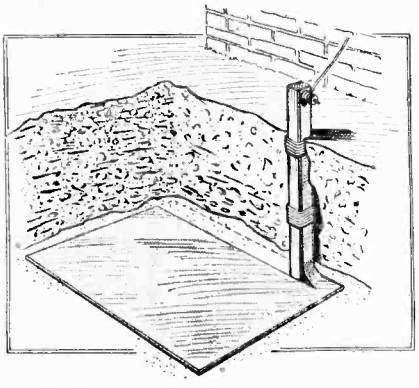
EARTH PLATE.

Soldered joints in an earth system below ground level are a continual source of trouble due to corrosion of the dissimilar metals near the joint.

The diagram shows a simple form of construction which entirely obviates the necessity for making soldered joints. A rectangular sheet of metal



Earth plate without soldered joints.

of the required size is cut along one edge to form a strip about 2in. wide which is bent vertically and lashed to a square wooden stake driven into the ground at the side of the horizontal plate. The earth lead is then connected to the projecting end of the strip and the earth filled in to cover the plate.

There will be no need to dig up the earth plate should trouble develop in the earth system, as the fault is certain to be found above ground level.

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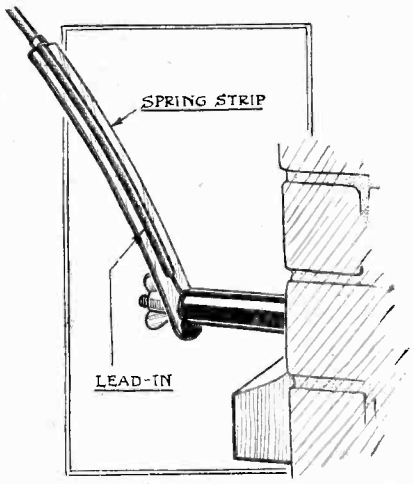
LEAD-IN BREAKAGE.

Continual swaying of the aerial down-lead will eventually break off the wire at the point of attachment to the lead-in terminal. It is at this point that maximum flexing of the wire takes place, and an obvious cure is to make any bending extend over a greater length of wire. A strip of springy brass or phosphor-bronze serves this purpose. It should not be less than 6in. in length, and should be drilled at one end to fit under the lead-in terminal. The other end should be cut to form two narrow strips, which are then turned over to hold the wire.



Flat spring fitted to relieve strain on lead-in wire.

The spring material should not be too stiff compared with the wire, otherwise the latter may break where it is clamped to the end of the strip.

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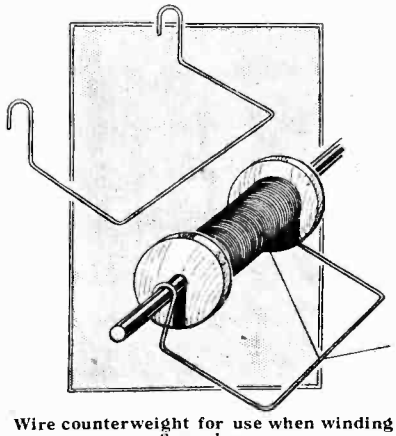
WINDING FINE WIRE.

Kinks are very easily formed when winding No. 47 gauge wire into telephone bobbins. In order to prevent this, a wire hook should be bent to the shape shown in the dia-



Wire counterweight for use when winding fine wire.

gram and hung across the rod supporting the wire spool. This will act as a counterweight, which will not only prevent the formation of kinks but will also give a more even winding tension.

B 20

The Experimenter's Notebook

Notes on Low-power Oscillators.

By "EMPIRICIST."

(*Continued from page 364 of the previous issue.*)

HAVING reviewed the general theory of valve oscillators with special reference to one particular type, it may be as well to give consideration to the more practical aspects of the problem and to discuss one or two alternative circuit connections. First, with reference to the circuit of Fig. 1 in the previous issue, we have seen that it is highly desirable both to keep on a reasonable working point of characteristic and to minimise the flow of grid current. In practice this amounts to keeping the steady potential of the grid at a negative value, and this has frequently been accomplished by the insertion of a condenser and leak in the grid circuit. An alternative and in many ways very satisfactory arrangement is that shown in Fig. 3 (*a*), in which a resistance of the order of 1,000 or 2,000 ohms is included

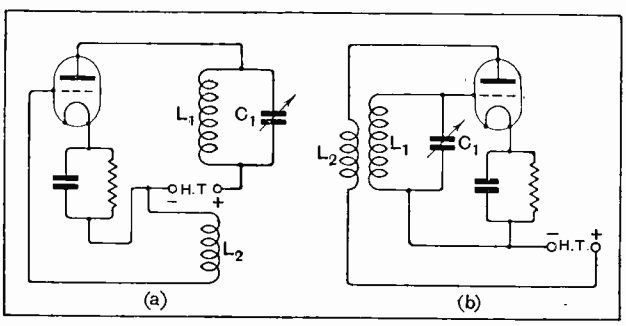


Fig. 3.—(a) Use of "automatic bias" arrangement to reduce grid current. (b) Similar circuit with tuned grid circuit and tight coupling.

between H.T. and L.T. negative, and shunted by a condenser of large value. The volt drop along this resistance is proportional to the steady anode current, and thus a measure of grid bias is applied to the valve, which in practice turns out to be largely self-regulating, and effects a considerable reduction, if not an extinction, of grid current. It is naturally of advantage to employ a valve of low impedance as oscillator, since valves of this type have a greater range of straight characteristic in the grid-current-free region; even with this, under the most favourable conditions, a trace of grid current will remain, unless, of course, very large values of high-tension voltage are employed. We therefore have to reckon upon some grid current flowing in the circuit, and to consider how this determining effect can be reduced to negligible proportions.

The most efficacious and practicable way of attaining this end in the case of the circuit of Fig. 1 is the reduction of the inductance value of L_2. This amounts to tightening up the coupling between L_1 and L_2, while keeping the mutual inductance up to the value which is necessary to give adequate reaction. This can be most readily accomplished by winding L_1 in the form of a solenoid and L_2 in the form of a winding superimposed upon L_1, and spaced from it by insulated strips. There will naturally be far fewer turns on L_2, and, in fact, it is quite astonishing what a small number of turns will enable oscillation to be satisfactorily maintained when this form of reaction winding is adopted.

It is really instructive to compare the constancy in beat frequency of an oscillator constructed on these lines with one in which ordinary plug-in coils are used. The critical factor is, of course, filament brilliancy, and it is astonishing what an enormous improvement, in respect of this variable, closely coupled windings will give. At the same time, another advantage is obtained, namely, evenness of reaction effect at different condenser settings.

Uniform Reaction.

This latter point requires a certain amount of elaboration, as, so far, we have not considered the variable factors introduced under practical conditions by change in the wavelength. Theoretically, in the circuit of Fig. 1 the working conditions, as regards dynamic characteristic, should be the same at all wavelengths. In practice, however, it is found that the reaction effect increases as the condenser C_1 is reduced in value. This is partially due to the losses in the coil L_1 having more weight for larger values of the tuning condenser, while an even more important cause lies in the effect of the capacity between the grid and the plate. When the inductance L_2 has appreciable value, the valve capacity current sets up a voltage across it which favours reaction, but, instead of this effect being constant at all wavelengths, it increases sharply at the lower wavelength, and thereby produces an effect as if the coupling between L_1 and L_2 were progressively tightened. The wave form, therefore, becomes worse and worse at the shorter wavelengths, and we possibly arrive at a state where unsatisfactory wave form at the short wavelengths is accompanied by insufficient reaction coupling at the longest.

The Experimenter's Notebook.—

The cure for this trouble again lies in the tightening of the coupling between L_1 and L_2, and there is no doubt that for an oscillator in which uniformly good wave form is required, this construction offers the highest advantages.

