AN "ALL-IN" MEASURING INSTRUMENT

SIMPLE SELECTIVITY

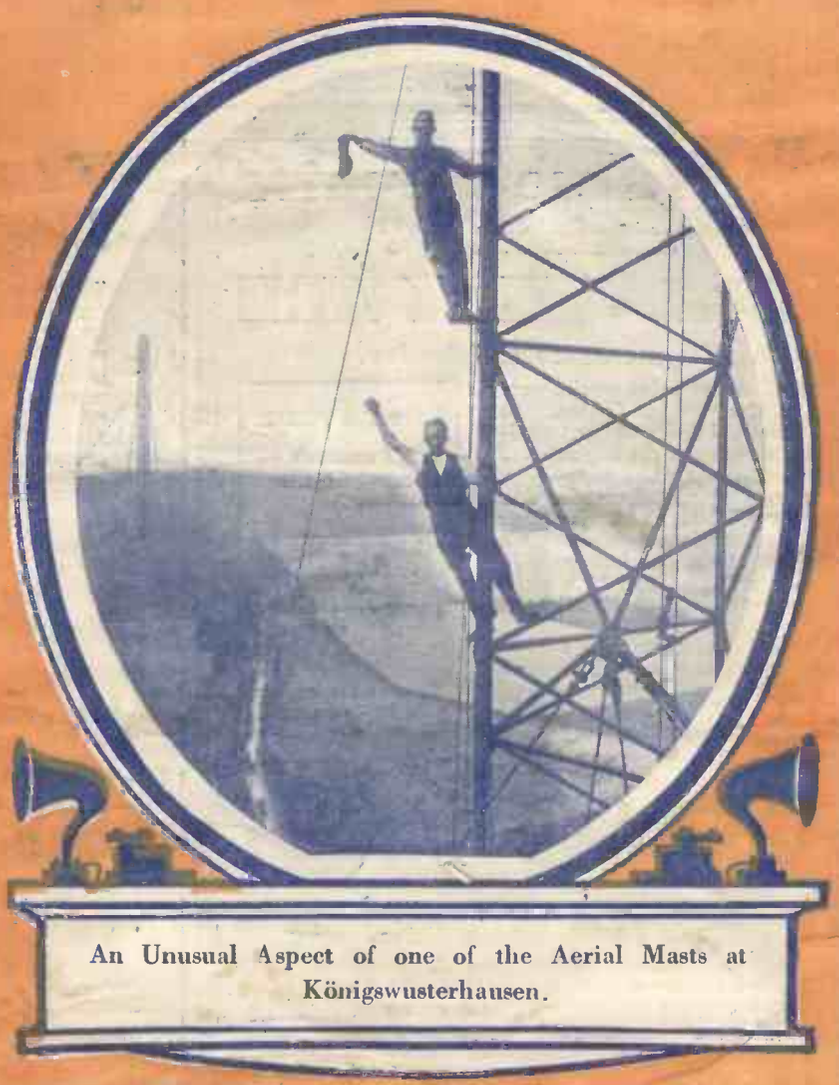
Amateur Wireless And Electrics

Vol. VIII. No. 200 SATURDAY, APRIL 3, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.



An Unusual Aspect of one of the Aerial Masts at Königswusterhausen.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. VIII. No. 200 — APRIL 3, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

SIMPLE SELECTIVITY

THERE is a widespread idea that a receiver can only be made really selective with the aid of expensive and elaborate instruments. This is quite wrong. A high degree of selectivity can frequently be obtained by altering the position of a component in a receiver, or by making one or two slight modifications in the wiring or layout of the instrument.

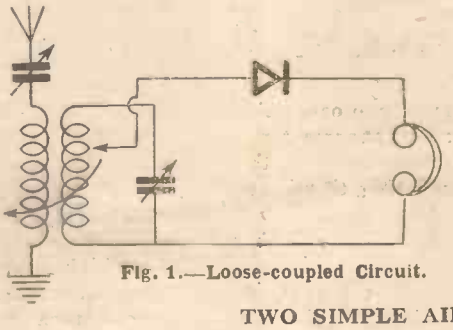


Fig. 1.—Loose-coupled Circuit.

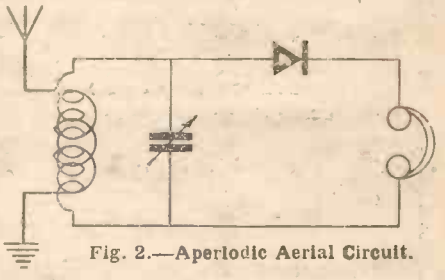


Fig. 2.—Aperiodic Aerial Circuit.

TWO SIMPLE AIDS TO SELECTIVITY

Sometimes it may be necessary to replace an unsuitable component by a new one of different (and better) design, but it is only in comparatively rare cases that the elimination of interfering signals demands the use of wave traps or complicated rejector circuits. These remarks apply particularly, of course, to ordinary broadcast reception.

From the point of view of cutting out interference the aerial circuit is the most important in a receiver. The efficiency of this circuit for the reception of waves of any given length depends, in the first place, on the relative values of its capacity and inductance. These factors are usually variable, by means of condensers and tuning coils. As every amateur knows, a particular station can be tuned in in a variety of ways, such as by using a large coil and a small amount of capacity, or a small coil with a large amount of capacity, etc. The smaller the inductance the larger must be the capacity. There is, however, one *best* value for the inductance and one *best* value for the capacity, and unless these are found maximum efficiency is not obtained.

The position of the aerial tuning condenser is not unimportant. Quite apart from the question of selectivity, it is never advisable to use a condenser in parallel with the aerial coil if it can be avoided, and it is rarely necessary to do so when receiving broadcast programmes on an amateur aerial. A condenser in series with the aerial lead, on the other hand, generally gives very sharp tuning, and although sharp tuning does not necessarily enable one to cut out interfering signals it is certainly a useful aid to selectivity.

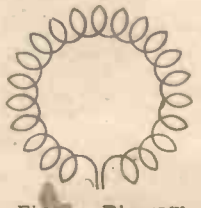


Fig. 3.—Diagram of Toroidal Coil.

The manner in which the crystal or valve is connected to the aerial circuit is still more important. In direct-coupled crystal circuits, for instance, the usual practice is to connect the crystal and phones across the whole of the aerial tuning inductance. A simple circuit of this kind can be made more selective by connecting the crystal to the centre (instead of to the top) of the tuning coil. This method can also be adopted with inductively-coupled circuits, of course. The circuit shown in Fig. 1 is extremely selective. The coupling between the primary and secondary coils should always be kept as loose as possible, as the selectivity of the circuit depends upon the extent to which the coupling can be loosened without

(*Concluded at foot of next page*)

PIRATES ABROAD!

Concerning the Relaying of British Programmes by Foreign Stations

IT is curious how the genius for compromise inherent in British character has again asserted itself with regard to the policy of broadcasting development. Cautiously, but nevertheless surely, this attribute has contributed to the evolution of a definite system, so that to-day British broadcasting stands on a sound foundation. One of the results of a definite policy is that wireless in this country finds itself in an enviable financial position. On the Continent are to be found a variety of policies and with them the consequent poverty, so that the inevitable result is that British broadcasting is surrounded by numerous poor relations, who after the manner of their kind are willing to accept whatever comes their way. It stands to reason that a private company with very moderate means will take advantage of valuable electric impulses that are to be picked up in a free ether.

Yet, from the British licence payer's point of view, is this generosity by its officials to be allowed to continue? Cannot barter be employed, or is John Bull forever to be the "milch cow" of the world? A parallel might be conjured up by the thought of how a gas company or electric light company would act were a user to tap either of the useful commodities which such industrious concerns produce.

International Piracy

The illegality becomes obvious when the parallel is mentioned of a Continental publisher printing and publishing a novel the copyright of which was not in his possession. Such an occasion cannot arise, but in the case of wireless there is no protecting legislation.

It can at once be said that in every case there is the same freedom, that an ideal state of ethereal socialism exists, but here again the ogre of capitalism steps in. British broadcasting radiates into the ether programmes whose hourly cost is vastly in excess of anything that can be "picked up" in return, so that the policy of free barter does not hold. The standard of wireless entertainment is in proportion to the financial capacity of the broadcasting company. Thus you cannot take out of the ether something that is not put in.

Britain's Lead

As British broadcasting is in so many respects ahead of all other countries (and as in the future the talent of the artistic world will undoubtedly be hired for the benefit of its listeners) to it then falls the unpleasant duty, forced by its own energy, of initiating the first steps for the establishment of machinery for the enforcement of payment for programmes relayed by foreign broadcast stations, the rate payable being in proportion to the cost per hour of the production.

A humorous point connected with the present state of affairs is that were a foreign broadcasting company to come to an arrangement whereby they relayed the programmes of the B.B.C. by land-line, suffering thereby the consequent impurity of reception, they would have to pay *pro rata*. On the other hand, the same programme can be "pirated" on a high wavelength comparatively free of interference. This valuable programme can then be locally radiated on a lower wavelength for the benefit of foreign listeners.

It becomes apparent how necessary it is that the productions of the British stations should be paid for in cash by foreign stations relaying the London programmes. Such relays must be placed on a cash basis of definite rates, and all stations could thus avail themselves of any programme by the payment of a rate fixed in accordance with the cost of production. One cannot make a record of the performance of a famous artiste by means of a loud-speaker and sell that record for profit; then why should a broadcasting company do the same thing for profit without payment to the originating station?

Bottled Programmes

The day is not far distant when wireless programmes will be "bottled" and reproduced on a commercial scale. With the arrival of this position it can be seen that the present state of "freedom" will not exist, as payment would have to be made, and that a heavy one, by all stations wishing to take the original broadcast of a programme. Otherwise the commercial value of the "bottles" would be very low indeed.

Wireless Customs Stations

This brings one to the next step of the institution of the Wireless Copyright Association Detecting Station. Such a station could be set up by the Geneva organisation for the purpose of detecting and recording the international relays. It would record and report the transmissions and durations of all relays and furnish the date on which payments should be made. Taking into consideration the quality of British broadcasting as compared with that of Continental and American stations, it can be seen how large would be the source of revenue from such "by products."

ROBT. GLENDINING.

The service on Easter Sunday evening is to be relayed from Norwich Cathedral and broadcast from all stations from 7 to 8 p.m.

"SIMPLE SELECTIVITY" (*continued from preceding page*)

weakening the signals which it is desired to receive.

The so-called "aperiodic" circuit shown in Fig. 2 provides another simple and effective means of obtaining selective tuning. The untuned aerial circuit contains a coil of wire, consisting of a few turns, by means of which it is coupled inductively to the closed (tuned) circuit. These modifications may also be introduced to valve sets, of course. Incidentally a stage of high-frequency amplification, with tuned anode, renders a valve receiver quite selective.

Toroidal Coils

The new "toroidal" coils, which are slowly gaining favour with British amateurs, are particularly suitable for use in selective receivers. A toroidal coil may be described as an air-wound solenoid, bent in the form of a circle (see Fig. 3). The planes of its end turns are thus almost parallel to one another. One result of winding the coil in this manner is to close the field of the coil, thus eliminating interaction between it and neighbouring components. Another result, which has a very important bearing on the problem of selectivity, is to reduce the coil's "pick-up" effect. It is well known that ordinary tuning coils are quite capable of picking up signals by themselves—when the aerial and earth are disconnected from the receiver. Anything which reduces this effect constitutes a distinct aid to selectivity. Interaction between components in a receiver should also be avoided as far as possible by spacing the components well apart.

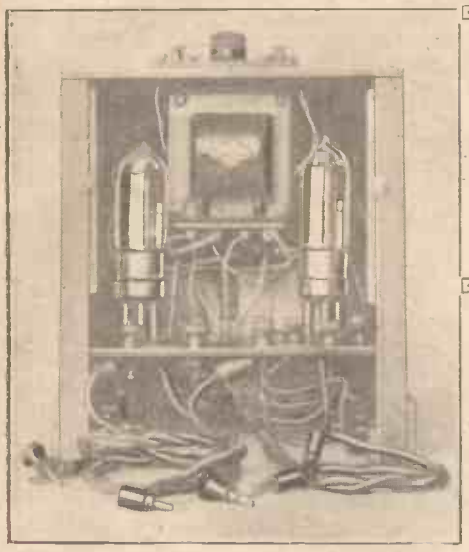
M. E.

The number of receiving licences issued in Glasgow, with a population of 1,100,000, is approximately 55,000. This does not compare favourably with Edinburgh's 27,000 licences for a population of some 400,000.

In order to prevent broadcasting becoming competitive with the Berlin theatres, the directors of the theatres have arranged to broadcast plays regularly. The Grosses Schauspielhaus, Berlin's largest theatre, has already been equipped with a powerful broadcasting set.

"DET., L.F. AND VARIOCOUPLER"

An Excellent Combination



Photograph of Rear of Receiver with Back Removed.

Photograph of Complete Receiver showing Tuning Controls

IN conversation with the engineering staff of one of the largest and best-known manufacturers of wireless apparatus in the country, the opinion was expressed that a detector valve coupled with a low-frequency amplifier was quite efficient for most purposes in this country. On such a set most stations could be brought in satisfactorily, especially in those parts of England situated in the midst of a chain of stations. "Stunt" circuits were vetoed. To emphasise their opinion, two or three sets, comprising two and three valves, worked from both frame and outdoor aerials, were tested. Not many miles from the nearest station there was sufficient strength on the two valves and an outdoor aerial to work a large loud-speaker with excellent results, and with the frame aerial and three valves one obtained all that was desired for the same purpose. Purity was one of the points emphasised by the staff of engineers, and certainly it was all that was claimed. No secret was made of the circuit, which was used in the army during the war. With one or two minor improvements to get better selectivity the circuit shown by Fig. 1 is the same.

To begin with, it is advisable to build the variocoupler, the dimensions of which are shown on Fig. 2 on the next page.

It will be noticed that the aerial coil is wound over the secondary and is aperiodic, requiring no condenser to tune it. This cuts out one control and greatly simplifies tuning. The reaction coil is made on a spider former with eleven pins, and is wound to allow it to turn inside the outer coil without touching the sides; $\frac{1}{16}$-in. clearance will be sufficient. The coil can be stitched to support it before taking it off the former. If preferred, this coil may be wound on a permanent cardboard former after the style of a basket coil. Other details are shown by Fig. 2.

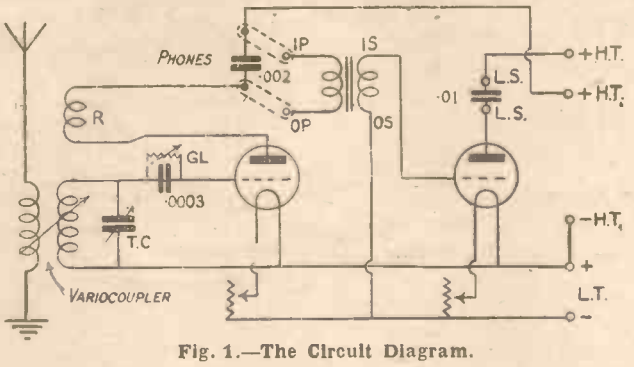
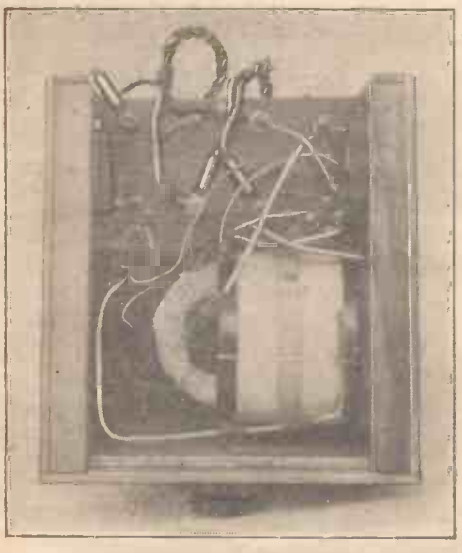


Fig. 1.—The Circuit Diagram.

The box is very simply made, with the use of very fine rivets, small screws and glue. The base must not be fastened on until the wiring is completed. The back is held in by two turn buttons and is hinged to allow the lower portion to be raised to allow phones or loud-speaker to be attached. The whole of the back may be taken out when placing the valves in position. The measurements are shown in Fig. 3. A broad beading or skirting placed around the base of the set puts a finished look to it.

The sloping front panel of ebonite may be cut and drilled to suit the components, also the ebonite shelf or sub-panel seen in the rear of the inside. (For measurements, see Fig. 4.) The grid leak, of the variable type, was placed on the top wooden panel of the box, as shown in the photographs. The positions of the components are shown in Fig. 4, which is also a guide for the wiring. In the photograph of the rear of the set most of the components placed on the back of the



Photograph of Under Side.

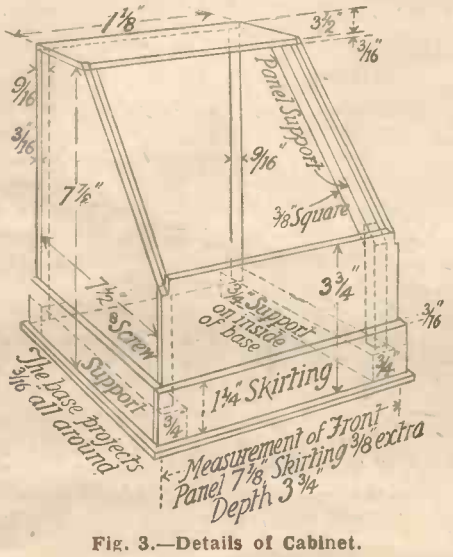


Fig. 3.—Details of Cabinet.