While the reasons in detail are not precisely the same, we are led to exactly similar conclusions in the case of a grid tuned oscillator, the circuit of which is shown in Fig. 3 (*b*). Here the same type of automatic grid bias may be employed with advantage, and an even smaller number of reaction turns suffices to produce adequate oscillation. (For one particular oscillator of this type three turns of reaction winding were enough.) The circuits of Fig. 3 differ in one fundamental respect, namely, that in the former the voltage in the oscillatory circuit is considerably greater than that in the latter. This is due to the fact that the variations in plate voltage necessary to take plate current from zero to saturation are the determining factor in the circuit of Fig. 3 (*a*), whereas the very much smaller variations in grid voltage which are necessary to achieve the same end regulate the extent of oscillation in Fig. 3 (*b*). In neither case, however, is the voltage a maximum unless the resistance of the oscillatory circuit is high; in practice, if an "anode tap" is employed, as in the circuit of Fig. 4, some point will be found at which the greatest amplitude of oscillation is produced, the resistance within the oscillatory circuit then being equal to that thrown into it by the damping due to the internal resistance of the valve.

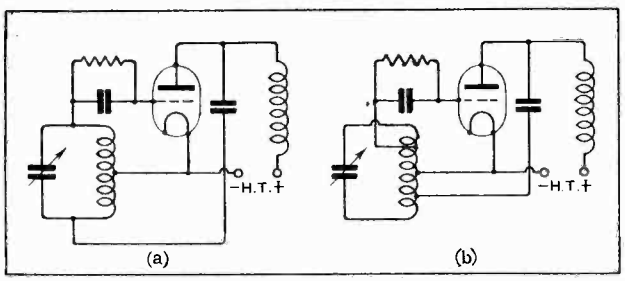


Fig. 4.—The Hartley circuit oscillator. (a) Usual circuit in which oscillations may be too strong. (b) Variable grid and plate tappings for reducing oscillation amplitude and improving wave form.

The Hartley Oscillator.

There is another class of oscillatory circuit of which a very well-known typical example is shown in Fig. 4. In this circuit, popularly known as the "Hartley," after its originator, the necessary opposition of phase between the plate and grid voltages is brought about by dividing the oscillatory coil itself into two halves and connecting its extremities to plate and grid respectively. In the example shown, a shunt path is provided for the high-frequency current in the plate circuit, the steady voltage necessary to operate the valve being supplied through a high-frequency choke as shown in the figure.

In the case of this circuit, it is the oscillatory current which is mainly responsible for building up in the grid circuit the voltage in opposition to that in the plate circuit, although, of course, there is mutual inductance between the two halves of the coil itself, and the sign of this coupling is correct for the production of oscillation. The circuit would, however, oscillate if the grid half and the plate half of the inductance consisted of separate coils screened from each other, and we have, therefore, to reckon with an essentially different method of producing reaction.

Circuits of this type are quite satisfactory in use, and compare favourably as regards constancy with the ordinary oscillator according to Fig. 3 (*a*) and (*b*), in which the inductances consist of plug-in coils. On the other hand, they have a disadvantage, inasmuch as both terminals in the tuning condenser are "live," and, as a consequence, screening is necessary if capacity effects are to be avoided.

Controlling Amplitude.

With a valve of ordinary efficiency and a solenoid type coil it will be found that the centre of the windings will give far too fierce oscillation if used as a tap for the filament, and it will be advisable to apply this tapping point a few turns from either end. If a tapping is made near the grid end, the properties of the circuit will approximate to that of Fig. 3 (*a*), and if at the plate end to that of Fig. 3 (*b*).

In some cases it may be considered desirable to tap the oscillatory circuit at its centre point, so that the total electrostatic field from the arrangement may be reduced in value owing to simultaneous positive and negative voltages of equal value being produced on opposite terminals of the apparatus. In order to achieve this, either the plate terminal or the grid terminal or both may be connected to tapping points as shown in Fig. 4 (*b*), and the amplitude and wave form of the oscillations controlled in whatever manner may be desired.

An oscillatory circuit with which the writer has had very good results as regards both constancy of frequency and purity of wave form is shown in Fig. 5. Here the inductances L_1 and L_2 are constructed as before, the turns of L_2 being closely coupled and reduced to the minimum value required, but the tuning condenser is connected across the two inductances in series after the manner of the Hartley circuit. The disadvantage of the normal Hartley arrangement that both terminals of the tuning condenser are "live" is here very much reduced owing to the fact that by far the greater part of the inductance is included in the coil L_1. Furthermore, this circuit has an advantage over that shown in Fig. 3 (*b*), inasmuch as greater constancy of frequency for change of filament brightness is achieved; in fact, when the circuit is correctly set up it is practically impossible to detect any change of beat frequency for a change of filament voltage.

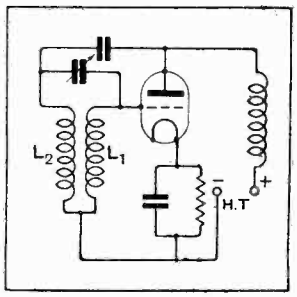


Fig. 5.—A stable oscillator giving good wave form with properly chosen parts.

We have not yet fully considered the question of constancy of calibration, since variations in the electrode capacities of the valve employed due to a burn-out occurring in the course of use will upset all of these circuits to a greater or lesser degree. In most cases one or other

The Experimenter's Notebook.—

of the valve capacities is placed in shunt across what is substantially the whole of the tuning inductance, with the notable exception of Fig. 4 (*b*), and as a result the electrode capacities will play an important part in determining the frequency of oscillation. Any arrangement in which electrode capacities are placed only across a fraction of the coil will result in these capacities playing a smaller part and the calibration of the circuit being more constant. This advantage is provided in the circuit of Fig. 4 (*b*), as, if an efficient coil is used, it will be possible to move both the plate and grid tappings to within relatively few turns of the centre of the coil. It can be shown that if equal fractions of the whole coil are intercepted between each tapping and the centre and the taps moved inwards until the reaction coupling is as weak as is permissible, then the effect of electrode capacity is a minimum.

The disadvantage attendant upon an arrangement of this kind is that reaction is likely to be more uneven over the range of the tuning condenser, since the exact nature of the resistance of the coil at different wavelengths becomes a controlling factor.

TRANSMITTERS' NOTES AND QUERIES

We are asked to state that reports for 6NC, the station of the Stoke-on-Trent Wireless and Experimental Society, should be sent to Mr. W. H. Reid, 19, Jervis Street, Heron Cross, Stoke-on-Trent, in preference to the address given in our issue of August 10th.

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Short-wave Tests.

An interesting series of tests on 11, 13, 15 and 17 metres was conducted under the auspices of the Reseau des Emetteurs Français from September 17th to 28th. Mr. R. P. Schlumberger (EF 8DQ) transmitted in code from Mordfeld, on the crest of the Vosges, with an input of 100-150 watts derived from an A.C. dynamo having a frequency of 600 cycles. Each transmission on one of the above wavelengths lasted for half an hour. Unfortunately, the schedule of times and wavelengths did not reach us in time for publication, but Mr. Schlumberger will welcome reports from any readers who may have heard these tests; these may be sent to him at Les Rosiers Guebwiller, Haut-Rhin, France.

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A Short-wave Receiving Station.

Mr. C. C. Mortimer (BRS 88), 86, Magpie Hall Lane, Bromley, Kent, sends us an interesting description of his short-wave receiving station, in which he employs an underground aerial 30ft. long buried 2ft. deep and encased in heavy rubber tubing. The receiver is a Reinartz o-v-1, tunable between 20 and 80 metres. He has successfully received stations from all parts of Europe and is arranging tests with India, Africa, and Brazil. He also uses an outdoor aerial 30ft. high with a 25ft. span, with which he employs a three-wire counterpoise, and at times a frame aerial 2ft. × 1ft. Mr. Mortimer would like to arrange "underground aerial" tests with amateur transmitting stations in all parts of the world.

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An Italian Pirate.

Capt. A. Pesaro (EI 1AI), Varese, complains that some "pirate" is making illicit use of his call-sign for telephony, and will welcome any information which will enable him to trace the offender. Whilst on this subject, we would assure those of our British readers who often ask us to publish complaints about the unauthorised use of their call-signs that, whilst we sincerely sympathise with their natural annoyance, we are confident that in many cases the publication of their complaints does more harm than good, as it puts the "pirate" on his guard and may impede the efforts of the R.S.G.B. and the Post Office authorities to track him down.

Danish Amateurs.

ED 7DH L. A. Duus Hansen, Brendekökke, Gelsted.
ED 7EL E. L. Enna, Allegade 17, Copenhagen.
ED 7FR H. V. Rödsbjerg Flensboe, Aagade 132, Copenhagen.
ED 7HP H. F. Petersen, Vidaagade 48, Tönder.
ED 7HM O. Mikkelsen, Sömandshöjskolen, Svendborg.
ED 7IM J. Kornerup Prior, Ehlersvej 7, Hellerup.
ED 7JJ J. J. Jörgensen, Aarhusgade 88, Copenhagen.
ED 7LY J. Stannow, Bolbrovej, Rungsted.
ED 7RN Radiolytteren Ugebladet, Pilestraede 35, Copenhagen.
ED 7TH T. M. Hansen, Graadyb Fyrskib, Esbjerg.
ED 7ZH H. Jensen, Grönnegade 6, Aalborg.
ED 7ZQ J. Hyllested, Kordilsgade 58, Copenhagen.

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Argentine Amateur Transmitters.

Supplementing and correcting the lists already published in the R.S.G.B. Log Book.

AP5	M. Cornell Arroyo, Viamonte, 958, Federal Capital.
DB1	P. Pell Richards, Rivera 23, Lomas de Zamora, Province of Buenos Aires.
DC3	J. Stockert, B. de Irigoyen 205, Punta Alta, Province of Buenos Aires.
DC4	G. Castillo, S. Luis 1819, M. del Plata, Province of Buenos Aires.
DC8	J. O. Barla, Libertad (F.C.M.), Province of Buenos Aires.
DD4	A. E. Solar., San Pedro (F.C.C.A.), Province of Buenos Aires.
EO3	L. Ticca, Salliquelo (F.C.S.), Province of Buenos Aires.
FJ4	E. Zorzoli, Urquiza 2556, Rosario, Province of Santa Fé.
JE5	J. T. Pons, Moreno 231, Concepcion del Uruguay, Province of Entre Rios.
JE7	J. F. Costa, Rocamora 615, Concepcion del Uruguay, Province of Entre Rios.
WA2	J. Toja, Gaiman, Territory of Chubut.

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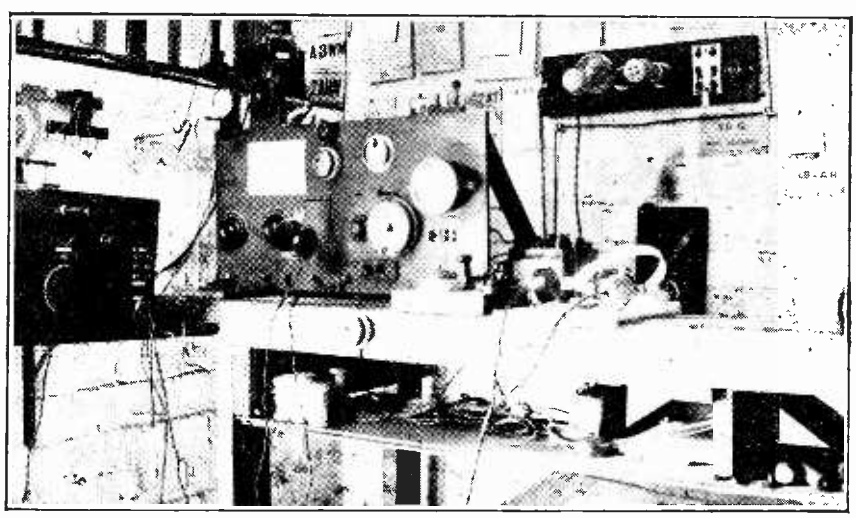
QRAs Wanted.

5DL, 6AC, 6BH, 6MA, 6TS.



A WELL-KNOWN STATION IN NORTHERN IRELAND. The crystal-controlled transmitter in Mr. Eric Megaw's Station GI 6MU at 3, Fortwilliam Drive, Belfast. The power valve is an Osram DET 1 and the crystal oscillator a Mullard DFA 8.

RECENT INVENTIONS

The following abstracts are prepared, with the permission of the Comptroller of H.M. Stationery Office, from Specifications obtainable at the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

Phosphorescent Valve Filaments.
(No. 271,401.)

Convention date (Austria): May 21st, 1926.

The inventor has discovered that certain sulphides possess an electron emission equal to that of the alkaline-earth metals or the thoriated tungsten usually employed for dull-emitter valves. This is particularly the case when the sulphides are phosphorescent, and it is suggested that some relation exists between these two properties. The sulphides of zinc, calcium, strontium, and barium are given as typical examples, especially when mixed with traces of sulphides of the heavy metals.

A metal filament of platinum or platinum iridium is first coated with calcium, containing traces of copper or bismuth, and the coating is then subjected to any known sulphurising process. Or the sulphide mixture may be first applied directly to the metal filament, and then fixed in position by heating to incandescence in an atmosphere of nitrogen. Patent issued to A. Just.

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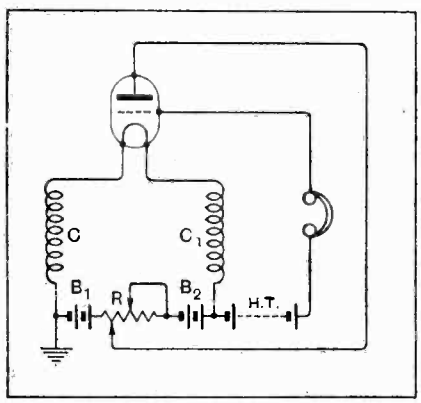
Filament Input Circuits.
(No. 272,797.)

Application date: January 18th, 1927.

Relates to valve circuits of the type in which the filament is insulated, so far as high-frequency oscillations are concerned, from the battery system, and in which the plate is maintained at a relatively low and the grid at a relatively high operating potential. In order to adjust the plate bias potential to its optimum point, the filament battery is divided into two sections, B_1 and B_2, which are connected through a resistance R. This allows a potentiometer tapping to be taken direct to the plate as shown. The positive terminal of the high-tension battery is taken through the phones to the grid, whilst chokes C, C_1 are interposed between the filament and its battery. Patent issued to A. F. and D. A. Pollock.



Three-electrode valve circuit with input applied to filament. (No. 272,797.)