Photograph of Back.

sloping ebonite panel are not visible owing to the low-frequency transformer being placed on the under side of the top wooden panel. A little in the rear of this transformer is the grid condenser, also not visible, but the approximate positions of all components are shown on Fig. 4.

Two small switches were made from thin brass sheet and placed on the terminals shown in Fig. 4. These may be used to switch on the second valve when required. There are also two H.T. plug terminals. The one connected to the second valve is used to provide a higher voltage for amplification purposes. All the battery leads are kept permanently fixed on the set on the under side of the platform or sub-panel, and when not in use are simply folded up and placed within the case and the hinged back dropped down.

With the exception of the aerial and earth terminals, all terminals are placed on the ebonite sub-panel in the rear of the set. This panel is raised about 2¼ in. from the base and is supported on projecting wooden supports at the side of the case. The variocoupler is also screwed to the side of the case, and to enable this to be done a circular piece of thin wood is cut to fit the base of the coupler former and is fixed with very fine screws; another piece of wood is fixed on the circular piece before fixing the variocoupler to the side of the box to allow the spindle to be placed centrally on the front panel. The wiring of the variocoupler is not allowed to touch the base, but is fixed a little above the base to clear it by about ¼ in. The position of the screw to fasten this instrument to the side is shown in Fig. 3. The condenser used on this set is a Baty.

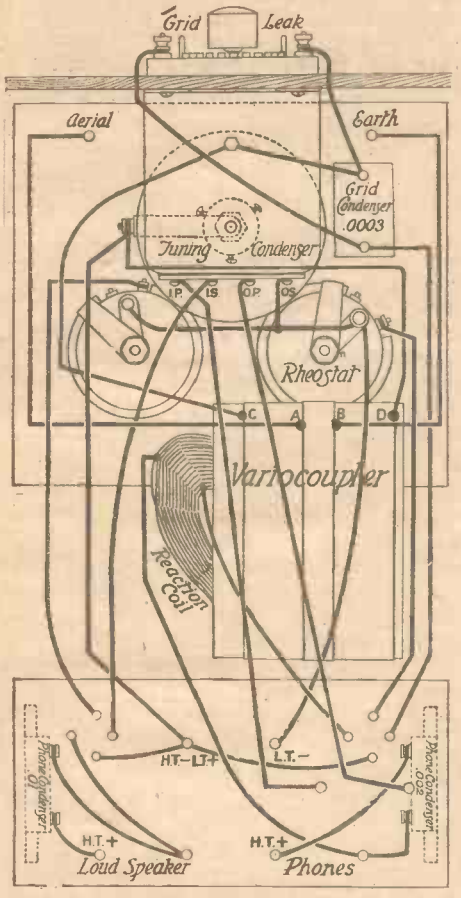


Fig. 5.—Developed Wiring Diagram.

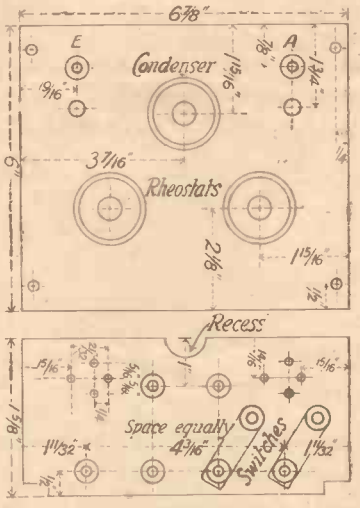


Fig. 4.—Arrangement of Components.

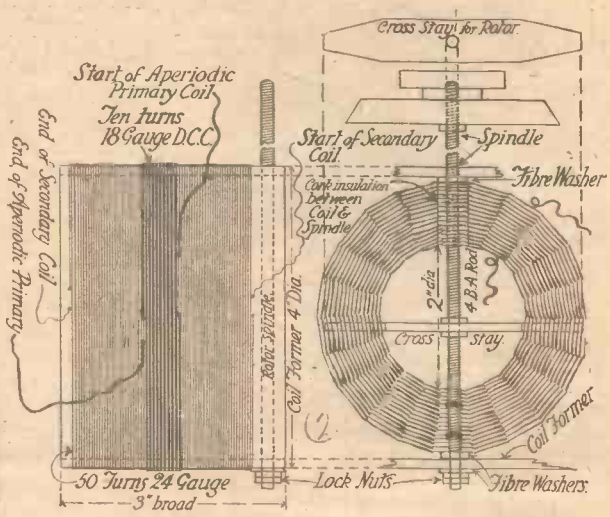


Fig. 2.—Details of Variocoupler.

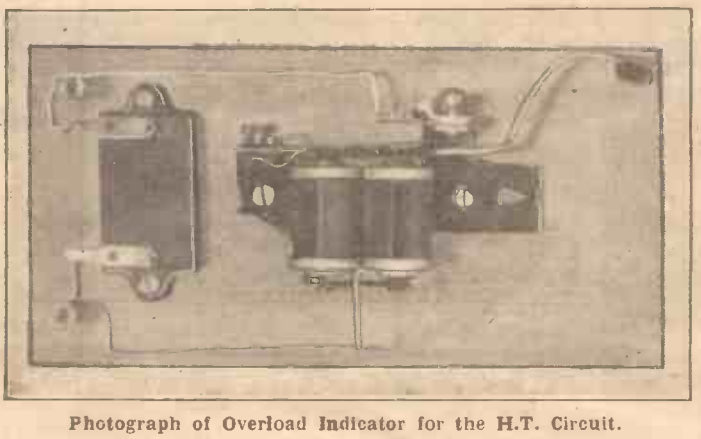
Simplification has been the keynote in building, there being practically only one control—the tuning condenser. The reaction coil will, of course, require attention, and if further simplification is desired a 2-megohm fixed grid leak may be used instead of the variable leak. The set has proved very elastic, and may be used on a frame aerial or a short length of wire suspended across a room, or an ordinary outdoor aerial. F. W. P.

SAFEGUARDING YOUR VALVES

A FUSE in the H.T. circuit, in the case of the experimenter who is constantly altering connections, is very often the means of saving the valve filaments should the H.T. be accidentally applied to the L.T. circuit. The device illustrated in the photograph is not a fuse, and therefore does not require replacement, but indicates by emitting an audible note that a wrong connection has been made.

It consists of a buzzer taken from an electric bell, across the terminals of which a fixed condenser of .002 capacity has been shunted.

When a wrong connection has been made the buzzer indicates the fault audibly, while the inductance prevents the current from rising to a value sufficient to burn out the filaments.

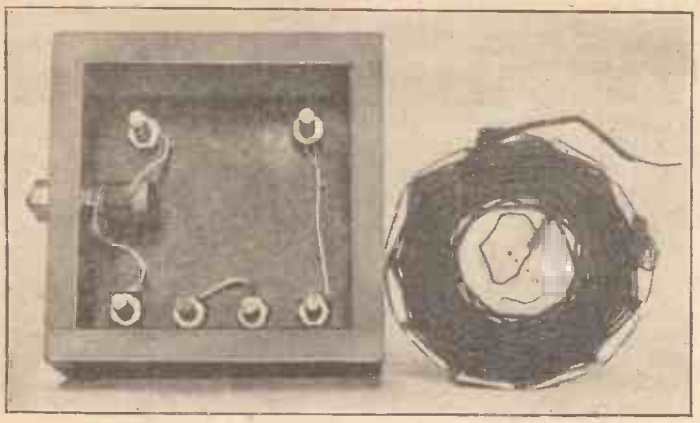


Photograph of Overload Indicator for the H.T. Circuit.

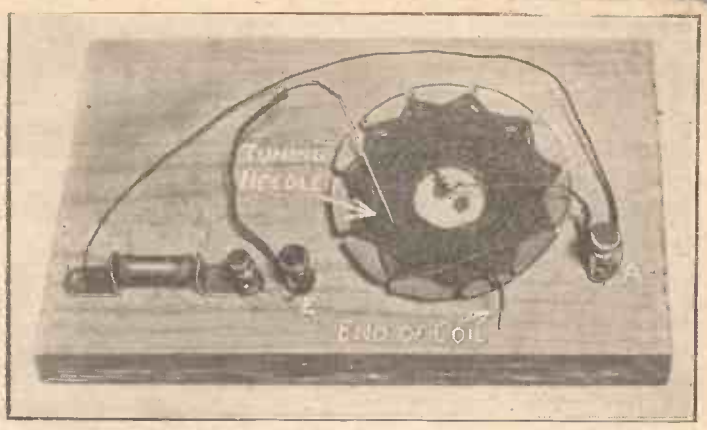
The normal H.T. current is insufficient to cause the buzzer to operate, and so good contact is maintained under normal circumstances.

The fixed condenser is fitted to by-pass H.F. currents, but is not essential to the operation of the device, which is connected in the positive H.T. lead. W. A. A.

The number of receiving licences issued in Glasgow, with a population of 1,100,000, is approximately 55,000. This does not compare favourably with Edinburgh's 27,000 licences for a population of some 400,000.



Under Side of Base and Tuning Coil.



Adjusting the Tuner.

A TOTALLY-ENCLOSED CRYSTAL SET

A simple receiver that does not require tuning

THE compact crystal receiver described and illustrated here is very easily and cheaply made, and if carefully constructed is highly efficient in use. The chief point to note is that, as the inductance is not variable, the coil must be tuned to the aerial and earth on which the set is to be used.

Materials

The materials required are: A small piece of $\frac{3}{16}$-in. ebonite, a length of wood about 12 in. by 1 in. by ¼ in. (such strips can be bought in 2-ft. lengths at Hobbies, Ltd., or similar shops for a copper or two), a quantity of No. 26 or 28 gauge s.s.c. wire, six terminals, screws, nails and a detector of the "fixed" perikon type. The detector shown here consists of a screwed vulcanite tube with adjusting screws at each end, with the two crystals lying between the screw-ends.

Few dimensions are given, as they will vary with the diameter of the inductance coil and the detector used. The inductance coil should be put in hand first of all. Cut a cardboard circle about 3 in. in diameter, with eleven slots on a 1-in. centre, and wind it full of the silk-covered wire, taking the wire into every third slot (missing two slots). This is to keep the diameter of the coil as small as possible.

Now lay out a "testing-board" something like that shown. Any piece of dry wood will be suitable for this purpose. Connect the aerial terminal to one side of the detector and to the inside (beginning) of the coil. Leave the outside (end) of the coil free. Connect the other side of the detector to one telephone tag. The remaining telephone tag goes to the earth terminal. Twist an inch or so of bared wire tightly through the eye of a needle, and attach the other end of this wire to the earth terminal.

Adjusting the Tuner

After connecting aerial, earth and phones to the testing-board, adjust the detector and push the point of the needle through the silk covering of the wire at different turns of the coil until signals are at their loudest. It is very difficult with a coil of this description to pick out any one turn from the one wound next to it, but as this is the most important detail of the construction of the set, it must be done accurately. Perhaps the easiest method is to fix the coil to the board with a couple of tacks, and having found the approximate "maximum" turn with the needle, take off most of the turns lying to the outside of it, cutting the wire. The remaining turns are then unwound one at a time, testing each one with the needle at the point where it leaves the card former. Do not cut the wire again until the "maximum" has been *definitely* found, and allow an inch or two for connection. The testing-board may now be dismantled,

Having found the size of the inductance coil, the dimensions of the ebonite top and the wooden sides of the set are easily arrived at. The ebonite should be marked out with a scriber, and the necessary holes for terminals and screws drilled before it is cut. After the panel has been cut the sides are cut from the strip of wood.

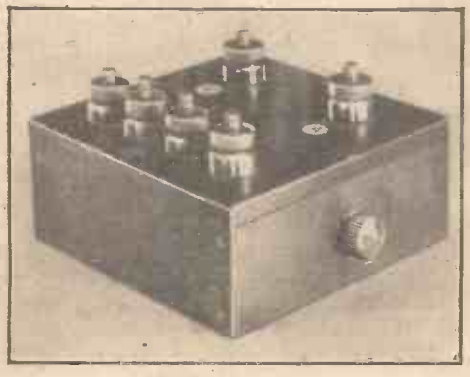
The detector should now be taken to pieces and the tube filed to give it four flat sides. When this has been done, a square hole to hit the filed detector tube must be cut with a fret-saw in whichever of the sides it is desired to place it. A strip of thin springy brass about 1 in. in length and slightly narrower than the hole is also cut. The hole has to accommodate both the tube and the brass strip, so it must be of such a size that while the tube alone fits fairly easily, the two together must be a tight fit. The strip lies under the tube.

The terminals may now be fitted to the prepared ebonite panel, after which the panel is screwed to the sides and the sides fastened together with small nails.

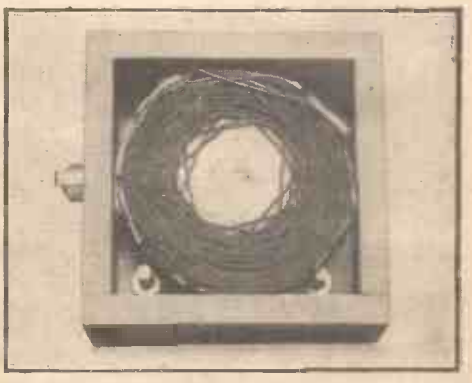
Wiring

After attaching a short length of wire to one end of the brass strip, insert the strip and the detector tube in the hole in the side, keeping the end of the strip carrying the wire on the inside of the set. The outer end of the tube lies flush with the outside of the set, while the "wired" end

(*Concluded at foot of first column on next page*)



The Complete Set.



Under Side of Receiver.

A PAGE OF DON'TS

A Brief Guide to Efficiency

FOR BEGINNERS

DON'T use "shoddy" components. Guaranteed parts are always best in the long run, even if they are slightly more expensive to buy.

Don't be too ambitious at first; it is best to start with a simple receiver and gradually work your way up to a large receiver.

Don't fail to erect the best possible aerial; the more energy picked up by the aerial, the better will the set work.

Don't despise the crystal set.

Don't forget your licence; it is necessary to obtain this as soon as you have bought your components.

Don't, if you have a valve set, use reaction so as to distort signals or cause squeals in the phones.

"A TOTALLY-ENCLOSED CRYSTAL SET" *(continued from preceding page)*

of the strip is pushed close up to the wood on the inside to keep it clear of the inner end of the tube. This wire is then attached to one of the outer telephone terminals. The phones being in series, the two middle phone terminals are connected by a wire and the remaining phone terminal joined to E.

A wire is twisted under the shoulder of one of the detector-screws, which is then screwed tightly home on the inside end of the tube. The other end of this wire goes to A. The beginning (inside) of the inductance coil is also attached to A, while the end (outside) goes to E. The coil is then placed in position as shown in the photograph.

The projecting end of the brass strip is now cut to such a length that it will project slightly over the detector screw when it is in position. After being cut, the strip is given a decided bend upward to ensure good contact with the screw.

A small plug (about ⅛ in. to ¼ in. long) of either Wood's metal or tightly rolled silver paper should now be dropped or pushed into the tube to make contact with the end of the inner screw. Then the crystals are dropped in, one at a time, and the remaining detector screw screwed *lightly* into the tube.

No attempt must be made to adjust the detector until the set can be tried, as a very light contact between crystals and screw is necessary, and this can only be secured by an actual listening test.

When two pairs of phones are in use, one pair is connected to the terminals 1 and 2 and the other pair to 3 and 4. When only one pair is used they are connected to 1 and 4 (the outer terminals).

The set shown in the photograph has been in continuous use for months and has given every satisfaction. J. T.

Don't connect the H.T. battery across the L.T. terminals.

Don't burn valves more brightly than is needed for good results, or you will shorten their life unnecessarily.

Don't fail to fit a proper earthing switch to the aerial.

FOR CRYSTAL USERS

DON'T expect genuine long-distance results unless your aerial is high and well away from surrounding objects.

Don't forget that if you wish to hear distant stations on an inefficient aerial you should couple the crystal set to a high-frequency valve amplifier.

Don't wind your tuning coils with thin wire. Better results are always obtained when thick-gauge wire is used.

Don't handle your crystals and cat-whiskers with the bare fingers. Although not discernible with the eye, a film of grease is deposited which prevents efficient rectification.

Don't move the catwhisker more than is necessary, as the delicate surface of the crystal is soon spoilt by so doing.

Don't fail to use the best phones it is possible to obtain. For weak signals those with adjustable magnets are preferable.

THE AERIAL

DON'T use a multi-wire aerial if you want to receive on short wavelengths.

Don't allow your aerial or lead-in wire to pass near to metal pipes or roofs.

SELECTIVITY

Don't forget that for best results your aerial, lead-in and earth wires should be of as low a resistance as possible.

Don't forget to let the free end of the aerial point towards your local station if you wish to cut out that station and receive the more distant ones.

Don't forget that for real selectivity it is best to use a counterpoise in place of the usual earth.

Don't, if you can help it, make joints in your aerial or lead-in wire. If this is unavoidable, however, see that the joints are well soldered.

Don't use insulators which are cracked or have the glazed surface rubbed off.

Don't forget that a coat or two of paint or wood preservative on the pole will considerably lengthen its life.

Don't forget that nothing looks worse than a bent pole due to too much strain on the aerial.

Don't forget that an efficient aerial is a good investment and may make all the difference in the results obtained.

FOR CONSTRUCTORS

DON'T fail to get the best components; they are the cheapest in the long run.

Don't use poor-quality ebonite or the set will never work well.

Don't splash solder all over the panel.

Don't crowd your components, or interaction will be liable to occur.

Don't, unless you have had considerable experience, attempt to modify the circuit given by an author.

Don't wire up in a slip-shod manner. Neat wiring is the hall-mark of the good constructor.