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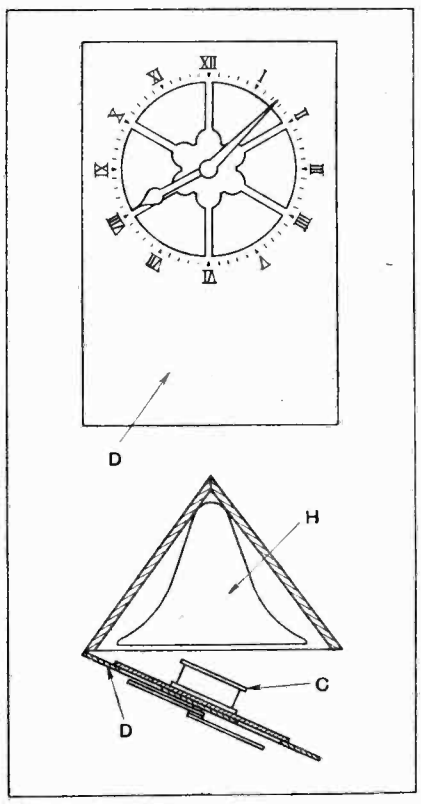
Disguising the Loud-speaker.
(No. 272,601.)

Application date: June 16th, 1927.

A loud-speaker of the goose-neck variety does not usually harmonise well with the furniture scheme of an ordinary living room. In order to render its presence less obtrusive, it is housed inside a cabinet, the outer face of which serves as a clock dial. As shown in plan the cabinet is preferably triangular in section, so as to fit snugly around the outline of the horn H. The front is a hinged door D, from the upper part of which a number of segmental parts are cut out to form the dial face. The clock C is mounted behind the centre boss, and the segmental spaces are backed with silk or other suitable material. The same scheme may be used to disguise a pleated disc or similar type of diaphragm. Patent issued to H. D. Arnold.



Loud-speaker cabinet with clockface front. (No. 272,601.)

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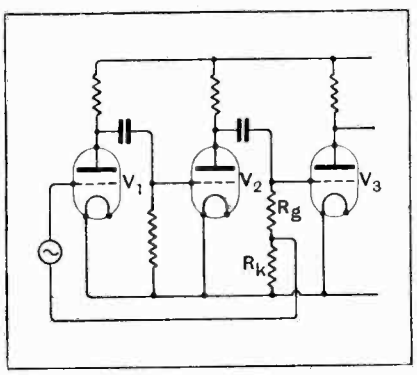
Resistance Reaction Circuit.
(No. 268,390.)

Convention date (Germany): March 27th, 1926.

The usual method of introducing reaction into a resistance-capacity coupled valve system is to connect the anode of one valve with the grid of a previous valve through a condenser. In such cases the degree of reaction naturally depends upon the impedance of the coupling condenser, and as this varies with frequency it becomes difficult to avoid distortion.

In the present invention back-coupling is introduced through an ohmic resistance R_k, which is inserted in series with the usual grid leak R_g of the valve V_3 and connected back to the grid of the valve V_1. It will be appreciated that the grid voltages of the two valves V_1, V_3 are in phase at any given instant, though they are 180° out of phase with the grid voltages of the intermediate valve V_2. Using valves with a "mu" of 7, and a coupling resistance R_k of 1,200 ohms, an overall distortionless voltage amplification of 1,225 has been obtained in the first two stages by this method. Patent issued to the Siemens Halske Co.



Resistance-coupled reaction circuit. (No. 268,390.)

Oscillation.—Highlanders and 5GB.—Long v. Short Plays.—B.B.C. to Relay Melbourne.—Listening and Reading.—First National Concert.

Concerning the Oscillator.

The revised anti-oscillation pamphlet, which the B.B.C. are still in the throes of preparing, is to have a more "popular" flavour than its predecessor. Its appearance will probably be delayed anotner week or two, what time the compilers add a few soulful touches calculated to draw howls, not of oscillation, but repentance.

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The Winter Offensive.

Meanwhile complaints of oscillation grow in direct ratio to the number of receivers in use, and Savoy Hill reports that the upward trend is occurring at the same time this year as last. Many of the protests come from listeners to 5GB, but this is explained by the fact that the advent of a new station is invariably followed by a flood of disturbance.

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An Obscure Cause.

In not a few of the cases recently investigated it has been found that the oscillation occurs in the set of the complainant! Most remarkable was the anti-oscillation protest of the elderly maiden lady whose case came up for investigation some time ago. When careful enquiries were made it was found that the good woman had never possessed a wireless set in her life. The cause of the disturbance has remained obscure.

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Letters from Maniacs.

When broadcasting first became popular quite a lot of maniacs became obsessed with the idea that their actions and thoughts were being pried into by wireless. The craze has somewhat abated now, though occasional letters are still received by the B.B.C. from people who consider broadcasting an instrument of the Devil.

The other day an elderly couple accused the broadcasting authorities of placing a secret microphone in their private sitting room.

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"Winston" to Broadcast.

Mr. Winston Churchill will broadcast an appeal for the Royal Infant Orphanage, Wanstead, from 2LO on October 9th.

FUTURE FEATURES.

London & Daventry (5XX).

OCTOBER 2ND.—Light Orchestral Concert.
OCTOBER 3RD.—Special International Chamber Music Concert.
OCTOBER 4TH.—Variety Programme.
OCTOBER 5TH.—"Miss Hook of Holland," a Dutch Musical Incident.
OCTOBER 6TH.—Military Band Concert.
OCTOBER 7TH.—National Concert conducted by Sir Henry Wood.
OCTOBER 8TH.—Variety Programme.

Daventry (experimental).

OCTOBER 2ND.—"Samson," an Oratorio by Handel.
OCTOBER 3RD.—Military Band Concert.
OCTOBER 4TH.—"Manon." by Massenet, relayed from Glasgow.
OCTOBER 5TH.—Symphony Concert.
OCTOBER 6TH.—Symphony Concert.
OCTOBER 7TH.—Light Music and Vocal Programme.
OCTOBER 8TH.—Roger Quilter Programme.

Bournemouth.

OCTOBER 4TH.—Spanish Music.

Cardiff.

OCTOBER 2ND.—Czecho-Slovakian Programme.
OCTOBER 5TH.—A Welsh Harvest Programme.

Manchester.

OCTOBER 8TH.—"On with the Show of 1927," relayed from the North Pier, Blackpool.

Newcastle.

OCTOBER 5TH.—"A Night in Venice," Orchestral and Vocal Programme.

Glasgow.

OCTOBER 8TH.—"The Postman's Knock," a programme presented and performed by the staff of the G.P.O. Glasgow.

Aberdeen.

OCTOBER 3RD.—A Goring Thomas Programme.

Belfast.

OCTOBER 8TH.—The Ladies Will Entertain.

A Sad Business.

My deep sympathy goes out to the Highlanders who have complained to the B.B.C. that they can't hear Daventry Experimental. But was 5GB ever intended for Scottish listeners? It may be a "complete failure" so far as Scotland is concerned, but, for that matter, so is Salamanca.

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Northern Dead Spots.

There is little doubt, however, that a shielding effect does occur on a line drawn northwards from 5GB. This is presumably due to the influence exerted by the 5XX masts, and it will be interesting to note whether the trouble vanishes when 5GB's new aerial system goes up in a fortnight's time. This, by the way, will be in the form of a single aerial with two masts, in place of the present double aerial scheme.

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Is Birmingham Happier?

Signs of returning contentment with the new order of things are evident in Birmingham, though there are still people in the central area who will never forgive the Broadcasting Corporation for scrapping 5IT in favour of 5GB.

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Long v. Short Plays.

The Long Play v. Short Play controversy is ending in favour of the short play, the consensus of opinion pointing to a preference for "short and snappy" works of between twenty and thirty minutes duration. Hear, hear! It takes an extraordinarily good broadcast play to retain a listener's interest for more than thirty minutes, and extraordinarily good broadcast plays can be numbered on the fingers of one hand.

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A Labour of Love.

No man, however, can hope to make a livelihood by writing short plays for the B.B.C. For the ordinary "thriller" lasting, say, twenty minutes, the Corporation may offer five or even seven guineas. This buys the play outright, and the B.B.C. may produce it as many times as they like without further payment.

A Reason.