Don't neglect the woodwork of your receiver; a good set deserves a good cabinet.

THE ACCUMULATOR

DON'T "top up" with tap water, as this often contains metallic substances which are injurious to the plates.

Don't fail to keep the brass parts of terminals covered with vaseline, or corrosion is sure to occur.

Don't leave the accumulator in a discharged condition. Sulphating of the plates is most liable to occur when the accumulator is run down.

Don't test the accumulator by bridging the terminals with a metallic object to get a spark.

Don't, when preparing the accumulator electrolyte, add water to strong acid. Always add the acid to the water.

Don't fail to carry the accumulator in a proper wood or metal case. Damage may easily result if it is held by the terminals or connecting lugs.

Don't allow the acid to splash on to the clothes

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS CABINET, solid oak, extraordinary bargain. Photo and price, Edwards, Ingham Street, South Shields. [52

[illegible] and Trade Marks obtained.—H. T. P. Gee, Patent Agent Member F.S.G.B., A.M.I.R.E., 51/52, Chancery Lane, London, W.C.2. Phone Holborn, 1525.

PATENTS.—Trade Marks. Advice Handbook free.—B. T. King, Regd. Patent Agent, 146a, Queen Victoria Street, London.

WIRELESS LICENCE HOLDERS, 1s. 6d., post free.—French, 2, Piershill Terrace, Edinburgh. [15

How the Wuncell defies old age

OLD friends, they say, are best. The longer one uses the Wuncell Dull Emitter, the more one appreciates its many sterling qualities—its supreme sensitiveness — its outstanding ability to produce a wonderful mellowness of tone—its complete freedom from microphonic noises—and, above all, its unvarying high standard of performance.

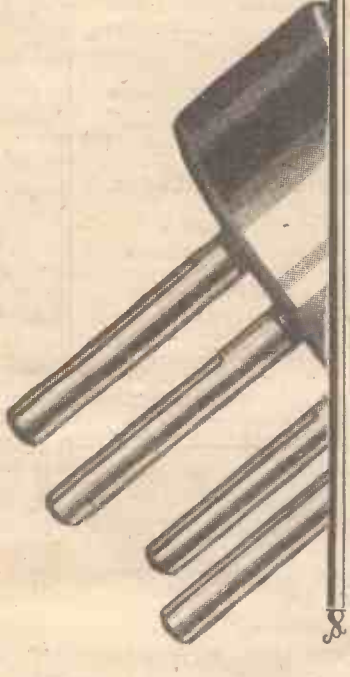
Owing to its unique filament, found in no other valve, the Wuncell is essentially a long-life valve. It is one you can choose with complete confidence, knowing that it will give you a long period of faithful unremitting service. A Dull Emitter, in fact, worthy of the reputation enjoyed by Cossor throughout this country and abroad.

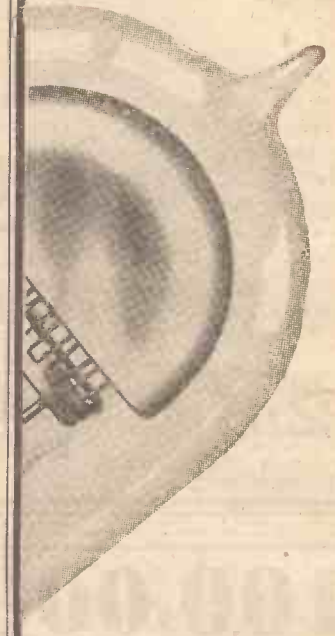
Wuncell superiority is due to two great fundamental features. The first is its triple-coated filament. This filament, instead of being whittled down to the point of fragility in an effort to ensure low current consumption, is built up *layer upon layer* until it is practically as stout as that used in any bright emitter. Yet so prolific is it in electrons that at a temperature of barely 800°—less than the embers of a dying match—the Wuncell is operating at its best. Compare this with the many types of so-called dull emitters which function only when their filaments are at white heat. Because of this special process of manufacture the Wuncell filament is exceptionally sturdy and able to withstand scornfully all the rigours of everyday use.

But the Wuncell filament is only one feature. It would be of little advantage producing a perfect torrent of electrons at a low temperature if the ordinary type of Grid and Anode were employed. In any valve the only electrons of any importance are those reaching the Grid and the Anode. If the ends of the Anode are open a considerable proportion of the electron stream must escape only to be wasted.

For this reason, therefore, the Wuncell utilises standard Cossor construction. Its arched filament functions within a hood-shaped Grid and Anode. Practically every electron given off by its barely-glowing filament is usefully employed.

This greater efficiency—coupled with its triple-coated filament—is responsible for a volume and purity of tone which has yet to be equalled. It is small wonder, therefore, that wireless enthusiasts, disappointed with the fragility and uncertainty of ordinary filaments, have turned eagerly to the Wuncell—the one Dull Emitter which admittedly defies old age.





Types and Prices:

*W.1. For Detector and L.F. use, 1·8 Volts. Consumption ·3 amps. - - - 14/-

*W.2. (With red top) for H.F. use, 1·8 Volts. Consumption ·4 amps. - - - 14/-

W.3. The Loud Speaker Valve, 1·8 Volts. Consumption ·5 amps. - - - 18/6

*Also in special base with resistance to suit 2-, 4-, or 6-volt Accumulator - 16/-

Cossor Valves

Issued by A. C. Cossor Ltd., Highbury Grove, London, N.5

On Your Wavelength!

An Outstanding Feat

FOLLOWING upon reports of successful two-way telephony between London and New York via Rugby comes one of a wireless feat which is even more remarkable in its own way. Rugby employs immense power and works on a wavelength of 5,700 metres to cover a range of 3,000 miles. Mr. E. J. Simmonds, who has already many remarkable achievements to his credit, has been speaking to Australia, 12,000 miles away, on a wavelength of 45 metres with a power of but 95 watts. I may be wrong, but I believe that this is the first time that telephony has been transmitted from this country to the Antipodes since Senatore Marconi spoke from Poldhu to Melbourne in the course of his beam experiments a couple of years ago.

Reception of Mr. Simmonds's transmissions was extraordinarily good. His Australian correspondent, Mr. J. Maclurcan, was able to use the loud-speaker instead of phones, and he heard every word of the message. So as to test in every way the clearness of the reception, Mr. Simmonds included in his message strings of figures, including the barometer readings from the weather report with their accompanying decimal points, the temperature shown by a thermometer in his room, and so on. When he had finished speaking, Mr. Maclurcan repeated the whole message in morse, every word and every figure being correct.

C.O.D.

Opinions seem rather divided over the question of the new cash-on-delivery service. Personally I think that it will be a splendid thing, both for the wireless amateur and for the wireless trade. So far as I can see it will not hurt the local retailer in the least, for we shall order C.O.D. only such parts as he has not in stock or is unable to obtain for us. Obviously if the local man has the apparatus that you require, it is better to buy from him, since you can examine the components before purchasing, whilst in some cases you may be able to obtain a demonstration of their actual working. Further, when you purchase over the counter you have not to pay either the postage or the collection fee. All of us will find the C.O.D. system very convenient. Most people probably get through the bulk of their private correspondence on Sundays. As things were before the coming of C.O.D. many an order that would have gone in was not sent at all because a postal-order could not be obtained on Sunday, and the matter was subsequently forgotten. Under the new system all that one has to do is to order the article required, adding to one's letter "Please send C.O.D."

This system has been in use for years in many Continental countries. In none of them has it been found to have adverse effects upon trade, and it is everywhere found to be a boon to the purchaser (who can order and make payment with the minimum of trouble) and to the dealer (who is automatically protected from contracting bad debts).

Good Relaying

One of the best bits of long-distance relaying that the B.B.C. has done for some time was that involved in the broadcasting of some of the speeches made recently at the League of Nations Assembly at Geneva. Despite the great length of land-line that had necessarily to be used, the words of the speakers came through with the utmost clearness and were very well received by listeners in this country. It was an excellent idea to relay these speeches, for it enabled listeners to obtain impressions of the public men of other countries. So long as we merely read reports of them or their words, or see their photographs in the papers, even the greatest statesmen must always remain more or less abstractions; when, however, the wireless set enables us to hear their actual words, they become very real people and we feel that we know a great deal more about them. The speeches are made usually at times which do not clash with the ordinary broadcast entertainments, and I am sure that there are large numbers of owners of wireless sets who would welcome the opportunity of hearing them.

Hunting the Howler

It is announced that the Post Office is shortly to put on the road a number of vehicles which to all outward appearances are nothing more than innocent mail vans. Appearances in this case will be deceptive, though, for the vans will be fitted with special direction-finding apparatus and will be used for the tracking down of those who make themselves a nuisance to their neighbours by indulging in persistent oscillation. I do not know the nature of the apparatus used, but I should imagine that those in charge of the vans may find that they have their work cut out. It is one thing to use a direction-finder in the open country, and quite another to work it in the streets of a town. In the former case you can obtain pretty accurate readings, unless, of course, there happen to be veins of metallic ore or something of that kind in the neighbourhood. But in a town you are up against all kinds of difficulties, as a friend and I found some time ago when we made some experiments. We found then that our bearings were simply all over the place owing to the deflecting effects of the big masses of metal that are buried beneath the surfaces of the streets or built into the walls of buildings. I wonder sometimes why the B.B.C. does not revive the "black list" that used to be a feature of its early programmes. A few words straight from the shoulder to offenders in a named locality had, as a rule, a salutary effect.

The Amateurs

As I like to listen to amateur transmitters, I often tune to 45 and 20 metres to see what is going on down there. Our amateurs are going in full swing now, and many of them have regular schedules with America, India, Australia, etc., but how I wish that they would not use the spacing-wave method of keying on these congested wavelength bands. One is often intently listening to American or other foreign signals and could copy them quite easily but for the fact that some of the high-power British amateurs who use this method of keying cover a 4- or 5-metre waveband with disastrous results! This method is that whereby a transmitting station sends morse by simply varying his wavelength to a slight degree on the oscillator, thus theoretically leaving his aerial without any current during the "space" period. He does this in order to keep a constant load on his valve so as to get a steady, clear note instead of a "chirrup" effect, but what he does locally is to send out a signal with a very broad band which is full of uncomfortable noises.

What effect he has at a distance it is difficult to estimate, but certain it is that a station using such a method is not only a nuisance but is almost impossible to read. Another thing I have noticed, and this is that some of the lower-power stations who would otherwise stand a very good chance of being heard overseas are almost entirely blotted out by the high-power stations when the latter commence work. I think that it would be good for amateurs generally if a mutual agreement were reached not to exceed a certain low power. If would then be possible to ascertain exactly how far it is possible to get with such small power, added to which all stations would be on an equal footing.

Gramophone Records

Speaking of the amateurs, have you noticed how many are still perservering in sending out gramophone records with an old-fashioned carbon-granule microphone? The results generally are rather discouraging, but in order to show that it is not a hopeless proposition, I learn that carbon microphones are being used by the

On Your Wavelength! (continued)

B.B.C. in connection with some of their transmissions of dance bands, etc. These microphones are not, of course, of the ordinary variety, but are specially built to requirements, and hence the excellent quality. I do not think it possible to send out really good music with the common type of solid-back microphone, but, all the same, some amateurs make a very good show at it. 2 P X is a very good example of what I mean, and although his transmissions are by no means perfect, yet at the same time they are excellent considering the gear used.

The Last Valve

Owners of a multi-valve set which is intended to give pure music are often puzzled by the fact that despite the proper application of grid bias, the use of resistance-capacity coupling and the like, they are unable to gain the long-wished-for natural reproduction. More often than not this is due to two causes—firstly, the use of even a slight amount of reaction, and, secondly, the use of too small a valve in the last stage. The remedy for both evils is obvious, and in the case of the former you cannot hope to get anything like good reproduction so long as you use even the slightest amount of reaction. As regards the latter, there are several valves on the market which will fill the bill, notably the LS5, the DE3 or the B.T.H. B4. The Mullard dull-emitter power valves are also suitable—in fact any large power valve will do. When using a number of low-frequency amplifiers there is such a heavy potential on the grid of the last valve that it requires something altogether different from the small general-purpose valve to handle it. Therefore try a power valve such as I suggest, and you will not only get greater purity but also greater volume. The snag (if there is any snag) is that the high-tension voltage must be increased to at least 100 volts if you want to get the best out of it and also that these valves are "rather heavy on the milliamps." Nevertheless, you cannot run a "Rolls-Royce" set without incurring expense, so that it is necessary to choose between a small low-power set with good reproduction but small volume and low running costs, and the bigger set with correspondingly higher all-round costs.

Dramatic Critics

I wonder how many listeners make use of the dramatic talks which are given fortnightly. Doubtless they are admirable and trite, yet I feel that they are not quite suitable to my particular theatrical "bent." Is it not possible to give this "sharp-eared child" a chance to tell us exactly what those astute people—"the gallery first-nighters"—think of a theatrical production?

Feeling somewhat fraternal and thirsting for truth, an idea occurred to me. Why could not the microphone be secretly installed at a selected spot in the gallery? Those concerned in the experiment could shepherd veteran first-nighters to its proximity and by judicious words these gifted linguists could be encouraged to give forth their opinions of the play as it proceeded. I should be attentively listening at home and would receive, by the process of compilation of comments, a naïve critique of the particular play in question.

What objection could the management offer? If the play be a good one, then surely the comment of "the gods" will be favourable, and I shall possess a desire to see the piece. Should the comments be adverse, I shall yet weigh them against the customary effusions of the professional critics.

Another Suggestion

Yet I feel that my suggestion will not be adopted, so that I venture to suggest an alternative. Among the squad of gallery first-nighters there are a number of people with sound judgment. These people are known to the managements. Now could not one or two of these "judges" be induced to give the fortnightly dramatic talk? In many ways this departure would be interesting, for their comments would possess personality. On the score of good taste there need be no qualms, for several of these dear folk, to my knowledge, know more of the stage than the average critic.

The Wavelengths Problem

At the present time the International Bureau is meeting again in an endeavour to find some means of straightening out the present appalling chaos of the broadcast waveband between 250 and 500 metres. Though I do not want to sound discouraging, I am rather afraid that the task is almost a hopeless one for the present body to undertake. Each country wants to provide its own inhabitants with a first-rate broadcasting service and to cater for the demands of the crystal users, who form by far the greatest class in the great body of listeners. If Ruritania has a dozen stations, then Sylvania and Montana fail to see why they should not have each an equal number. And there is no one to say them nay, since the International Bureau is merely a friendly association and not a body possessing authority. It seems to me that the whole question is a pressing international problem affecting a very large proportion of the population of every European country. The time for firm, concerted action has surely come when, as is at present the case, listeners in most countries cannot make use of many of their home transmissions owing to interference that comes from outside.

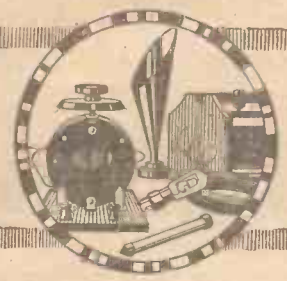
Fair Exchange

Readers will have noted with some satisfaction that exchanges of programmes between Daventry and Hilversum are shortly to become a regular feature of broadcasting. Owing partly to the excellence of its transmitting plant and partly to the wavelength which it uses, Hilversum's is one of the best of the Continental transmissions that reach this country; he is, in fact, one of the very few that you can be pretty certain of receiving on any evening without interference or distortion.

The history of the Hilversum station is a very interesting one. It was started in a very small way rather more than two years ago by a little band of wireless enthusiasts, which included both amateurs and manufacturers in its ranks. There was then, and there still is, in Holland no system of licensing receiving sets. The company had therefore to depend for its income almost entirely upon voluntary contributions. In spite of this it has made enormous progress, the power having risen in two years from 200 watts to 6 kilowatts, whilst shortly it will be equal to that of Daventry. It is expected that a licensing scheme will soon become law in Holland, in which case the company will receive a proportion of the fees paid. Not everyone knows that the success of the Hilversum station is largely due to the splendid work of an Englishman, Mr. W. G. White, who has been chief engineer from its earliest beginnings.

Some Crowded Spots

If you want to see how bad overcrowding can be on the broadcast band, try the neighbourhood of 400 metres. You will find there Hamburg, Dublin, Radio-Iberica, Graz and Newcastle, whilst sometimes Moscow joins the merry throng, and there is usually an harmonic of 5 X X. All of these are powerful stations, and the resulting medley, even with a selective receiver, of long-distance duets and of heterodynes has to be heard to be believed. I hear that within the next few weeks the new Spanish station at Salamanca proposes to elbow its way in upon 400 metres! Another well-filled patch is that between 320 and 328 metres. This contains ten stations, including three of our own relays, two Swedish stations, three Spanish, one Icelandic and one Italian. Several of these are low-power transmissions, but if their speech and music are not generally audible in this country, their carrier waves frequently provide heterodynes. In addition the voice of the spark transmitter who has wandered a little off his wavelength is often to be heard amongst them. Try again towards the upper limit of the broadcast band. Between 470 and 495 metres there are seven broadcasting stations and many sparks and C.W. harmonics. THERMION.



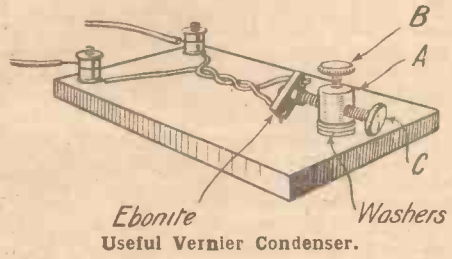
PRACTICAL ODDS AND ENDS

Starting Small Screws

THERE is a no more fiddling or exasperating job than that of starting a short fine screw in an awkward place. Here is a simple tip which will save any amount of trouble when a task of this kind crops up. Cut a strip of stiff paper, and push the screw through it close to one end. If there is not much room, narrow the end of the strip with scissors after the screw has been put through it. With the screw thus held it will be found quite easy to guide its point to the proper place and to hold it there whilst the important first turn is given with the screwdriver. Once the screw is started a slight pull tears away the paper. R.