In fairness to the B.C.C., it should be remarked that they cannot pay at theatre rates for the reason that there is small hope of more than two or three performances of any one play in the course of a year.

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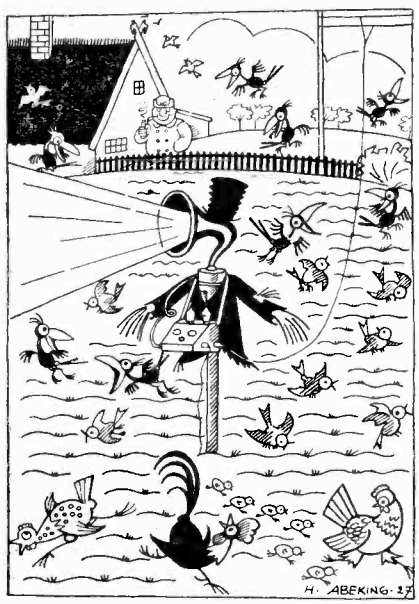
B.B.C. Relay from Australia.

The statement that the B.B.C. has declined to co-operate in a broadcast from 3AR, Melbourne, in about a month's time, is, I hear, incorrect. The transmission is being arranged by a Melbourne paper, which states that a wavelength of 55 metres will be used at



THE OLD ORDER CHANGETH. The time having arrived for scrapping obsolete receivers in favour of newer and more economical models, the cartoonist in the official catalogue of the recent Berlin wireless exhibition provides a valuable hint for those who seek a use for the old set.

1 p.m., Greenwich time. In view of past results the chances of obtaining good reception in England on that wavelength in the middle of the day are not good; but the B.B.C. opinion is that if a wavelength of 25 metres or lower is used, or if a 55-metre transmission is tried at 9 p.m., Greenwich time, there are hopes of successful reception and relay.

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Listening and Reading.

Many people profess to be able to read a book while listening to broadcasting, though I imagine that the degree of concentration depends upon those two variable factors, the quality of the broadcast and the interest of the book. At any rate, the broadcast listener has the advantage over the concert-goer in that he can perform things while listening at the fireside which would be reprehensible in a concert hall.

Perhaps the mildest form of iniquity is knitting, against which a Welsh orchestral conductor has seen fit to lodge a protest; but knitting is surely one of those sub-conscious employments which do not exclude concentration on lighter forms of intellectual activity. The same cannot be said of reading, and the fellow who attempts to listen to a classical concert while devouring the evening newspaper is committing the crime of waste. He ought to be saving his battery.

A man of my acquaintance writes to his *fiancée* on Sunday evening to the accompaniment of the Piccadilly Hotel Orchestra. This should be regarded as a just cause or impediment to the match.

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Pointed Criticism.

"It is perhaps just as well that Schubert did not add anything more to the Unfinished Symphony; 5SC doesn't even play all the notes he did write."—A correspondent in the *Glasgow Herald*.

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The Recurring Announcer.

The Americans, I see, have carried the idea of "starring" certain announcers to such an extent that some of these luminaries, before they "go on the air," are themselves announced by subordinates.

This business grips one—it reminds one of recurring decimals. We can imagine the Under-Sub-Deputy-Assistant Announcer starting up: "Just a word, folks, to let you know that Hiram X. Splob is about to tell you that Jesse K. Yellowhammer will introduce Pflugel J. Spottedog who . . ."

Anyway, it fills up the evening.

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Free Crystals for All.

There will be great goings-on in the Skeoch Woods, near Rothesay, when the news gets about. The news is that in the Skeoch Woods you will find a mineral which makes quite a good rectifier—about 75 per cent. as good as ordinary hertzite. The same mineral has also been found, according to my informant, at Tyndrum, Leadhills, and at Strontian, in Argyllshire.

The important point is to make sure of getting there first. Och aye!

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Unhappy Twenty-nine.

Every thirtieth Canadian owns a receiving set, according to official estimates at Ottawa.

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The Eisteddfod Atmosphere.

Eisteddfod winners will give a concert from Cardiff on October 5th. An attempt will be made to capture the authentic Welsh atmosphere of the Eisteddfod.

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Mr. Temple Thurston.

Mr. E. Temple Thurston, the author of "The Wandering Jew," which was broadcast in the early summer from 2LO, has developed a keen interest in broadcast drama. As a result of a visit which he paid to Savoy Hill last week, it is hoped that some interesting developments will take place, in which Mr. Temple Thurston will play a prominent part.

Mr. Jetsam on Broadcasting.

Mr. Flotsam and Mr. Jetsam will begin another week's appearance before the microphone at 2LO on October 10th in a new programme. Judging from the results of a recent provincial tour, broadcasting, in Mr. Jetsam's opinion, so far from prejudicing him and his partner, has brought crowded audiences to their performances, and the financial results have been eminently satisfactory.

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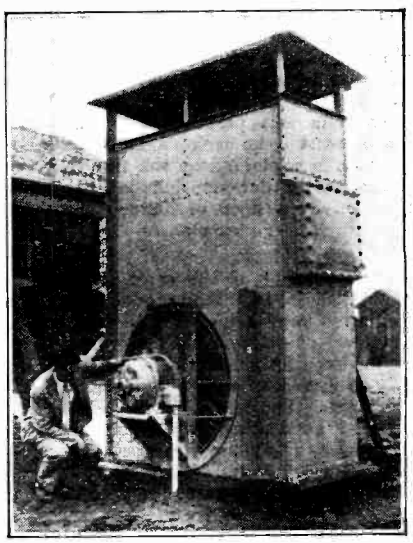
Can You Beat It?

The spirit of optimism is not dead. Signals may fade away, atmospherics may torture, Morse may splutter, but the spirit of optimism will still shine.

"Why this ranting humbug?" you ask.

It is not ranting humbug, as the following will prove:—"Sir,—I have today forwarded to the Postmaster of Birmingham an application for refund of the value of the unexpired portion of my 'wireless' licence." In the rest of this letter, which is culled from the correspondence columns of the *Birmingham Post*, the writer makes it known that he is displeased with reception from the new 5GB, hence the step he has taken.

For sublime optimism I award him the palm, with dates.



COOLING A 50 kW. TRANSMITTER. This quaint erection is the water cooler which deals with the 4,000 gallons of water needed hourly for cooling the valves at the new WEAF Broadcasting Station at Bellmore, Long Island, N.Y.

First National Concert.

The first of the season's B.B.C. National Concerts, to be given from the Queen's Hall on October 7th, will include the 9th Beethoven Symphony, thus completing the series, the other eight having been given in the "Proms." The principals taking part in the choral symphony are Stiles Allen, Astra Desmond, Tudor Davies and Harold Williams. The chorus will comprise the Royal Academy of Music Chorus and others.

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

WIRELESS SETS AND THE B.B.C.

Sir,—I notice in your issue of September 21st a letter from a Mr. C. R. Stewart and a reply from the British Broadcasting Corporation, where Mr. Stewart suggests the B.B.C. should undertake the design and manufacture of radio receivers.

Mr. Stewart, in the first place, has no regard apparently whatsoever for the number of perfectly reputable radio set manufacturers who have invested large sums of money in research and factory equipment, nor in the number of work-people that might conceivably be thrown out of employment were his suggestion adopted and these same manufacturers put out of business.

Up to a certain point the statement from the B.B.C. which you publish is reassuring, but it would be far more satisfactory and equitable if the wireless industry had this assurance in some more permanent form. Whilst the letter which you have published is entirely satisfactory as representing the fixed policy of the B.B.C. on this important subject, and whilst this policy would, I feel sure, be generally approved as right and proper by independent judges, it should not be overlooked that the B.B.C. itself is liable to changes in administration, that a new executive might hold entirely opposite views, and that there is at present nothing in the Articles by which the Corporation is bound, to prevent the adoption by such a new executive of the very policy which the Corporation at the moment so entirely condemns.