A Vernier Condenser

A SMALL vernier condenser easily made up and costing but a few pence to construct is illustrated below. Cut out a piece of ¼-in. ebonite about 3½ in. in



Useful Vernier Condenser.

length by 2 in. in width. In one end of this mount a large terminal of the telephone or "push-in" type (A in the drawing), and in the opposite end place two terminals of any type.

A long 4 B.A. screw (C) should be obtained, preferably with a milled head, and to the end of this fix a small strip of ebonite. In each end of this drill a small hole and in the middle of it make a 4 B.A. clearance hole. Cut off two pieces of single rubber-covered flex, and fix one end of either piece to the small terminals, passing the other ends through the small holes drilled in the ebonite strip. Take care that there is no contact between the strands and the screw (C). As the wires are twisted, so the capacity is increased. H.

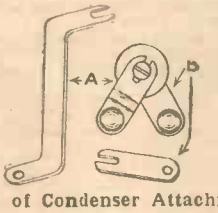
Coil Formers

VERY satisfactory formers on which to wind plug-in coils may be obtained by cutting up a discarded cornice pole into lengths of about 8 in.

To determine the correct points at which to insert spacing pins (2-in. headless nails may be used for the purpose), a piece of paper should be wrapped round the former so that the length of the circumference can be marked off. When removed it can, with the aid of a rule, be marked off into eleven equal parts. On again wrapping the paper around the former the points can be marked through on to the wood. H. P.

Fixed Condenser Attachment

THE photograph shows a most convenient method of attaching a fixed condenser direct to the primary or secondary terminals of a low-frequency



Details of Condenser Attachment.

transformer of the type shown, where the four terminals are placed in a line along the top of the instrument.

The two clips are cut from sheet-brass, as at A and B in the sketch, and clamped under the two adjacent transformer terminals. The long Z strip is screwed hard down under its respective terminal at the

Condenser Attachment in Use.

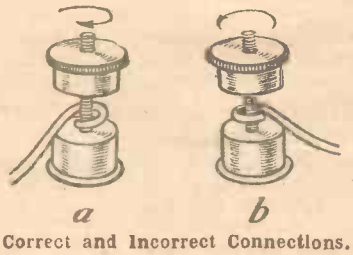
approximate angle shown, while the short strip B (which is previously attached to the lower end of the condenser) is swivelled towards it until the screw in the upper end of the condenser engages the slot in same. The top condenser screw is then tightened up and the lower clip finally adjusted and clamped firmly under its supporting terminal. O. R.

Enlarging Holes in Panels

THE largest drill which can be held in the chuck of the type of hand-drill used by the majority of constructors is $\frac{2}{16}$ in., consequently when fitting one-hole fixing components the holes in the panel have to be enlarged with a rat-tail file. The file, if not used carefully, will jump out of the hole and the point will scratch the panel. A phone terminal screwed on the point after the file has been inserted will allow long cutting strokes to be made without fear of scratching. J. W.

Connections to Terminals

CONNECTING a wire to a terminal seems to be a simple enough business, and yet many people do it wrongly. If the end of the wire is wrapped round the shank of the terminal in an anti-clockwise direction (as shown at *b*), screwing down the milled headed nut will tend to uncurl it, and should there be several wires con-

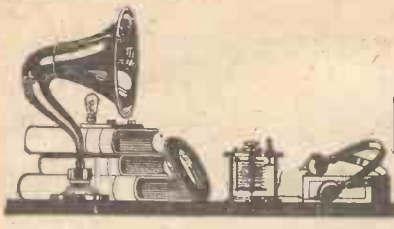


Correct and Incorrect Connections.

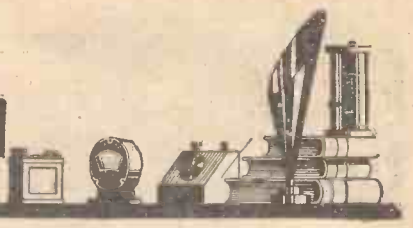
nected to the same terminal it is quite likely that one or more of them will not be gripped between the nuts. Turn the wire or wires in a clockwise direction round the shank (as shown at *a*), and the screwing down of the nut tightens up the loops and causes them to lie closely together. Though connections made wrongly on the upper side of the panel may not matter much, it is most important that when connecting wires to the shanks of terminals below the panel the ends should be put on in the right way. H.

Bornite Crystal

BORNITE is a natural crystal of iron sulphide, iron and copper, and is generally used in conjunction with some other crystal as a perikon detector. It has a metallic blue lustre of a crystalline nature due to its exposure to the air, its natural colour being copper or bronze when freshly cut. In using the crystal in combination with other crystals, zincite or copper pyrites are suitable. B.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 544).

Anodes and Plates

Q.—*Why is the anode of a valve (nearly always in the form of a cylinder) so often referred to as the plate?—C. V.* (*W.6*).

A.—The term is merely a survival from the early days of the valve, when the anode was really a flat plate of metal placed near to the filament. It was later found that the electron stream could be used more efficiently when the plate took the form of a cylinder concentric with the filament. Incidentally, when the anode was a plate, the "grid" really was a grid, or at least it resembled a small grid-iron placed between the filament and plate. In the early valves two plates and two grid were often used, a pair of each being placed on either side of the filament.—J. F. J.

Weather and Wireless

Q.—*Is it a fact that the weather has no effect on wireless communication?—D. G.* (*Croydon*).

A.—This depends on what is meant by "weather." Local conditions have little effect on reception, though naturally the earth connection is improved when the ground is wet. This may be counterbalanced by the fact that the insulation of the aerial may be better when the weather is fine. Atmospheric conditions in the region between the transmitting and receiving stations do, however, affect reception to a considerable extent, allowing "freak" ranges to be obtained in some cases, and causing fading in others, the exact effects not yet being fully understood.—J. F. J.

Separate H.T. Tappings

Q.—*What is the advantage of using a separate H.T. voltage to each valve? Is it really necessary to do so if all the valves are of the same type?—L. P. C.* (*Blackburn*).

A.—Provided that all the valves were rated at about the same anode volts and that the H.F. valves were controlled by a potentiometer and the detector provided with a variable grid leak, separate H.T. tappings could be dispensed with and no loss of efficiency result. If, however, the mean potential of the H.F. and detector grids is fixed, separate variable H.T. tappings to these valves enable them to be worked under the best conditions, oscillation being kept under control in the first case and most efficient rectification being ensured in the second. Besides this, however, it is a great advantage of separate H.T. tappings that different types of valves can be used for experimental purposes.—B.

Accumulator Connections

Q.—*I get good results from my three-valve set, H.F., det. and L.F., with the accumulator connected normally. If I reverse the accumulator connections results are very poor, and I cannot understand this, as I thought the function of the accumulator was merely to raise the filaments to a certain temperature. Can you explain this?—D. S.* (*Peckham*).

A.—The main purpose of the accumulator is, as you suggest, to raise the filaments to the correct temperature. Incidentally, however, the manner in which the accumulator is connected determines the normal potential of the grids of the H.F. and L.F. valves. Supposing no grid bias to be used the normal grid potential will be slightly negative with respect to the negative ends of the filaments owing to the drop in voltage across the used portions of the filament rheostats. The amplifying valves will work well under these conditions. If you reverse the accumulator connections you will make the normal grid potentials a little more positive than the positive ends of the filaments, and so poor and distorted amplification is to be expected when the accumulator connections are reversed.—B.

OUR WEEKLY NOTE

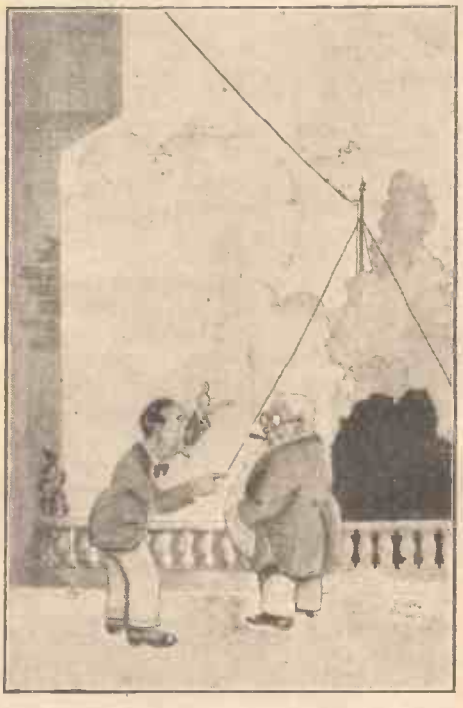
LOUD-SPEAKERS

There appears to be a good deal of misconception as to what loud-speakers really do. Much disappointment is caused through a loud-speaker being attached to a set which is incapable of delivering sufficient power to work it properly.

It cannot be too clearly understood that a loud-speaker does not amplify signals in any way. A loud-speaker, being of much more massive construction, can deal satisfactorily with signals which would be much too strong for phones. The horn, if one be used, directs the sound waves in a particular direction and so prevents energy being dissipated in directions in which it is not required, but it is not capable of giving out more power (or even as much power) as is put into it by the set.

If signals are only comfortably loud on the phones, it is no use fitting a loud-speaker and expecting that this will render them audible at good strength all over a room.

THE BUREAU.



EXPERT: "I'm afraid it's up there where the trouble lies; possibly a leaky insulator."
NOUVEAU RICHE: "Blow it—why didn't I know yesterday while the plumber was here!"

Phones in Series

Q.—*When several pairs of phones are used with a valve set is it better to connect them in series or parallel? There seems to be a considerable difference of opinion on this point.—R. N.* (*Yarmouth*).

A.—The truth of the matter is that there is no definite rule on the subject which would apply to all cases. For most efficient results the total impedance of the phones, for mean speech frequencies, should be approximately equal to that of the last valve. You will therefore see that the method of connecting the phones for best results will depend upon the impedance of the last valve of the receiver, the impedance of each pair of phones, and the total number of pairs of phones to be used. In any case, the matter can easily be settled by simple experiment and, when several pairs of phones are to be used, it will generally be found best to adopt a series-parallel arrangement.—B.

Specific Inductive Capacity

Q.—*What do the initials S.I.C. stand for?—T. B. C.* (*Preston*).

A.—They mean specific inductive capacity. When two metal plates, or two sets of metal plates, are placed near each other, a condenser is formed which will have a certain capacity. This capacity will depend upon the areas of the plates and upon their distance apart. The larger the plates and the nearer they are together the greater will be the capacity. If the plates are separated by different insulating materials the capacity will be altered according to the S.I.C. of the insulating material (called the dielectric). Unless otherwise stated the number quoted as the S.I.C. of a dielectric means that a condenser whose plates are separated by that material will have a capacity that number of times greater than if only air separated the plates. Other standards than air are sometimes used, but the fact is always specially stated. Nearly all insulating materials have a S.I.C. greater than air, the exceptions being one or two other gases.—R. W.

Oscillation

Q.—*Why does my set oscillate more readily if the aerial or earth is disconnected and more readily still if both are disconnected?—D. B.* (*Lincoln*).

A.—You do not state what circuit you are using, but it is probably an arrangement in which the first valve is directly coupled to the aerial circuit. Now in order that the set may oscillate it is necessary that the energy handed back to the grid circuit from the plate circuit should exceed the amount expended in the grid circuit. When the set is connected up in the usual way the aerial and earth form part of the grid circuit, and the energy handed back by the reaction coupling must be sufficient to overcome the damping of both aerial and earth leads in addition to the tuning circuit. It will be obvious that when either the aerial or earth lead is disconnected the energy expended in the grid circuit will be less than when they are connected. The set thus oscillates more readily without the aerial or earth.—J. F. J.

Overloading the Loud-speaker

OFTEN as one passes during broadcasting hours the door of a shop in which wireless goods are sold, one's ears are assailed by a blare of harsh, raucous and distorted sound. On going in you are likely to find that the proprietor is demonstrating to a prospective customer the beautiful reproduction obtainable with a midget loud-speaker! He has attached the small instrument to a powerful set, and though he probably does not realise it, he is producing sounds hideous enough to fill a discriminating customer with a horror of loud-speakers, and probably even of wireless reception itself. Often, too, in private houses one hears bad reproduction of the same kind. Neither the shopkeeper nor the private owner realise that they are asking the loud-speaker in use to perform a task of which it is incapable. In plain language, they are overloading it hopelessly, with the result that purity, clearness and quality of tone go by the board.

The Question of Size

This is not to say that small or medium-sized loud-speakers are of no use. Far from it. They are the *only* instruments to use in small or medium-sized rooms, where a large instrument is completely out of place. The loud-speaker should match both the receiving set with which it is worked and the room in which it is used. If an attempt is made to reproduce the transmissions of a main station, say, twenty-five miles away with a five-valve set and a midget loud-speaker in a large room, the results will be frankly horrible, for though the receiving set is suitable for the purpose, neither the diaphragm nor the trumpet of the loud-speaker up to its work. A singer may possess a small, sweet voice, which sounds well in a drawing-room, but would be hateful it she strained it in an attempt to fill the Albert Hall.

Speaking very roughly, the midget loud-speaker is seldom capable of giving reproduction at a strength greater than will enable every word to be heard clearly and easily at a distance of more than about 15 ft. It is therefore suitable only for the two- or three-valve set. For the three-valve set used for the reproduction of the transmissions of a near-by station, or for general work with a four-valve set, a medium-sized loud-speaker is required, whilst for larger sets a full-sized instrument is advisable. Working on similar lines, we find that the midget loud-speaker does well in rooms of small size, the medium instrument in those of moderate size, and the full-sized loud-speaker in large rooms.

How are we to know when the loud-speaker is being overloaded? One of the most obvious signs is that loud passages and certain rather highly-pitched notes cause a buzzing, which may be slight or very marked. This is due to the fact that the diaphragm vibrates so violently that it is brought into actual contact with the pole-pieces of the magnets. Next we shall notice that the middle part of the scale is unduly accentuated, both the very low and the very high notes being almost inaudible. When speech is in progress the overloaded loud-speaker makes the voice sound unnatural; either it booms or it assumes a queer, cracked sound, most unpleasant to listen to. It is a fairly safe rule that the loud-speaker should never be allowed to give the maximum volume of sound obtainable from it. Your reproduction will always be better if you *could* make signals rather louder than they are.

Signs of Overloading

The loud-speaker itself is not always entirely responsible for the effects of overloading. It may be that the last valve is being overdone, for even the power valve has its limitations. Here is an example. My own set is a five-valver with two stages of high and two stages of low-frequency amplification. The second note magnifier is provided only for use when it is necessary to amplify very weak and distant signals. Both of the note-magnifying valves are power amplifiers, with 120 volts on the plate of each and proper grid bias. It is quite impossible with this set to use the second note magnifier when receiving London's transmissions at a range of roughly thirty miles. The loud-speaker is up to the work, but the second power valve cannot deal with the enormous voltage swings impressed upon its grid. To enable it to do so it would require probably 300 volts on the plate with a very big negative bias on the grid, and if it were given a plate voltage of this magnitude its life would be a short one.

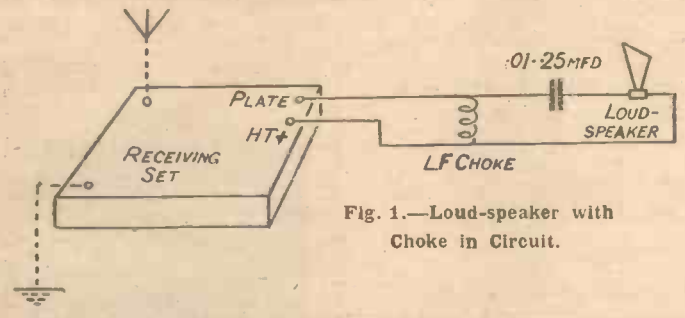


Fig. 1.—Loud-speaker with Choke in Circuit.

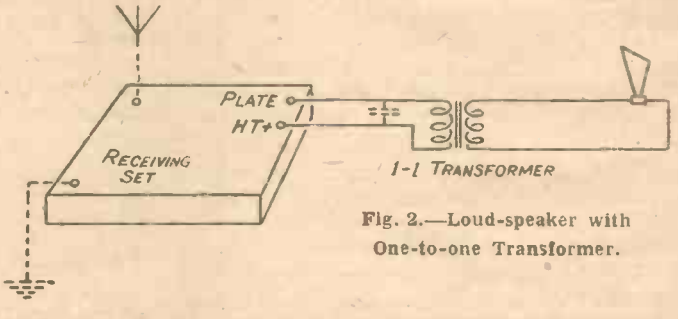


Fig. 2.—Loud-speaker with One-to-one Transformer.

A Simple Test

If you wish to see whether your last valve is being overloaded, borrow a milliammeter, supposing that you do not possess one, and wire it into this valve's plate circuit. When the valve is able to cope properly with the signals that are coming in, the pointer of the milliammeter will remain stationary, registering only the steady anode current. If, however, the valve is being overloaded, the needle will show violent kicks, which betoken that rectification is taking place owing to the working point being pushed up into the grid-current area during the positive half-cycle, and down to the lower bend of the characteristic curve during the negative half-cycle.

When an efficient transformer is used for the first stage on the low-frequency side of the set, the voltage variations applied to

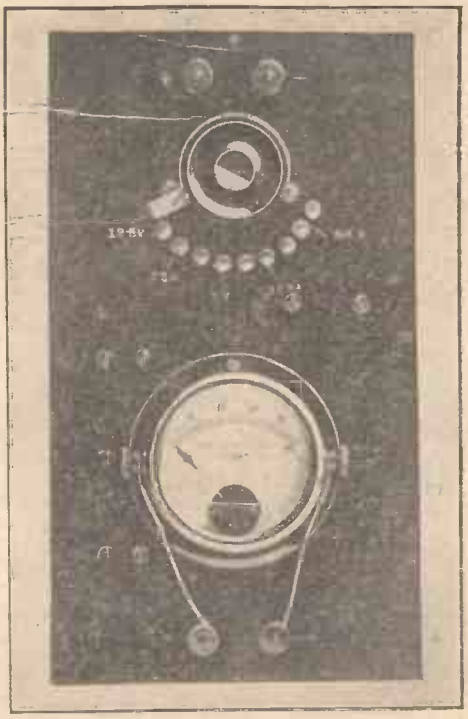
(Concluded in third column on page 530)

ALL MEAS
WI
ONE INST

MAKING THE MILL

By J. HARTL

UNLESS he possesses certain measuring instruments the amateur is always more or less working in the dark with his receiving set, for he can only guess at the potentials between various points and at the currents passing in different circuits. The instruments needed to give one a thorough knowledge of what is taking place in every part of the set are no less than four in number: A voltmeter for reading accurately the small potentials such as those across the terminals of the accumulator or between filament legs; a second voltmeter, which must have a high resistance, reading up to 100 volts or more for measuring the terminal potential of the high-tension battery, as well as the various plate potentials of the valves; an ammeter which will show the amount of current consumed by the valve filaments; and, lastly, a milliammeter which will show the drain made upon the high-tension battery either by the receiving set as a whole or by individual valves. To purchase four good instruments would cost from £5 to £12, for which very good reason large numbers of amateurs do without them and rely largely upon guesswork.



Plan View of Instrument Panel.

A Fivefold Instrument

It is quite simple actually to make one instrument do the work of four; the photographs show how my own milliammeter has been made into a *five*-fold instrument. By means of the addition of a few "gadgets" that anyone can make, it now reads at will from 0 to 2.5 amperes, from 0 to 25 milliamperes, from 0 to 5 volts, from 0 to 25 volts, and from 0 to 125 volts. These particular ranges suit very well, since I always use dull-emitter valves and work with a 4-volt accumulator. For those who prefer bright valves, more suitable ranges would be 0 to 5 amperes, 0 to 25 milliamperes, 0 to 12.5 volts and 0 to 125 volts. Though the description which follows is concerned mainly with the five ranges first mentioned, I shall show how the others may be obtained if they are preferred.

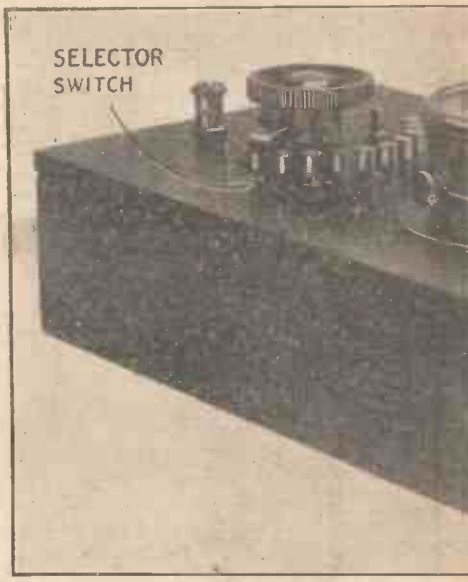
The total cost is very reasonable. The milliammeter required is one that reads from 0 to 25 milliamperes, and it should be a moving-coil instrument of good quality. These can be obtained at prices ranging from about 18s. to 3 guineas. My own instrument, which is extremely accurate, cost 22s. 6d. Beyond the price of the milliammeter the necessary expense is only about 8s. or 10s.

The Principle

The moving-coil milliammeter is simply a calibrated galvanometer, so adjusted that a full-scale deflection of the pointer occurs when 25 milliamperes of current are passed through the instrument. To turn it into a voltmeter all that you have to do is to place in series with it a resistance whose value is such that the instrument will pass 25 milliamperes of current under a pressure equal to that of the maximum voltage reading desired. To put it in another way, 1 volt, according to Ohm's law, will drive 1 milliampere of current through a resistance of 1,000 ohms. If, therefore, we wind a resistance whose value is such that when it is added to that of the instrument itself the total is 1,000 ohms, then the milliammeter becomes a voltmeter, each scale division of 1 milliampere corresponding to 1 volt, and the readings obtainable being now 0 to 25 volts.

In the same way, if we make the total resistance 200 ohms, 5 volts will drive 25 milliamperes through it. The instrument thus reads from 0 to 5 volts, each milliampere scale division now corresponding to .2 volt. A resistance with a total value of 5,000 ohms will mean that 125 volts are required to drive 25 milliamperes, so that the instrument reads from 0 to 125 volts, each of the original scale divisions now corresponding to 5 volts.

So much for the theory of the conversion of a milliammeter into a voltmeter. Now for the amperes. In the circuit shown in



The Complete Mea

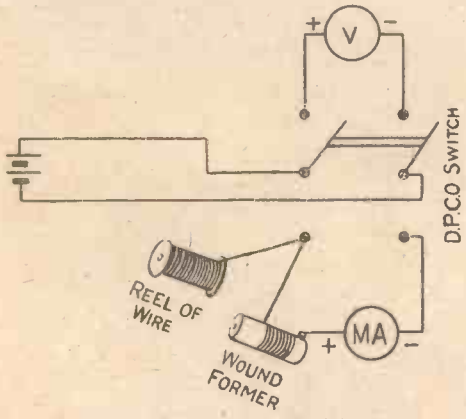


Fig. 4.—Testing the Resistance.

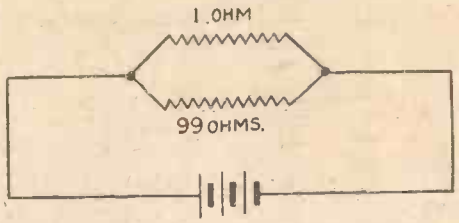


Fig. 1.—Explanation of Shunt Circuit.

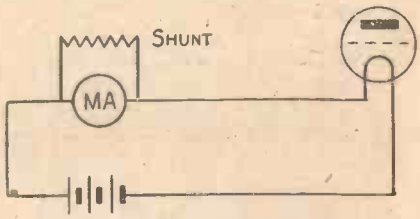


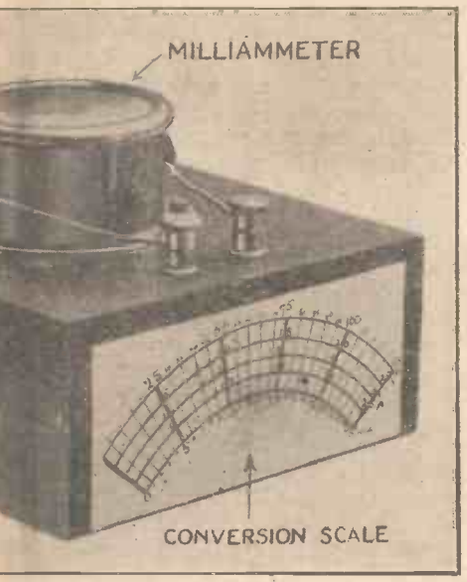
Fig. 2.—The Ammeter Shunt.

UREMENTS TH TRUMENT

LIAMMETER WORK!

EY REYNOLDS

Fig. 1 there are two parallel resistances. The upper one of these has a value of only 1 ohm, whilst the lower is 99 ohms. Whatever the magnitude of the current passing in the circuit 99/100 of it will pass through the small resistance and 1/100 through the large one. Now look at Fig. 2, where a shunted milliammeter is shown wired into a valve filament circuit. If we make the resistance of the shunt 1/99



asuring Instrument.

that of the milliammeter, then 99/100 of the current will pass through the shunt and 1/100 of it through the instrument.

In other words, if the total is 2.5 amperes (2,500 milliamperes), 2,475 milliamperes will flow through the shunt and

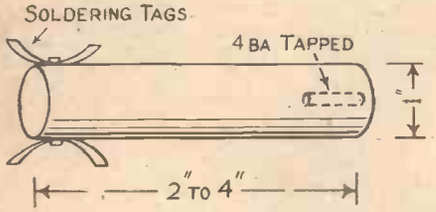


Fig. 3.—Former for Resistances.

Under-side View of Panel.

25 through the milliammeter. A total current of 2.5 amperes will thus cause a full-scale deflection of the milliammeter, and each scale division will correspond to .1 ampere. The instrument will then read from 0 to 2.5 amperes.

Making the Resistances

It is best to begin by constructing the resistance required to make the milliammeter read from 0 to 25 volts. The former for this is a piece of round ebonite rod 1 in. in diameter and 3 in. in length. In one end of this make a 4 B.A. tapped hole, and at the other end fix two soldering tags as shown in Fig. 3. Purchase 1 oz. of No. 42 double-silk-covered Eureka resistance wire, which will suffice for making all of the resistances. Bare the end of the reel of wire by waving the flame of a match about some inches below it in order to char the insulation, which can then be removed with the fingers. Solder this end to one of your tags and wind on evenly and tightly. A good way of winding is to place a piece of studding in the tapped hole in the end of the former and to insert this into the chuck of the hand drill. The drill can then be fixed into the jaws of the vice, and with its help the

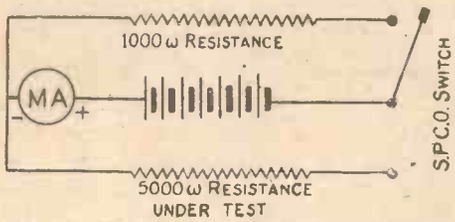


Fig. 5.—Testing the 5,000-ohm Resistance.

former can be rotated at a good speed. The reel of wire, with a suitable spindle thrust through it, should be held by a friend, who regulates the tension by the pressure of his fingers upon the flanges of the reel.

When your single-layer winding is about 1½ in. long the time has come to make a test in order to see whether the resistance is nearly correct. To do this, proceed as follows: Prevent the wire on the former from unwinding by applying a dab of sealing-wax to the last two or three turns. Do not cut the wire between the former and the reel, but remove a little of the insulation.

Testing

By far the best way of making your test is shown in Fig. 4. Borrow a really good voltmeter and arrange a battery and a double-pole change-over switch as shown. Connect your milliammeter between one of the switch contacts and the soldering tag of the former. To the second of the lower pair of switch contacts fix the bared place in the wire between the former and the reel. This is quite easily done by fastening a short length of fine flex to the switch contact and wrapping its strands round the bare portion of the resistance wire.

Throw the switch over first of all so that the voltmeter is in circuit and take the reading carefully. Let us suppose that this is 6 volts. When the resistance is quite correct the milliammeter should read 6 milliamperes on throwing over the switch to the other pair of contacts. If the reading is more than 6 milliamperes, you have not yet got sufficient wire on to the former. Shellac the bared portion of the wire and continue winding. Go on until you obtain a reading of rather *less* than 6 milliamperes. Then cut the wire, having secured the turns by means of a small dab of sealing-wax as before.

Now using the same circuit with the double-pole change-over switch, remove a few turns of wire and take another reading. Continue, removing less and less wire as you approach the correct reading, until the instrument indicates exactly

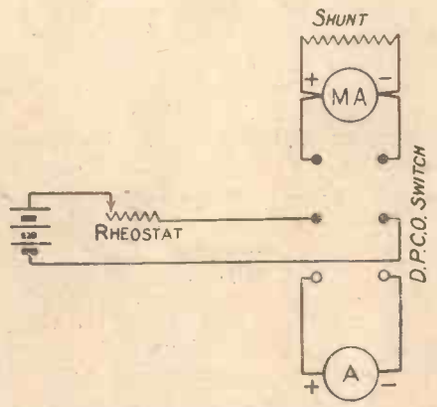


Fig. 6.—Circuit for Testing Shunt.

6 milliamperes. The first resistance is now finished, and you can use it in combination with your milliammeter for making the second, which has a value of approximately 5,000 ohms. Measure first of all the length of the windings upon your former. If this is 1¼ in., then you will need five times that amount, or 6¼ in., for the 5,000-ohm resistance.

Using a former 4 in. in length prepared as previously described, this means that you will need a double-layer winding, each layer being approximately 3⅛ in. in length. Put on this amount of wire, and then make your first rough test in the way shown in Fig. 5. The battery, which can be a portion of your H.T.B., should have an E.M.F. of 20 volts or so. You can read its E.M.F. exactly by throwing the switch so as to bring in the 1,000-ohm resistance, and so using your milliammeter as a 0-to-25 voltmeter. When the big resistance is of the right value the readings obtained with it will be exactly one-fifth of those obtained with the 1,000-ohm resistance.

Wind as before until you have rather too much wire on the former—that is, until an E.M.F. shown by the 0-to-25 volt circuit to be, say, 22 volts gives a reading of only between 3 and 3½ milliamperes with the large resistance. Adjust as already described until you obtain with the large resistance a reading exactly one-fifth of that obtained with the smaller milliamperes. The instrument will now read voltages from 0 to 125, each milliampere scale division representing 5 volts.

The resistance for the 0-to-5-volt scale will have a value of approximately 200 ohms; that is to say, you will require about one-fifth of the amount of wire that was needed to make the 1,000-ohm resistance. It is wound on a former similar to those made for the other two, but only 2 in. or so in length. The adjustment of the resistance can be done either with the Fig. 4 circuit, using the borrowed voltmeter, or with that seen in Fig. 5, a 4-volt battery being used in either case. If the Fig. 5 circuit is used the 200-ohm resistance replaces that of 5,000 ohms.

Should you be unable to borrow a good voltmeter, you can still make your resistances with fair accuracy in the following way. Have your accumulator charged, and get the man at the charging station to take the E.M.F. after the battery has been placed for an hour or so under a load of 1 ampere. Make a note of this figure, work to it when you wind your 1,000-ohm resistance, and then use your 0-to-25-volt scale for making the remaining tests.

Strictly speaking, the resistances should be wound non-inductively. I do not know that this makes any great difference in what is admittedly not an instrument of laboratory precision, but if you wish to wind them in this way it is quite easy to do so. When you obtain your resistance wire, purchase it in two ½-oz. wound upon separate reels. Bare the end of the wire of each reel and solder them together, covering the joint with shellac. Fasten the joint to your former with two or three turns of thin silk. Now wind on double from both reels simultaneously, and when you have cut the right length of wire, solder one end of each to the tags on the form. Fig. 6 shows the ammeter shunt which will be detailed in the next and concluding instalment. J. H. R.

(To be concluded.)

RECENT PROGRESS IN PHOTO-TELEGRAPHY

SOME further progress has recently been made with the new German system of rapid photographic transmission. The Telefunken Co. has been sending photographs by wireless between the German station at Nauen and some American stations, and claims to have beaten all records for speed. The number of separate signals which can be dealt with per second is 15,000, which is at least fifty times as great as that in use in the average system of photo-telegraphy. This should mean that the rate of transmission of a picture is only a few seconds, and should this be true it is a great step towards television.

Greater Speed

Wireless photograph transmission is steadily gaining ground, and at the annual dinner of the Institution of Electrical Engineers the other day the president, Mr. R. A. Chattock, stated that his own portrait had recently been sent across the Atlantic by the Marconi Co.

This quiet progress means that here in France, Germany and the United States experiments are being continually carried on with a view to the instantaneous transmission by wireless of visual images. Once the rapidity can be attained, the means of seeing the image visually instead of recording it on photographic paper can easily be accomplished.

A new nomenclature is bound to spring into existence in connection with television, just as it has done with ordinary wireless; many wireless terms in common use to-day were entirely unknown to the pioneer workers of two decades ago. At the fifth anniversary of a broadcasting station in Cincinnati, at which Mr. Francis Jenkins, inventor of the system being used by the Marconi Co. for Transatlantic transmissions, was present, Mr. Powel Crosley spoke of a "vision microphone" that would transmit vision to a screen attached to the amateur wireless receiving set. Such a term might well take the place of a more clumsy phrase meaning "a transmitter of vision by wireless," and so on. Meantime a new verb is badly wanted to describe the act of radiating the visual image of a living person or an actual event.

Telephotography, by the way, is used by a technical paper in connection with this subject. This is a mistake. The term telephotography has been in use in photographic science for years, and implies the taking of photographs through telescopic lenses. Photo-telegraphy was suggested and adopted in 1907 when Professor Korn first transmitted the pictures from Paris to London, which really inaugurated the practical beginning of this new science.

T. THORNE BAKER.

"OVERLOADING THE LOUD-SPEAKER" (*continued from page* 527)

the grid of the following valve may be surprisingly great. A second note-magnifying stage may make them so big that the valve to whose grid they are applied is quite incapable of dealing with them. A small-power valve may be able to deal efficiently with a voltage swing of 6 volts, but this is about its limit unless the plate potential is excessive. When, as is often the case, general-purpose valves are used as note magnifiers the maximum safe voltage swing is not more than 2 or 3 volts.

To return to the loud-speaker, there is another way in which it is frequently overloaded. Why should its windings be made to carry the steady plate current which serves no useful purpose by passing round them? When a high-resistance instrument is used, an improvement in results as well as a lengthening of its life may be obtained by making use of the circuit seen in Fig. 1. It is often stated that the secondary of a transformer whose primary has been burnt out will serve quite well as a choke. With this I do not entirely agree. Such a make-shift choke may give fair results, but if you want the best, use an instrument designed for the purpose. The coupling condenser should be large, since it is called upon to pass frequencies as low as thirty a second. Quite good results are obtainable with a coupling condenser of .01 microfarad, though it is better to use one with a capacity of .25 microfarad.