There is certainly no doubt that when the Articles of Association were drawn up and approved, the possibility of such an action on the part of the B.B.C. must have been entirely overlooked, as otherwise it seems unlikely the way would have been left open, as is the case at the moment. However, it is not too late to remedy this matter.

In spite of the criticisms which are often very unjustly levelled at the B.B.C., they have, in an incredibly short space of time, carried out a marvellous service to the public. Only those who have heard radio in many other countries can fairly judge. Let them stick to this magnificent work and allow the manufacturer to stick to his particular problem, which is the design and production of first-class radio apparatus at the lowest possible price and, moreover, which is equally important, backed up by service after the initial sale.

(Signed) W. H. LYNAS, Managing Director.
For and on behalf of GRAHAM AMPLION, LTD.

September 21st.

WIRELESS IN ARMOURED CARS.

Sir,—In your issue of *The Wireless World*, dated September 7th, I notice a reference to one of the armoured cars of this regiment in which it is stated that radio communication between armoured cars and headquarters could be maintained.

I should like to add that not only is this so, but, what is still more important, communication between the armoured cars themselves while in motion, up to a range of 10 to 15 miles, can be effected with ease.

In justice to the various manufacturers who were kind enough to supply apparatus for our experiments, I should like to place on record that Osram valves were used throughout in conjunction with a Mackie generator, Peto and Radford accumulators and Ormond condensers.

K. HARTRIDGE (Captain),
Engineer Officer, 23rd (London) Armoured Car Company.

London, N.W., September 8th, 1927.

SHORT-WAVE RECEPTION IN BRAZIL.

Sir,—In view of the possibility of a short-wave station being erected in England, I thought it might interest you to know that out here, PCJJ, 2XAF and KDKA are absolutely the only broadcasting stations one can hear with comfort. It is, of course, possible to pick up other broadcasting stations in the States and South America, but the atmospherics prohibit any enjoyment being obtained from them. The two stations, PCJJ and 2XAF, however, come in at good loud-speaker strength on a set built in accordance with your Empire Broadcast Set of June 29th, plus a L.F. amplification second stage and a choke feed to the loud-speaker.

I had already built a short-wave set with which I received the reports of the Dempsey-Sharkey fight. You will see by the front page from the local paper the interest that was taken in my reception of the report of that fight.[1] There are only about four of us in this town of some 200,000 inhabitants with receiving sets that give results. Had it been the report of a football match in England the interest would have been greater still, the Brazilians being very keen followers of the game.

Unfortunately most people here seem to think North America is the only country that knows much about wireless, so that it is impossible to buy anything but American parts, and I certainly think that North America owes a lot of its increasing influence in the South American countries to its wireless propaganda, especially on short waves. Announcements are very often made in Spanish, and advertisements are sometimes made, but not in a way to interfere with the programme. I am quite sure that if England put up a really good and powerful short-wave station our prestige would go up enormously in South America, and apart from giving a tremendous amount of pleasure to Englishmen in these out-of-the-way spots, it would, no doubt, open up a market for English apparatus. People at home have no idea of the thrill it gives one in a foreign country so far away to hear English songs and music come in over the wireless, even if it is spoken with an American accent or by gramophone records from Holland.

I certainly congratulate you in your efforts to get a short-wave station established, and I sincerely hope that it will not be long before your efforts meet with success, and a really good and powerful short-wave station is established in England.

H. FOSTER SMITH, A.M.I.E.E.

Pará, N. Brazil, August 22nd, 1927.

LEGISLATION FOR AMATEUR TRANSMITTERS.

Sir,—No doubt I am not the only person who has read, with considerable amusement not unmingled with a certain amount of alarm, some of the preliminary suggestions that have been forwarded for consideration at the International Radio-telegraphic Conference, to be held at Washington, U.S.A., during October, to revise the radio laws throughout the world.

With wavelengths above 200 metres I am not particularly concerned, but with the lower wavelengths I am, in common with other British transmitters, very much interested.

Judge my surprise, then, on reading in the current issue of "Q.S.T." an extract from the said proposals. First, the

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[1] The journal ("O Estado do Pará") devotes half its front page to an account of this incident, and reproduces a photograph of a group taken at Mr. Foster Smith's residence during the reception of the fight.—ED.

Swiss Government has suggested that "the establishment by individuals . . . of radio-telegraphic communications between several countries, exclusively intended for the exchange of private correspondence of interest only to an individual, is forbidden."

Well! If that is an example of the proposed legislation we are to get, it behoves us to delve deeper. However, knowing Switzerland to be a country always opposed to progress in any form, and amateur radio progress in particular, I read on, only to find that this is the trend of the majority of the proposals submitted by the world's Governments.

For instance, the Italian Government would like "to reserve the waves below 100 metres for public, military, and international commercial services. . . ." As "Q.S.T." rightly observes, "And so on, *ad naus.*"

In fact, the only two countries that seem to favour amateur transmission in any form are the U.S.A. and Great Britain.

Our own delegation suggests authorising transmission on exactly the same status as we at present enjoy; whilst the U.S.A. Radio Commission is even more generous, and proposes to grant amateurs exclusive wave bands in the 20, 40, and 80 metre regions, with another non-exclusive band in the 150-200-metre regions.

However, the great point is whether the hostile element will be sufficiently strong to overpower the suggestions of our own and the United States delegations.

I am not aware of the voting systems to be employed, so I must leave this question to a more able person than myself to supply the answer, but the prospect is sufficiently alarming to cause us a certain amount of trepidation.

Amateur transmission is in jeopardy unless amateur organisations throughout the world make immediate protests to their respective Governments.

In the case of our own country, I can only hope that the R.S.G.B., as representing the British transmitting amateur, is aware of the situation, and is taking suitable steps to see that our delegation to the conference is aware of the amateurs' views on the matter.

After all, there can be no legitimate doubt that the amateur *has* helped to develop short-wave transmission, in spite of contrary statements in this and other countries, by interested commercial parties.

Thus if extermination is to be the amateur's final reward, I suppose it must only be considered a logical development of his already far too long persecution.

New Malden, ERNEST A. DEDMAN
September 14th, 1927. (G2NH).

B.B.C. PROGRAMMES.

Sir,—It seems ungracious to criticise where so much is excellent, and I think that many of us feel this so strongly that the intended letter is much too often never written.

I want to say something about the preponderance of vocal over band and string music. It is very large, as a glance at the programmes for any day will show.

I have suggested to the B.B.C. that an occasional programme of band or orchestra without any vocal items at all would delight a large number of listeners.

Even if the studio did justice to the tenors, sopranos, and baritones—which most certainly it does not—it is, I am sure, an unwelcome interruption. If they were given in a separate part of the programme—part 1 or part 2—it would then surely suit all tastes.

One day last week 5GB had a "Military Band Programme" in the afternoon. Fifteen of the items were vocal and, I think, six band music. The same proportion existed in the evening programme, and, indeed, will be found in most of the programmes from the various stations.

It may be that the majority of listeners like this, but from what I hear I do not think they do.

Then there is the "Running Commentary." In my humble opinion the "Royal Tournament," the "Trooping of the Colour," and the "Tidworth Tattoo" were completely ruined by the incessant chatter of the commentators. Why should they do more than just tell us what is coming and leave us to enjoy the event?

On some occasions it seemed to me that the music and the noise of the crowd were deliberately reduced so that the "talk" of the commentators should not be interfered with. I noticed this at the broadcasting of the "Trooping of the Colour." R. T. WATKIN WILLIAMS.

Honiton,
September 19th, 1927.

TELEVISION IN 1925.