In the second circuit a 1-to-1 transformer is used with a high-resistance instrument. This is an excellent scheme, for it completely protects the loud-speaker windings and gives a good reproduction. There is, however, one point to bear in mind. Iron-cored transformers have large external fields, so that unless the 1-to-1 transformer is kept well away from the receiving set there may be interaction between it and those used for intervalve couplings. My own plan is to place this transformer, not in the receiving set but beside the loud-speaker, where it is 2 or 3 yards from the intervalve transformers. R. J. W.

The Union Radio Club of Liége has installed a small transmitter which is now broadcasting concerts every Monday, Wednesday and Friday at 9.30 p.m. on 185 metres.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

New R.C.C. Unit

WE have recently constructed an amplifier embodying the new Polar resistance-capacity coupling units manufactured bf Radio Communication Co., Ltd., of 34 and 35, Norfolk Street, Strand, London, W.C.2. Each unit consists of a wire-wound anode resistance, a specially made Dubilier fixed coupling condenser and a Mullard grid leak. The unit is made in two types, that known as the Green Seal having an anode resistance of 40,000 ohms and the Red Seal 80,000 ohms. Another type is made having an interchangeable grid leak. The resistance wire is wound on a cylindrical spool mounted vertically, inside which is mounted the grid leak. Both grid leak and resistance are mounted on the coupling condenser, which acts as a base and which can be screwed to a panel or to a baseboard. Connections are made to the unit by nickel-plated terminals, each of which is clearly marked.

The results obtained with the units (three Red Seal type in cascade) were exceptionally good, using Osram DE5B valves. The reproduction obtained was far purer than could be obtained from a transformer-coupled amplifier, whilst the volume was all that was necessary to fill a very large room. We can thoroughly recommend these components as being very efficient.

New R.C.C. Unit.

Radion Valves

WE have just completed tests on samples of valves submitted to us by Radions, Ltd., of Bollington, near Macclesfield. The three types tested were those known as the DE06, DE34 and the Pyrmamid No. 1. We were particularly impressed by the results obtained with the DE06 type, which we found especially suitable for high- and low-frequency amplification. As a rectifier results were not quite so good, but as a general-purpose valve this is one of the best of the .06 type we have tested.

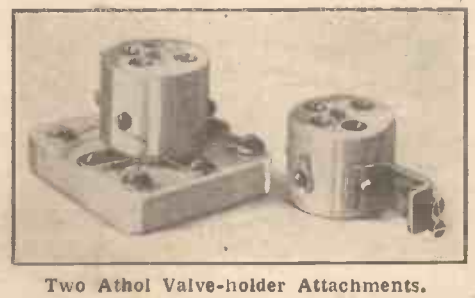
The DE34 valve is another general-purpose type from which good results can be obtained, and gives better rectification than the DE06. In appearance the valve is similar to the DE06. Both of them are fairly small, having a silvery coating on the inside surface of the bulb. The base is of a moulded insulating material, in which the usual split-pins are embedded.

Characteristic	Valve		
	DE06	DE34	Pyramid No. 1
Type	General purpose	General purpose	Power amplifier
Rated filament voltage	3	2	5·5
Tested filament current	·068	·336	·258
Rated anode voltage	30-90	20-80	50-100
Suitable anode voltage as L.F. amplifier	80	80	50
Grid bias required	-3	-3	-6
Suitable anode voltage as detector	45-60	50-60	—
Suitable anode voltage as H.F. amplifier	70	60	—
Impedance at 60 volts	29,700	30,300	9,700
Amplification factor at 60 volts	6·5	7·25	8
Total emission in milliamps	7·6	10·7	28

The Pyramid No. 1 is a power valve, and is capable of handling large voltage variations without distortion. The glass bulb is unusually large, the overall dimensions being 55 mm. by 120 mm. We have no hesitation in recommending this valve for amplification where plenty of volume is required with a minimum of distortion. The accompanying table shows the more important electrical properties of the three valves as tested in our laboratory.

Athol Valve Holders

IN order to make their porcelain valve holder non-microphonic the Athol Engineering Co., of Cornet Street, Higher Broughton, Manchester, have introduced a square porcelain base which, when the valve holder is mounted thereon and a valve inserted, gives a slow rocking motion when any vibration occurs. The rocking motion is obtained by a springy piece of thin brass shaped in the form of a cross and bolted at each of the four points to the base. The valve holder is bolted by a screw passing through a hole punched in the centre of the brass cross piece. Connections from the base of the valve holder are made with short pieces of bare copper flex. In actual use we have found this device quite efficient.



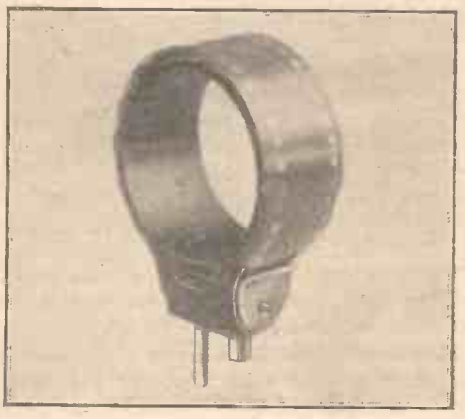
Two Athol Valve-holder Attachments.

Another fitting which may be used in conjunction with the Athol valve holder is that intended for use when it is desired to fix the valve holder on to the back of a vertical panel. The device consists of a heavy-gauge strip of brass bent and drilled as shown in the accompanying photograph.

The Lewcos Coil

WE have received from The London Electric Wire Co. and Smiths, Ltd., of Playhouse Yard, Golden Lane, London, E.C.1, samples of their Lewcos inductance coil. These coils are wound with a multi-strand conductor which gives a low high-frequency resistance. It is claimed that the wire with which the coil is wound is specially designed to give a minimum high-frequency resistance over that particular wavelength band to which the coil will tune.

In actual outward appearance the coil is similar to most of the types at present on the market. Internally, however, the construction is different, the windings are in flat layers, each layer being separated by corrugated celluloid. The former on which the coil is wound is an insulating compound which prevents the absorption of moisture. Connections are brought out to the usual pin and socket.



Lewcos Low-loss Coil.

On test the efficiency of this coil was found to be very high. It was noted, for instance, that when these coils were substituted for others in a standard receiver there was considerably less reaction required to bring the set into oscillation. On a standard P.O aerial with a .0005 variable condenser in parallel a No. 35 Lewcos coil tuned from 247 to 423 metres. The self-capacity of the coil is low and the pure inductance high.

THE PRINCIPLE OF THE SUPER-HET EXPLAINED

The second and concluding instalment of a special article by Dr. M. LATTER

Supersonic Amplifier

THE supersonic amplifier is shown connected to the foregoing apparatus in Fig. 9. The second, third and fourth valves comprise a three-valve supersonic tuned amplifier. In the anode circuit of each of the three valves is a circuit tuned to 30,000 frequency, and coupling to successive grid circuits is effected by the secondary windings of the intervalve transformer, namely, L4a, L5a, L6a.

In the output circuit C7, L7 we have the amplified beat-frequency oscillations, which are inaudible and unable to be received by telephone receivers. To effect telephonic reception another detector valve and heterodyne unit is required.

No. 2 Detector

The second detector valve is shown as the last valve in Fig. 9. In the grid circuit is contained a grid leak and condenser for rectification purposes, the secondary winding L7a of the last intervalve transformer and coil L8 which is coupled to coil L9 of the No. 2 heterodyne unit. By impressing these heterodyne oscillations on the signal-caused supersonic oscillations in the grid circuit of the second detector valve, a beating oscillation is produced therein in exactly the same manner as in the tuner circuit L1, C1. In this case, however, the heterodyne condenser C9 is adjusted so that the beats occur at an audible frequency. The second detector valve rectifies the beating supersonic oscillations, and in the anode circuit is produced the rectified beats which cause a sound in the telephone receivers. Instead of receiving in the phones as shown in Fig. 9, a two-valve note-frequency amplifier could be inserted after the second detector valve.

Telephone Reception by Frequency Changing

In the case of telephony, the modulation of incoming oscillations at audible frequency is present in the tuner circuit, and consequently the second heterodyne valve already referred to is not needed. The supersonic beat-frequency amplifier also requires very careful designing for telephony purposes. In the reception of C.W. this amplifier can be made as selective as desired or as rendered possible by the constancy of the length of wave sent out by the transmitting station. In the reception of telephony, however, such a highly-selective supersonic amplifier would produce distorted speech. The incoming signal carrier wave has speech-frequency modulations superimposed on it which widen the carrier-frequency band to about 5,000 cycles above and below. If the amplifier be too selective then it will not deal with the whole frequency band and distorted speech results.

Auto-heterodynes

In the circuits outlined above separate heterodyne valves are employed as shown. In some cases designers prefer to economise in the number of valves used and employ the two detector valves as auto-heterodyne detectors. The advantage of reducing the number of valves is counterbalanced by the less efficient reception of the valve when used as an auto-heterodyne. The valve circuits must be detuned from the received signal in order to heterodyne, and this detuning naturally results in loss of signal strength. The best plan is to employ a separate heterodyne and also provide the first detector circuits with reaction sufficient to reduce the damping of the tuner circuits to a low value but insufficient to generate oscillations. A typical arrangement to effect this is shown in Fig. 10.

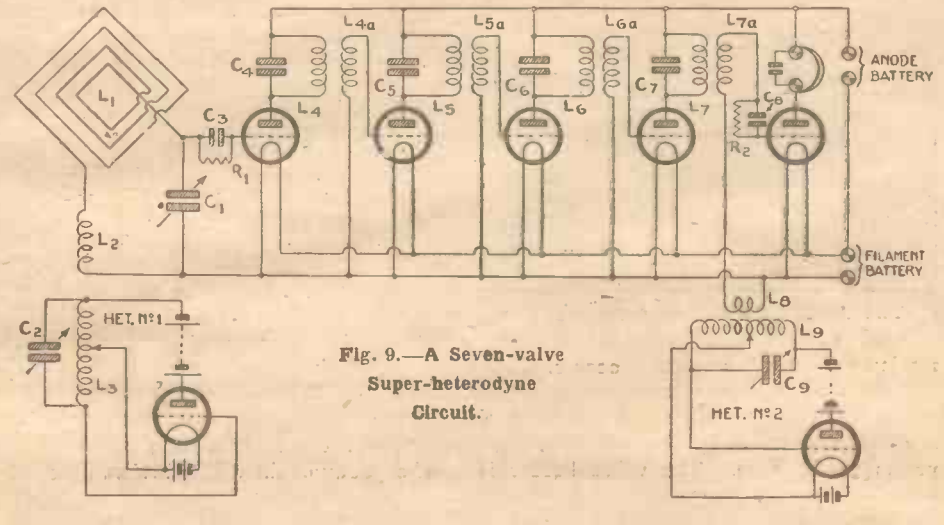


Fig. 9.—A Seven-valve Super-heterodyne Circuit.

Super-het and Re-radiation

In common with all heterodyne detectors coupled directly to a receiving tuner, the simple circuits previously outlined (for the purpose of explaining the super-heterodyne method) suffer from the drawback of

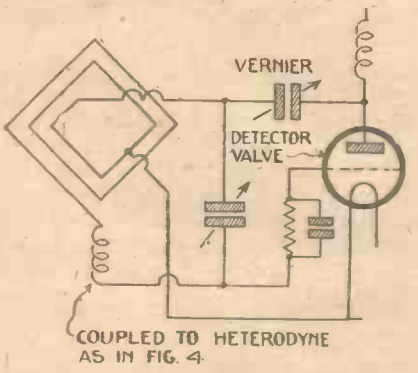


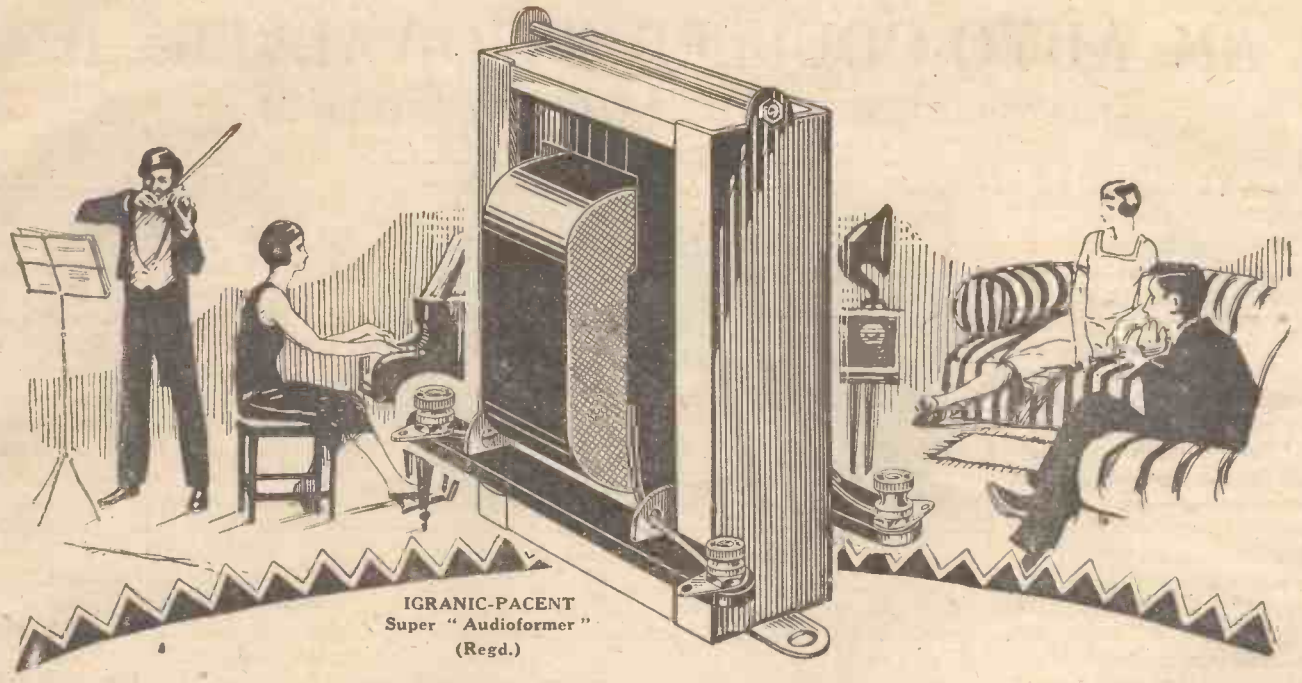
Fig. 10.—Capacity-reaction Coupling.

re-radiation. The oscillations induced in the tuner circuits by the first heterodyne radiate waves which will cause interference to other near-by receivers. In order to minimise this trouble, the oscillations induced in the tuner by the heterodyne should be as weak as possible. They should, in fact, be of approximately the same strength as the incoming oscillations. No gain in amplification is produced by making the heterodyne oscillations very strong. Sometimes the anode battery of the heterodyne unit is dispensed with and weak coupling arranged with the tuner circuit. Another method is to use harmonic heterodying methods.

Harmonic Heterodyne

Instead of employing a straight circuit as in Fig. 4 and Fig. 6 (p. 493, No. 199), it is better to design a heterodyne whose fundamental frequency is far removed from the frequency of the incoming signal wave and to employ a harmonic of the heterodyne generator for the purpose of beating with the received oscillations in the tuner circuit. Two advantages accrue from this. First, the induced oscillation in the tuner circuit is appropriately weak and, second, the tuner and heterodyne circuits can be varied independently without affecting one another. When two circuits tuned to the same frequency are coupled together it is found that one cannot be varied without producing variations in the other. In other words, if the con-

(Concluded at foot of page 538)



Music worth listening to!

Broadcasting has often been condemned by music lovers who have listened to imperfect reproduction of a beautiful musical composition. More often than not the transformer has been to blame, because it has not been designed to give that perfect reproduction which makes broadcast music really worth listening to.

There is a vast difference between a cheap transformer which has been indifferently designed and stinted of material for the sake of economy—and one which is the result of exhaustive research and experiment by skilled radio engineers and incorporating ample materials of the finest possible quality for the purpose.

Such an instrument is the IGRANIC-PACENT SUPER "AUDIOFORMER"—it is an outstanding achievement in L.F. transformer design. It will reproduce with equal fidelity the grandeur of a full orchestral rendering or the more delicate passages of the solo instruments—the high notes of a soprano or the deepest cadences of the human voice.

The IGRANIC-PACENT SUPER "AUDIOFORMER" gives perfectly uniform amplification over a very wide range of audio frequencies—every note is amplified in proportion and the results will satisfy the most exacting critic. Ratio 3 : 1—suitable for use in first and second amplifying stages and with plate voltages up to 500.

Ask your dealer about the SUPER "AUDIOFORMER."

Exclusive Manufacturing Licensees of

IGRANIC ELECTRIC COMPANY LIMITED

Pacent Radio Essentials

149, Queen Victoria St., LONDON.

Works : BEDFORD.

THE IGRANIC-PACENT Super "Audioformer"

(Regd.)