Sir,—I have seen repeated statements as to the first successful work in television having been accomplished by Mr. Baird, your English inventor.

While I personally admire what Mr. Baird has done in forwarding the art of television, nevertheless I think, in fairness

Washington

NGTON: SUNDAY, JUNE 14, 1925.—EIGHTY-SI

First Motion Pictures Transmitted By Radio Are Shown in Capital

Government Officials and Scientists, Summoned Quickly by Telephone, View Successful Experiment in Laboratory of C. Francis Jenkins—Small Apparatus Functions Perfectly.

A group of distinguished government officials and scientists, called unexpectedly from their offices and laboratories, sat yesterday morning in the laboratory of C. Francis Jenkins, at 1519 Connecticut avenue northwest, and saw for the first time in history motion pictures of a moving object miles away, received over the radio and thrown upon a miniature screen.

Among the visitors who had been called hurriedly on the telephone by Mr. Jenkins when he found the machine functioning perfectly, and who visited the laboratory at various hours in the morning, were Secretary of the Navy Wilbur, Dr. G. K. Burgess, director of the bureau of standards; Stephen B. Davis, Acting Secretary of Commerce; W. D. Terrill, of the radio department of the Department of Commerce, and two San Francisco scientists, who heard of the experiments and accompanied the officials to the laboratory.

Although the image broadcast was devoid of dramatic interest of itself, being merely a small model windmill with the blades in motion, NOF, the old naval radio station, which was turned over to Mr. Jenkins for experimental purposes when the department erected a larger one. It was from NOF that Mr. Jenkins broadcast still photographs to Philadelphia, Boston and other cities in 1923.

To illustrate motion, a small model Dutch windmill was erected and the blades propelled slowly by wind from an electric fan. The image of this was through a lens onto a kround glass. From this ground glass the image was picked up by Mr. Jenkins' apparatus in much the same fashion that it is for a still photograph. That is, a small sensitive pencil travels across it making approximately fifteen lines to the inch, converting the light intensity into electrical intensity or electrical modulations.

These modulations were broadcast over a wave-length of 546 meters and picked up in Mr. Jenkins' Connecticut avenue laboratory. Here the modulations were converted back into light values and a pencil of light made to travel in the same fashion as the sending

Television in 1925. A cutting from a Washington newspaper.

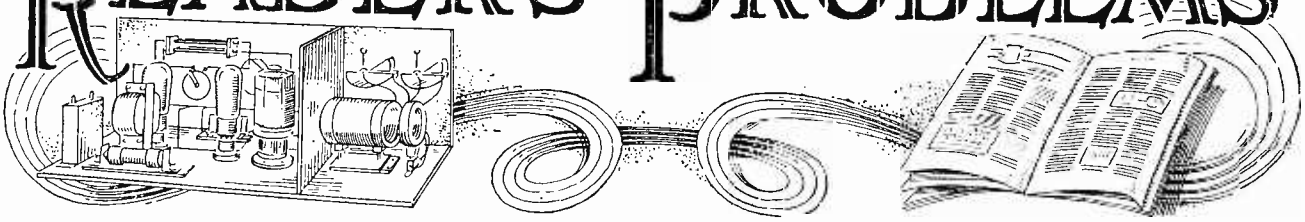
to the facts, that Mr. C. Francis Jenkins is entitled, probably more than any other man, to credit as the earliest successful worker in this important research.

I am forwarding some clippings from papers of several years ago which testify as to these facts, which I know will be of interest to your magazine.

JOHN HAYS HAMMOND, Jun.

Gloucester, Mass., U.S.A.
September 7th, 1927.

READERS' PROBLEMS



"The Wireless World" Information Department Conducts a Free Service of Replies to Readers' Queries.

Questions should be concisely worded, written on one side of the paper, and headed "Information Department." One question only should be sent at a time, and must be accompanied by a stamped, addressed envelope for postal reply. Any diagram accompanying the question should be drawn on a separate sheet. No responsibility will be accepted for questions sent in which do not comply with these rules.

Am I Interfering with my Neighbours?

I have built a three-valve receiver, the circuit of which I submit, and am using all best quality parts. I find, however, that on connecting up the receiver, although I can receive stations quite well on the loud-speaker, there is a persistent whistle, which mars reception. This whistle is present on the transmission of every station, and does not alter or disappear when I move the tuning controls. Is this oscillation, and am I interfering with my neighbours? Also, can you tell me where to look for the trouble, and how to remedy it? C. H. R.

A whistling noise such as you describe can be brought about by three main causes. Firstly, H.F. oscillation either deliberate or through ignorance. In this case, the whistling is brought about by the wave radiated from the aerial of your present receiver, beating with the carrier wave of the local, or other station. Since, however, alteration of your controls makes no difference to the beat of the note, this is not the cause. The second cause is a heterodyne note produced by the carrier waves of two different broadcasting stations beating with each other, the trouble being due to the fact that there is not sufficient frequency separation between the radiations of the two stations. This note would not be altered in pitch by movement of your dials, but would be altered in strength, but the whistling noise would only appear when you were tuned to either of the two offending broadcasting stations, and you would not hear the whistle on every station as you apparently do. The third case is due to L.F. oscillation in the set, due among other things, to bad design, magnetic interaction between transformers or chokes in the receiver, and battery coupling due to a high resistance in a portion of the H.T. battery acting as a coupling between the circuits of the various valves in the set. This whistle would persist no matter to which position the tuning controls were set, and is in all probability your trouble.

We notice in your diagram that you have omitted to insert large fixed condensers (1 mfd. or greater) across from each H.T.+ tapping to the common H.T.– and this is very likely the cause of the trouble, more especially if you are using a dry cell source of H.T. supply, which has a higher internal resistance than H.T. accumulators. The effect of these condensers is virtually to short circuit the battery with respect to A.C. currents, and so prevent coupling due to A.C. differences of potential being set up across the internal battery resistance. The insertion of these condensers is advised in any case, but they will not stop the trouble if it is due to a badly laid out receiver, and you are advised to see that transformer cores in your instrument are at right angles to each other and that they are earthed, or if the transformers are of the shrouded type, that the shrouds are earthed, and that transformers and other components are not built into an extremely confined space.

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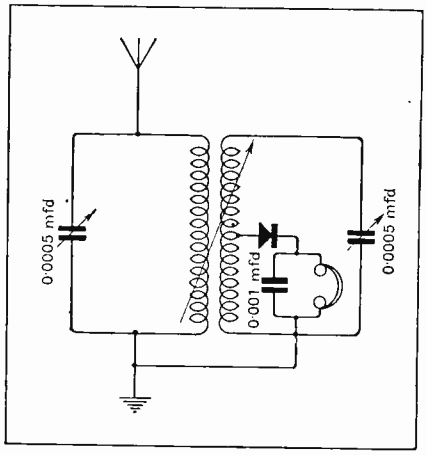
An Efficient Crystal Receiver.

I wish to build a first-class crystal receiver which will give me maximum signal strength and also will be selective, as I wish to receive both 5GB and also my local station, in addition to the long-wave Daventry station. I should be glad if you will assist me in this matter. R. A.

The circuit which we give below should be highly suitable for you. You will require two variable condensers of 0.0005 mfd. capacity, a 0.001 mfd. fixed condenser, and a two-way coil holder, together with crystal detector, plug-in coils, etc.



Selective crystal circuit with loose coupling.

The receiver employs loose coupling, using a fully tuned aerial and, in addition, a centre-tapped coil is used for the secondary, the crystal and telephones being tapped across half this coil, thus considerably reducing damping in this circuit. With regard to the secondary coil, of course, either a special coil holder will have to be used, or you can make use of one of those centre-tapped coils in which the centre connection is picked up by means of a terminal mounted on the coil.