Ratio 3 : 1. Price 27/-

It is one of the range of

RADIO IGRANIC I-Pacent ESSENTIALS

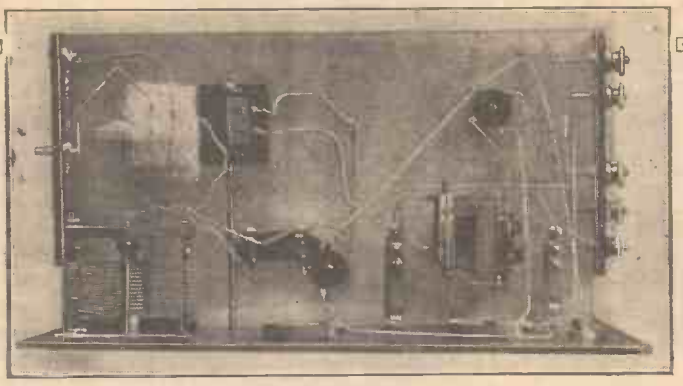
of which the Igranic Electric Co., Ltd., are the exclusive manufacturing licensees. The range includes: Porcelain and Bakelite Rheostats and Potentiometers, the True Straight Line Frequency Variable Condenser, the Elegant Microvern Dial, the Balcon, the most complete line of Plugs, Jacks and Switches in the world, Jack Nameplates, the Radiodyle, the Radio-file, etc.

All reputable dealers stock them.

Write for the Igranic Booklet No. P.70.

AN AUTO-COUPLED TWO-VALVER.—II

COMPLETING AND OPERATING THE RECEIVER



Plan View of Baseboard.

THE coil support consists of three-ply wood cut to the dimensions in Fig. 5 (see page 540). It is fixed to the wood base of the receiver by means of a small brass strip 2 in. long and ½ in. wide, drilled for the fixing screw and bent to a right-angle. The coil can now be carefully pushed on to the two arms of the support, which should be a good tight fit into the inside of the coil.

The whole of the wiring, with the exception of the two leads to the reaction coil, is done with No. 16 tinned copper wire, and all leads are carefully spaced. The two leads from the reaction coil are of rubber-covered flex. The method of wiring up can easily be followed from the diagram Fig. 6 and from the photographs.

It will be noticed that in the theoretical diagram a .001-microfarad condenser is shown across the telephones and that 1-microfarad Mansbridge condensers are shunted across the high-tension positive to high-tension negative tappings. These are not seen in the photographs or panel lay-out, as in the writer's receiver the telephone condenser is across the input of a telephone distribution box, which is used to control the number of headphones in use, and the Mansbridge reservoir condensers are in the box which houses the high-tension batteries. If the two reservoir condensers are included in the receiver they should be placed behind the front panel on the edge nearest the H.T. terminals. Their presence is not necessary to the working of the set, but they will be found to be an advantage. The telephone condenser can be placed across the loud-speaker terminals, but the best value can only be found by experiment.

Wiring

In wiring up, the lead from the beginning of the tuning coil goes to the grid condenser and also to the fixed vanes of the variable tuning condenser. The next tapping (the twentieth) is taken to the aerial terminal. The fortieth tapping is connected to the earth terminal and the end of the coil is connected to the moving vanes of the tuning condenser and also to low-tension positive. The rest of the wiring is quite standard. Note how the .001-microfarad condenser across the primary of the low-frequency transformer is attached to the leads to IP and OP of the transformer.

For the reaction coil a No. 50 or 75 Igranic answers very well, or a 75-turn basket coil may be wound and mounted to swing up to the aerial coil. The first valve, or detector valve, may be any type of general-purpose valve with about 30 to 60 volts on the plate. The second valve may also be one of the general-purpose valves, but better results will be obtained if one of the small power valves, such as the P.A. or the B.4, be used with about 120 volts on the plate and suitable grid bias. A soft Dutch valve with 36 volts H.T. and a B.T.H. B4 with 120 volts on the plate and 6 volts grid bias gives excellent results.

Care should be taken to see that the grid bias battery is connected the right way round.

To operate the set, the reaction coil should now be brought fairly close to the aerial coil and with the first valve filament lighted the tuning condenser should be slowly rotated until a station is heard. Next move the reaction coil up to the aerial coil until a faint rushing sound is heard and then carefully move it back until the sound disappears. If you hear howls and shrieks, varying in pitch as your condenser dial is rotated, your set is oscillating and the reaction coil coupling should be immediately slackened off. If, however, signals get weaker as the reaction coil is moved nearer to the tuning coil, or even fade away altogether, it will be necessary to reverse the two leads to the reaction

(*Concluded in third column on page* 540)

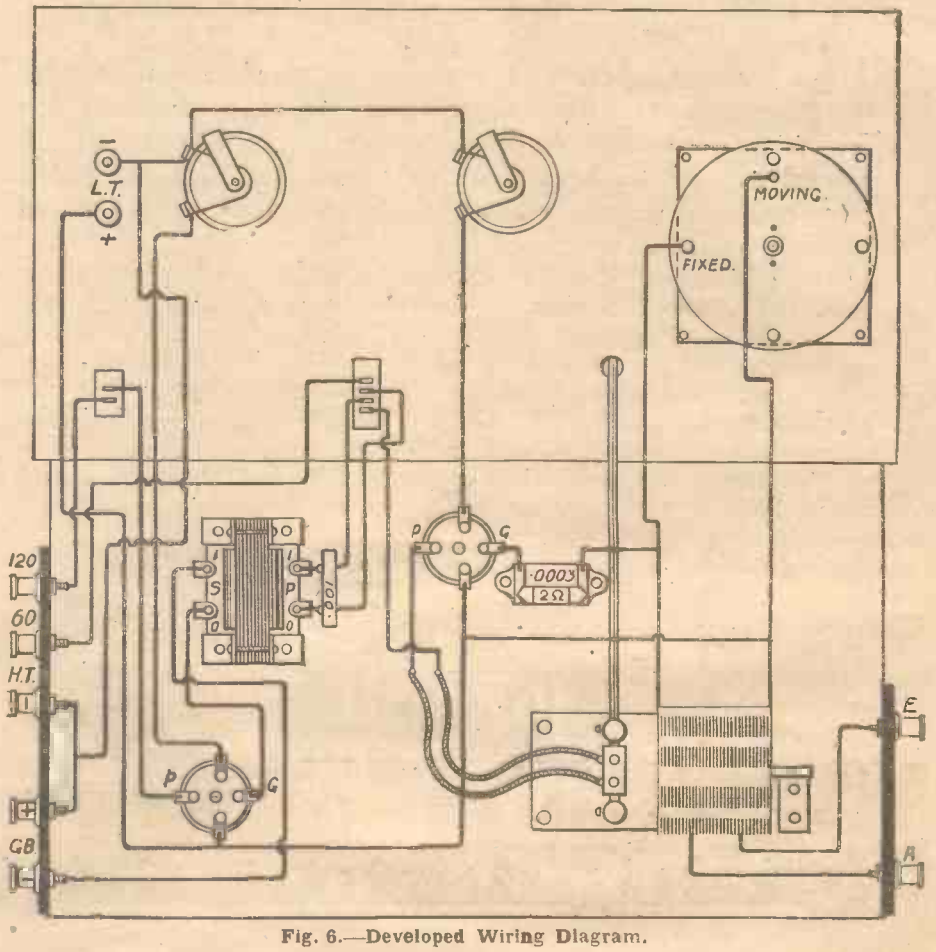


Fig. 6.—Developed Wiring Diagram.

FOR the first time listeners will have an opportunity of hearing Mr. Lloyd George via the microphone on the occasion of his speech to be given at the tenth annual dinner of London head teachers on April 7.

The dramatic department of the B.B.C. has organised a programme entitled "My Mistake" for the evening of April 13. Amusing dialogue and music has been built around the idea of a deaf man being brought into the studio to act as an announcer.

Miss Isolde Menges, the famous violinist, will broadcast for the first time from the London studio on Sunday, April 4.

The band of H.M. Royal Air Force, Miss Mavis Bennett and Mr. Harry Dearth will constitute the main items of the Easter Monday programme.

The second concert to be relayed from Devonshire Park, Eastbourne, will take place at 9 p.m. on April 7.

Excerpts from the variety entertainment given by the prize winners in the Great Western Railway Musical Festival, held at Swindon early this year, will be relayed from the Birmingham station on April 9.

In Austria the town of Klagenfurt is anxious to possess its own relay station, and has made arrangements with the Vienna broadcasting company to take over the old transmitter as soon as the Rösenhugel high-power station is in perfect working order. It is an interesting point to note that the latter is the first transmitter made by the Telefunken Co. working with water-cooled valves.

Reception of the Dublin station on the west coast of Scotland is improving. Recent reports show that the new Free State station is now at loud-speaker strength in Scotland on two valves.

A popular monthly feature in Glasgow is a series of pictures of characters in literature, with dramatised scenes from the books in which they appear. The series has been the means of turning numbers of listeners to the works of standard authors. The latest character was Squeers, the schoolmaster of *Nicholas Nickleby*.

Commencing in April, the local broadcast talks from all Scottish stations are to be arranged as follow: Monday, from Dundee; Wednesday, Aberdeen; Thursday, Glasgow; Saturday, Edinburgh. The Tuesday talks will mostly come from London. The Saturday evening sports talks are to include golf, tennis and motor cycling.

A device to minimise interference caused by "howling" receivers has been invented by Sir Oliver Lodge.

The P T T relay station is now transmitting on a wavelength of 260 metres.

Special concerts are broadcast every week from the Hilversum station for the benefit of hospitals.

A new relay station is to be erected in the neighbourhood of Kaiserslautern.

With an input of only 6 watts, 6 W G (Glasgow) has been reported at R3 strength in Heidelberg, a distance of about 700 miles.

The Glasgow station has been running a series of broadcasts, in co-operation with the Army authorities, depicting the histories of the various Scottish regiments.

The Prime Minister states that there is a great body of opinion against broadcasting the Budget speech, and wireless listeners will therefore not hear any of the Parliamentary proceedings.

With a view to improving the wireless communication services of the Royal Australian Navy, short-wave C.W. apparatus is undergoing preliminary tests. It is probable that the naval authorities will invite experienced amateurs who have pioneered short-wave work in Australia to join the naval wireless reserve.

At the request of the B.B.C. the L.C.C. Elementary Education Sub-committee are recommending that permission be given to 20 central schools, which possess wireless apparatus, to listen on Friday afternoons to broadcast lessons in elementary French.

Plans are now in hand for a regular interchange of broadcast programmes between Daventry and Hilversum, and the first transmission of Dutch programmes for British listeners under this scheme will take place on Monday, April 19.

Fred Rome and Partner will make their first appearance before the microphone on April 12. Mr. Fred Rome is well known as a concert-party artiste.

A special music-hall programme is announced for broadcasting from London and Daventry on April 22.

The Government of Ecuador has approved the proposal of a Guayaquil firm granting it the exclusive right to import wireless apparatus for a period of five years, and to erect stations at Quito and Guayaquil.

Three Sheffield schools have been furnished with a wireless receiver. A one-valve set has been installed in one school and landline connections run to the other two.

Considerable progress is being made with the construction of the beam wireless station at Skegness for communication with India and Australia. Five huge steel masts are already in position. The station is due to be completed towards the end of next month.

The B.B.C. is offering £1,000 in prizes for original musical compositions to be performed in London next autumn at a B.B.C. musical festival. Competitors must be "young and lesser-known" composers of British birth.

From April 13 5 X X will broadcast the two weekly alternative programmes on Tuesdays and Thursdays.

As a further development in the relay of international broadcasting the B.B.C. have now made all arrangements with various European stations, which will allow of special programmes for British listeners. The scheme will include the celebration of the anniversary of different historical personages and composers by a relay from their mother countries, and on these occasions a suitable foreign station will co-operate with the B.B.C. in this connection.

Another amateur broadcasting station has been erected at Antwerp in connection with the Radio Club D'Anvers. Its call sign is D I, and transmissions are made on a wavelength of 225 metres. Concerts are broadcast every Thursday from 22.00 G.M.T. until midnight, and on Sundays from 14.00 to 16.00 G.M.T.

On March 6 a concert given at the Victoria Hall, at Geneva, was relayed to P T T, Paris. An attempt will be made within the next few days to relay an operatic performance from Monte Carlo by landline.

America has coined a new word to denote a wireless transmission which includes both literary talks and musical subjects. The term "literamusicale" is already used by several broadcasting stations.

Chaliápin recently stated in New York that previous to his broadcast at 2 L O he suffered so much from microphone fright that he brought with him an audience and completely filled the studio with a group of admirers. To counteract any nervousness on the part of performers, the K M O X (St. Louis) broadcasting station separates the audience from the singers by a sheet of glass. The artiste is able to see the listeners, and they hear him by means of a loud-speaker in the other room.

A broadcasting concern for pupils who wish to study the technique required for successful broadcast transmission has been opened at New York.

NEXT WEEK AT 2LO

By THE LISTENER

THE practice of having visits from the musical directors of other stations has proved a complete success, and on Sunday next listeners will have opportunity of hearing the Wireless Orchestra under the baton of Mr. Warwick Braithwaite, who has been the musical director of Cardiff station for a considerable time.

In addition, Miss Isolde Menges will be heard again. She has not been heard at 2LO since one of the big star concerts given early last year, or in the provinces since her two early broadcast recitals at Manchester. Later in the afternoon will be played Part I of a morality play by R. E. Jeffery, entitled *'Twixt Dark and Dawn.*

De Groot and his orchestra give a short recital in the evening, with Miss Elsie Cochrane as the vocalist.

Francesco Ticciati

Isolde Menges

The day's programme for Easter Monday starts at 2 o'clock, when a concert of the same type as that usually given at Daventry in the morning will be broadcast.

The band of the Royal Air Force will be heard in the evening, with assistance from three popular broadcast artistes, namely, Mavis Bennett, Harry Dearth, and Foden Williams (entertainer).

The 10.30 feature will be given by Vivian Foster, the "Vicar of Mirth."

Concertina bands are a novelty in London, though up in the North the capabilities of this instrument are better recognised. On Tuesday listeners will hear Percy E. Gayer's Premier English Concertina Band.

Wednesday is devoted mainly to chamber music, the artistes being the Philharmonic Trio, which consists of three distinguished players, namely, Albert Fransella, flautist, of Queen's Hall, Leon Goossens (oboe), and Francesco Ticciati, one of the most brilliant of Italian pianists and a clever composer as well. Later a second concert will be relayed from Devonshire Park, Eastbourne.

Thursday marks an important feature, for the concert will be relayed from the Bournemouth Musical Festival. The conductors are Dame Ethel Smyth, Sir Herbert Brewer, and Sir Dan Godfrey.

On Friday the variety programme given by the prize-winning soloists in the Great Western Railway Musical Festival, held at Swindon early this year, will be relayed from Birmingham.

Variety is then the keynote of the evening, for at 9.5 comes that clever little band "The Midnight Follies" and Jay Whidden at the Hotel Metropole, while at 10.30 the feature will be a broadcast from the studio of a cabaret performance by the Chez Fysher Company from Paris.

The Saturday night programme will be of a more serious nature than usual, consisting of Grieg's pianoforte Concerto in A minor, with Maurice Cole as soloist, and groups of sea shanties, sung by John Goss, and the Cathedral Male Voice Quartet.

GERMAN RELAYS

ON Sunday, March 21, Reichspresident Von Hindenburg visited Cologne. A concert took place in the Great Hall of the Rheinpark in the exhibition buildings, and at the Gürzenich, a large hall situated in the centre of the Rhineland capital.

In both of these halls microphones were installed and the transmission conveyed by cable to the Cologne central telephone exchange, thence to the Elberfeld broadcasting station. This relay fed both Münster and Dortmund. From this point the transmission was conveyed by overhead cable to Berlin "trunks," which again divided the signals between Königswusterhausen and the main studio. An S.B. panel has now been installed in Berlin, thus linking up to the Vox Haus studio the Hamburg and Frankfort group, as well as the Königsberg and Breslau transmitters.

The system is being extended, and it is hoped in the near future to connect all the German stations, and through Münich to effect an exchange of programmes with the Austrian stations.

J. A.

Radio Toulouse now relays performances from the local theatres three times monthly, and on this occasion the transmission is broadcast on a wavelength of 500 metres.

"THE PRINCIPLE OF THE SUPER-HET EXPLAINED" (*continued from page* 532)

denser C1 in Fig. 6 be adjusted to bring the circuit L1, C1 in tune with the incoming wave, then on adjusting condenser C2 in the heterodyne unit the circuit L1, C1 is detuned from the incoming wave. By way of example, consider the reception of a 300-metre wave (1,000,000 frequency) on a super-heterodyne receiver containing an amplifier tuned to 30,000 cycles.

To produce a 30,000-frequency beat with the incoming 1,000,000-frequency signal, a frequency of 1,000,000 plus or minus 30,000 is required from the heterodyne unit, that is, 1,030,000 or 970,000. If the heterodyne is designed to operate on the second harmonic, then the fundamental frequency will be either 515,000 or 485,000. If the oscillator operates on its third harmonic, then its fundamental frequency will be 343,333 or 323,333, which corresponds to wavelengths in the region of 900 metres, sufficiently far apart from the incoming 300-metre wave to avoid inter-tuning difficulties with the receiving tuner.

Low-wave Interference

A supersonic amplifier tuned to a frequency of 30,000 per second has been referred to, but in actual practice amplifiers are designed to operate up to 100,000 cycles per second (3,000 metres).

M. L.

A BIRMINGHAM EXHIBITION

IN response to a request from the Queen's Hospital Extension Appeal Committee, the Birmingham Chamber of Commerce has agreed to organise on comprehensive lines a wireless exhibition for Birmingham and the Midlands. The exhibition will be held in Bingley Hall from May 19 to 29.

The National Association of Radio Manufacturers and Traders has given permission for its members to participate, and the undertaking has every promise of being a pronounced success. It is hoped to secure the support of the B.B.C. and display the latest methods of broadcasting from a temporary station in the exhibition.

"Wireless Telephony Explained."—In the review of this book, which was given in No. 198, it was stated that Mr. J. Hartley Reynolds was the author. It should be noted, however, that the book was produced under the joint authorship of Mr. Reynolds and Mr. G. Leslie Morrow.