This receiver should give very good results both from the point of signal strength and of selectivity.

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Mechanical Feed-back.

I am troubled by an annoying "howl" which is only curable by taking the loud-speaker into another room. All the usual precautions advocated in "The Wireless World" have been taken, but I am led to believe that this howl is not electrical, but in some way closely associated with the proximity of the loud-speaker to the receiver. I should be obliged if you could explain this phenomenon, and if possible suggest a cure. P. V.

The "howl" you are experiencing may be termed a mechanical feed-back as against an electrical feed-back which is usually responsible for this effect. What is actually taking place is that the sound waves emitted from the loud-speaker impinge on the detector valve and cause this to vibrate. This vibration results in a slight displacement of the various electrodes inside the valve, and their relative positions are altered. The very slight alteration in the disposition of the electrodes results in the constants of the valve being changed, and this change in its turn brings about a variation in the anode current. This is passed to the L.F. stages, amplified, and again fed back to the detector valve, but at a greater amplitude. The result is in many respects synonymous with the "reaction" employed in a receiver to boost-up the received signal. The main difference, however, is that the former takes place at a low frequency and originates from a mechanical effect, whereas the latter is an electrical effect and takes place at high frequency.

The obvious cure is to mount the detector valve so that it does not respond readily to vibrations of the receiver, or cabinet, in which the receiver is mounted. A good "anti-microphonic" valve-holder should be used, or perhaps a better method would be to mount the detector valve holder on spongy rubber and always keep the receiver enclosed in a cabinet when working. The sound waves will then be prevented from affecting the detector valve, and owing to the springiness of the mounting it will not respond to vibration of the cabinet.

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Eliminating Hand-capacity Effects.

I have constructed a single-valve "Hartley" receiver, but find that I have considerable trouble due to hand-capacity effects. Can you tell me to which point the moving plates of the condenser should be connected?
F. T. L.

In the majority of modern variable condensers it will be found that the moving plates are in electrical connection with the metal frame work of the condenser, the fixed plates being insulated, and it is intended, of course, that the moving plates and metal frame work be connected to a point at earth potential, in order to avoid hand-capacity effects. It is perfectly easy to do this in the ordinary receiver in which one set of plates of the tuning condenser is at earth potential, but in the case of the "Hartley" receiver both sets of plates of the tuning condensers are at high H.F. potential with respect to earth and one cannot therefore earth one set of plates. For best results with such a receiver it is necessary to employ a special condenser in which both sets of plates are insulated from the metal frame work. When using such a condenser the metal frame work should be earthed. Such an instrument is made by Messrs. W. G. Pye, Ltd. The only alternative, if an ordinary condenser is used, is to mount the condenser well back in the receiver, using a piece of ebonite tubing as an extension of the shaft, the dial being affixed to the other end of the shaft on the front of the panel. An additional precaution in such cases is to mount a metal plate at the back of the panel and earth it, or, of course, a metal panel, which should be earthed, could be used.

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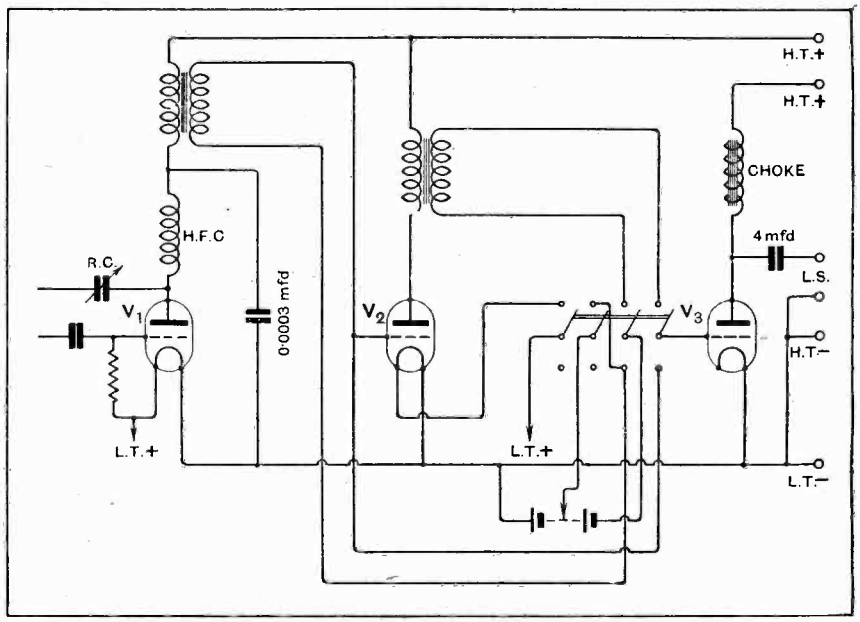
Switching L.F. Circuits.

Although I realise that switches in wireless circuits tend to reduce the efficiency of the receiver, I nevertheless desire to incorporate a switch in my L.F. amplifier so that one stage can be cut out when not required. Can you suggest how this can be accomplished with the minimum of loss in quality of reproduction and efficiency in operation? L. E. R.

We deplore the employment of switches in wireless circuits for the reason that unwanted capacity is introduced in the circuit, but if great care is exercised in carrying out the wiring the losses can be considerably reduced. In view of the fact that the output valve should be capable of handling plenty of power under all conditions, it is recommended that this be kept in circuit even when one stage only of low-frequency amplification is in use. As it is usual to employ a reasonably high voltage magnification valve in the detector position, it follows that the first intervalve transformer must have a high primary inductance, and therefore a low ratio, whereas in the second position a higher ratio and a lower primary inductance is usually used.



An efficient method of switching a L.F. amplifier.

Whatever switching arrangement is used must therefore maintain the low ratio transformer in the detector circuit and the output valve always connected to the loud-speaker. This can be achieved by a four-pole, two-way switch which cuts out the first L.F. valve and changes the secondary of the low-ratio transformer to the grid of the last valve, at the same time applying the required bias to this valve's grid. The diagram shows a switching arrangement whereby V_2 is cut out in one position and brought into circuit in the other, and also complies with the conditions outlined above.

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A Faulty Valve-holder?

I have a detector and two L.F. set which gives reasonably good results. Recently, however, I removed the grid leak from the detector valve and found to my surprise that the results obtainable were almost as good as when the grid leak was present. Can you tell me the cause of this phenomenon? M. S. H.

We are afraid that the fact that your set functions equally as well without a grid leak indicates a path of comparatively low resistance between the grid and the filament of the valve. We mean that there must exist a path having a resistance which is very little higher than the 2 megohms resistance of the grid leak. Needless to say, the insulation resistance between grid and filament of the valve should be in the order of many hundreds of megohms. It is obvious that there are many places where such leakage could occur, such as through the ebonite or other insulation material of which the valve-holder is composed. This would indicate a valve-holder of inferior quality. Similar trouble would be caused by a certain amount of dampness or soldering flux between the valve-holder sockets. It is not at all unlikely, for instance, that in wiring up you have allowed a certain amount of flux to spread underneath the valve-holder. The trouble might also occur in the actual valve base due to a faulty valve, or it might be due to an ebonite sub-panel if you are making use of valve sockets mounted on ebonite. A moment's thought will reveal that there are quite a number of other places where the trouble should be looked for.

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Adding H.F. to a Portable.

I am building the small single-valve portable receiver described in your issue of July 21st of last year, but wish if possible to add an H.F. stage without altering the external dimensions of the case, as I wish to use the set in a position rather more remote from a transmitting station than was mentioned as advisable by the author.
D. L.

It is quite impossible to add an H.F. stage to this receiver within the very small compass of the attaché case in which it was built. You can, however, improve the range of the receiver by redesigning the frame ariel in accordance with the drawings and instructions given on page 637 of our May 18th, 1927, issue.