Amateur Short-wave Work

SIR,—In your issue of February 20 THERMION makes some observations on the subject of the reception of short waves, concerning which I should like to mention certain facts which will no doubt be of interest to readers of AMATEUR WIRELESS.

In the first place, I do not think it will be agreed by those who are actively engaged in short-wave working that reception of such wavelengths is still in the experimental stage; certainly the factors governing the actual difference between day and night transmission and seasonal variations have not yet been completely explained for wavelengths of the order of 15 to 100 metres, but the reception itself of these wavelengths is certainly no more in the experimental stage than, say, that of the broadcast band. One has only to listen on waves around 20 and 45 metres to hear the large number of amateur stations all over the world working to schedule day after day to realise that reception on these waves is extraordinarily consistent.

As regards aerials for the reception of short waves, there appears to be no "best" type, as so much depends on local and other conditions and on the type of receiver used. If a proper method of coupling the aerial to the receiver is used the ordinary broadcast receiving aerial having a fundamental round about 120 metres is quite efficient for reception on 45 metres, providing care is taken to reduce capacity losses to earth as far as possible in such things as lead-in tubes, etc.

The type of aerial described by THERMION appears to have some resemblance to a particular form of short-wave transmitting aerial which has been in use by amateur and commercial stations for some considerable time. For 45-metre working a single wire 22.5 metres long when fed at 45 metres will oscillate with a nodal point at the exact centre, and therefore one may consider that one half of the elevated wire is acting as the aerial proper and the other half as the counterpoise. Similarly if the same elevated system is fed at 22.5 metres there will be two nodal points, one at a quarter and the other at three-quarters of the actual length, the system in this case having a full wave on it.

The connection from the transmitter to this type of aerial is made by a radio-frequency feeder which for 23 and 45 metres should be connected a quarter of the way along the aerial—*not* in the centre—and the aerial system should not be earthed.

The radio-frequency feeder carries only a very small current owing to its good power factor, and the feeder may therefore be of long length and of fairly high resistance without affecting the efficiency. The small series condenser mentioned by THERMION is *only* necessary when the feeder happens to tune to the operating wave or a harmonic. This type of aerial is most efficient for transmission, but for reception a good single-wire aerial is as good as any other.

Finally, on the subject of aerials in general, the number of wires has no effect on directional effects whatever, such effects only being noticeable when the length of top-hamper is very much greater than the down-lead.—G 6 U V (Berkhamsted).

Low-frequency Transformers

SIR,—I should like to call the attention of readers to what is apparently becoming a common and misleading practice in reference to low-frequency transformers. I refer particularly to the question of impedance, which, as every engineer knows, depends in a reactive circuit such as a transformer winding to a vast extent on the frequency at which it is measured.

This point is not appreciated by the average enthusiast, and therefore any statement of transformer impedance which does not give the frequency at which it is measured is as misleading as it is useless.

Any transformer may have a comparatively high impedance at, say, 500 cycles, but this does not indicate that it will give good results, since the whole of the male and female speaking voices and the major portion of the fundamental notes are below this frequency, so that for an impedance value to be of any real use it should be stated at a periodicity of not higher than 100 cycles. If the impedance is reasonably high at that frequency, good reproduction, particularly of the low notes, is assured.

It is sometimes suggested that the impedance of a transformer primary and that of the valve preceding it should be matched, and one must say at once that this is quite wrong and such a state of affairs should be avoided if at all possible. The object at which one must aim is to make the transformer impedance as high as possible so that it is infinitely great with reference to the impedance of the preceding valve, and under these circumstances the full amplification of the valve is obtainable and the true amplification per stage may be calculated by multiplying the valve amplification factor by the ratio of the transformer.

It is only with transformers of comparatively low ratio, say from 3-4/1, that the above high impedance is possible, for which reason high-ratio transformers should be as a rule avoided unless they are used following valves having very low impedances, under which circumstances the transformer impedance is still comparatively high compared to that of the valve. Really good results cannot be obtained under any circumstances unless the transformer impedance is very great, which cannot be the case with a high-ratio transformer.—J. B. (Manchester).

Other Correspondence Summarised

T. L. B. (Blackpool), referring to the second article on making a permanent H.T. battery, which appeared in "A.W." No. 195 states that all carbons can be used, no matter how old or hard they may be, simply by removing the canvas covering and re-wrapping with strong cloth—linen or calico—afterwards binding with strong cotton or thin string.

N. W. SKINNER (296, London Road, Westcliff-on-Sea) has been allotted the call-sign 5 S N.

"AN AUTO-COUPLED TWO-VALVER" (*continued from page 534*)

coil. When good signals have been received on the first valve the telephone plug should be inserted into the second jack and the second valve filament turned on. The combination of high-tension tapping and grid bias must now be found which gives the loudest and clearest signals free from distortion. If the signal strength on two valves is very poor or even worse than when using the detector valve alone, try the effect of reversing the grid-bias battery.

The results one may expect from a set of this type are rather better than the average two-valver will give, inasmuch as tuning is so easy and the smoothness of the reaction control makes the set very selective. Tested on an average P.M.G. aerial at Preston, 2 Z Y, thirty miles away, comes in at good strength on the loud-speaker, and the other B.B.C. stations are also heard

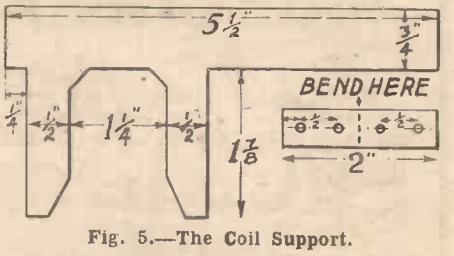


Fig. 5.—The Coil Support.

quite well. On the phones at least half a dozen B.B.C. and Continental stations can be picked up almost any night.

If the constructor desires to do a little experimenting with this set he can leave the wire from the earth terminal to the fortieth turn of the aerial coil unsoldered at the coil end and make contact by just twisting it round the tapping wire. After trying the earth connection in this position, take it off the fortieth turn and try it connected to the end of the tuning coil, that is, to the same end of the coil as the lead to filament positive. On some aerials this will be found to give an increase in signal strength.

No mention has been made of the case or cabinet to contain the set. In the writer's case this consists of an open-fronted box, made of ⅜-in. oak and measuring 15 in. by 8 in. by 8 in., with the two ends cut away to clear the terminal strips.

WARNING

Use of Patents in the Home Construction of Broadcast Apparatus

MARCONI'S Wireless Telegraph Company, Ltd., of Marconi House, Strand, W.C.2, published in this paper during January a notice concerning the unauthorised disposal of broadcast receivers by amateurs and others. From correspondence subsequently received it is clear that a large section of the public is under the impression that the Company have given the free use of their patents to all home constructors, and therefore it is desirable that this misunderstanding should be rectified.

AS far back as 1922 the Marconi Company placed at the disposal of the bona fide experimenter or amateur the use of their patents. Whilst the Company have no intention of withdrawing this, they cannot consider persons who make up receivers at home merely for the purpose of obtaining amusement from the broadcast programmes as "experimenters," and therefore the concession referred to above is not applicable to them.

IT is clear that any other attitude on the part of the Company would be tantamount to converting the royalty into an unfair penalty imposed upon the manufacturer, who has not only to pay royalties, but also to bear the cost of heavy overhead manufacturing charges.

THE Company, not only for the protection of the legitimate trader, but also to safeguard their own interests, wish to make it known therefore that, while they have no desire to influence the public as to whether a set shall be bought complete or constructed at home, royalties are payable in either case. The Company also desire to give notice of their firm intention to take such action as may be necessary to uphold their patent rights.

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM, 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 308 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 324.5 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 323.5 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 302 m. **Stoke-on-Trent** (6ST), 304 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily (exc. Sun.), 7.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. G.M.T.*

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 535 m. (temp.) (10 kw.). 10.00, con. (almost daily); 14.30 con.; 18.25, news, weather, time sig., con., lec., news; 19.00, con.; 21.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 19.10.

BELGIUM.

Brussels, 262 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 19.00-22.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 09.00, con., news (Sun.); 18.00, lec., con. or dance daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 14.30, lec.; 16.30, children; 19.00, play; 20.15, news, con.; 20.5, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.): 19.00, lec., con., news, con.; 20.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 08.00, sacred service; 16.30-20.30, same as Copenhagen; 19.00 (Wed., Thurs.), lec., con., news, orch.

Hjoerring, 1,250 m. (1.5 kw.).*

Odense, 810 m. (200 w.).*

Sorö,* 1,150 m. (1½ kw.). Also occasionally relays 5XX from 22.00 G.M.T.

* Relay Copenhagen.

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 20.10, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 260 m. (500 w.).

***Bordeaux**, 410 m.

* Relays of PTT Paris.

Montpellier, 238 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 275 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 513 and 571.5 m. (4 kw.). 08.00, sacred con. (Sun.); 10.00, con. and tests; 11.55, time sig., news, weather; 14.00, educ. hour (Sun.), markets, time sig.; 16.00, orch.; 19.30, con., weather, news, time sig., dance music until 23.00 (nightly). Relayed on 1,300 m. by Königswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 10.30-11.50, relays Berlin (Sun.); 14.00, lec. (daily.); 17.30, relay of Berlin (Vox Haus) con. (daily); 2,525 m. (5 kw.), Wolff's Buro Press Service: 05.45-19.10; 2,880 m.: Telegraphen Union: 07.30-18.45, news. 4,000 m. (10 kw.); 06.00-20.00, news.

Breslau, 418 m. (4 kw.). 11.00, con. (daily); Divine service (Sun.); 11.55, time sig. (Sun.), weather, Stock Ex., news; 15.00, children (Sun.); 16.00, con.; 18.00, lec.; 19.30, con., weather, time sig., news; 20.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.55, time sig., news; 11.55, Nauen time sig.; 15.00, con. (Sun.); 15.30, con.; 17.00, markets, lec.; 19.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (232 m.). Sundays: 06.25, time sig., weather, news, lec.; 08.15, sacred con.; 12.15, con.; 17.00, con.; 18.15, sports, weather, con. or opera, dance. Weekdays: 05.55, time sig., weather; 06.00 and 06.30 news, weather; 11.55, Nauen time sig., news; 13.00, weather, con.; 15.15 and 17.00, con.; 18.00, lec.; 18.55, weather, con.; 21.00, dance (daily, exc. Tues.).

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., weather, news; 15.30, con.; 16.00, con. (Sun.); 18.30, lec.; 19.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 07.30, sacred con. (Sun.); 10.00, educ. hour (Sun.); 11.00, con. (daily); 11.55, Nauen time sig., news; 15.30, con., children (Wed.); 19.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 493 m. (3 kw.). Relayed by Nuremberg (340 m.). 10.30, lec., con. (Sun.); 13.00, time sig., news, weather; 15.00, orch. (Sun.); 15.30, con. (weekdays); 17.30, con. (weekdays); 18.15, lec.; 18.30, con. (Sun.); 19.30, con.

Münster, 410 m. (2½ kw.). Relayed by Elberfeld (259 m.); Dortmund (283 m.). 10.45, Radio talk, Divine Serv.; 11.00, news (Sun.); 11.30, news (weekdays); 11.55, Nauen time sig.; 14.30, news, time sig.; 15.00, con.; 16.00, children (Sat.); 18.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 23.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 10.30, con. (Sun.); 15.30, con. (weekdays); 16.00, con. (Sun.); 17.30, time sig., news, lec., con. (daily); 20.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 07.15-16.10 (exc. Mon. and Sat., when 1.10-11.10), news, Stock Ex.

Hilversum (HDO), 1,050 m. (1½ kw.). 09.40, sacred service (Sun.); 19.50, con.; 21.40, news, etc. Will shortly test on 25 kw

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 15.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 20.30, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4¼ kw.). Con.: 17.30-24.00 (almost daily).

Madrid (EAJ4), 340 m. (1 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). News, lec., con., 17.00-21.00 (Sun.), 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-24.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 21.00 or 22.00

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). Daily: 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. Daily: 19.00-22.00, con.

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. Daily: 19.00-22.00, con.

San Sebastian (EAJ8), 343 m. (500 w.). Daily: 17.00-19.00, 21.00-23.00.

Salamanca (EAJ22), 400 m. (1 kw.). 21.00, con. daily.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 10.00, sacred service (Sun.); 11.30, weather; 13.00, con. (Sun.); 16.00, children (Sun.); 17.00, sacred service; 18.00, lec.; 20.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Joenkoeping (SMZD), 265 m.; Karlsborg, 1,250 m.; Karlstadt (SMXC), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 218 m.; Sundsvall (SASD), 540 m.; Trollhättan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 340 m.; Helsingborg, testing.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 19.00, lec., con. (daily).

Zurich (Höngg), 504 m. (temp.) (500 w.). 10.00, con. (Sun.); 11.00, weather; 11.55, Nauen time sig., weather, news, Stock Ex.; 12.30, piano soli; 16.00, con. (exc. Sun.); 17.15, children, women; 18.00, news, weather; 19.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 19.15, con. (daily).

Berne, 434 m. 09.30, organ music (except Sat.); 15.00, 19.30, con.

Basle, about 400 m. Testing.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. BALDWIN informed Mr. Campbell that he had consulted with the leaders of the other parties and had obtained information through the usual channels, and he had come to the conclusion that there was a greatly preponderating body of opinion against broadcasting the proceedings of the House of Commons.

Capt. Fraser asked the Prime Minister whether he did not think that there was a section of the community who would like this matter investigated.

Mr. Baldwin said that if there was any body of opinion in the House whose views had not been brought before him he should be pleased to consider those views.

Mr. A. M. Samuel informed Mr. Day that the following statement showed the imports and exports in the year 1925 of wireless instruments and apparatus and of wireless valves.

Branch of Trade, etc.	*Telegraph and Telephone Instruments and Apparatus: Wireless*	*Wireless Valves*
	£	£
Total Imports—	654,433	134,048
of which consigned from		
United States ...	110,760	6,567
Germany	358,366	7,402
France...	54,525	32,908
Netherlands	14,309	55,678
Switzerland	72,043	37
Total Exports of United Kingdom manufacture...	1,106,311	183,304

The above particulars excluded the imports and exports of batteries and accumulators and other material, the ultimate use of which could not be ascertained at the time of importation or exportation.

Sir W. de Freece asked the Postmaster-General if there was any technical difficulty in the broadcasting of the Budget speech?

Sir W. Mitchell-Thomson said that there was no technical difficulty in broadcasting speeches delivered from the box on either side of the table. The broadcasting of speeches from other parts of the house would probably present difficulties.

HOWLING RECEIVERS

ALL amateurs, at one time or another, have suffered from interference caused by near-by oscillating receivers. As we go to press we learn of a new arrangement, devised by Sir Oliver Lodge, which makes it impossible to re-radiate by means of an oscillating receiver. The new circuit, although extremely efficient, is incapable of oscillation. In our next issue we hope to give further details of this interesting arrangement.

GLAZITE

IT is a matter for regret that in our issue dated March 13 the Glazite announcement contains some errors.

The coils of Glazite wire are stated to be 1s. each, whereas the correct price is 1s. 2d. On the other hand, the packets of 2-ft. lengths are said to be 1s. 2d. per packet, but the correct price is 1s. So it comes to this: The coils are 1s. 2d. and the packets of 2-ft. lengths are 1s. each.

We have been experimenting a great deal with Glazite during the last few months, and can say most definitely that it has many advantages and has a wonderfully neat appearance after wiring is finished.

We should like readers to interest themselves in the Glazite announcement and to see for themselves the effect of using this particular material.

CHIEF EVENTS OF THE WEEK

SUNDAY, APRIL 4

London	*'Twixt Dark and Dawn.*
Birmingham	Light Classics.
Bournemouth	Easter Festival Concert.
Glasgow	Orchestral Programme.

MONDAY

London	Brahms: interpreted by Laffitte.
Aberdeen	Light Entertainment.
Manchester	Choral, Vocal and Instrumental Music.

TUESDAY

London	*Loyaltty.*
Daventry	Symphony Concert.
Birmingham	Mirth and Melody.
Cardiff	Fred Spencer ("Mrs. 'Arris.")
Glasgow	Music and Humour.
Newcastle	Light Orchestral Concert.

WEDNESDAY

London	Chamber Music.
Aberdeen	Syncopated Melodies.
Birmingham	Grand Opera and Light Opera.
Cardiff	Bristol Night.
Glasgow	Symphony Concert.
Hull	Chamber Music.
Liverpool	*Augustus in Search of a Father.*
Manchester	Radio Humour.
Nottingham	Musical Comedy Evening.

THURSDAY

London	Solomon (Solo Pianoforte).
Bournemouth	Winter Gardens Night.
Belfast	Hunting Programme.
Cardiff	A Synopsis of Syncopation.
Glasgow	Variety.
Manchester	Mirth and Melody.

FRIDAY

London	Excerpts from *Wildflower.*
Birmingham	G.W.R. Concert.
Bournemouth	A Popular Instrumental Hour.
Cardiff	Welsh Programme.
Glasgow	*The Heart of a Clown.*
Manchester	Masters of Opera: (1) Wagner.
Newcastle	A Request Night.

SATURDAY

London	Sea Shanties.
Aberdeen	*The Rose Maiden* (Cowen).
Birmingham	Vocal and Instrumental Programme.
Bournemouth	"The Holiday Spirit."
Belfast	Scottish Programme.
Glasgow	Third Edition of *Listening Time.*

"Tuning up the Photographic Outfit" is the subject of a seasonable article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles in the same number are: "An Embossed-leather Blotting-book," "Laying a Tiled Hearth," "Some Good uses for Strawboard," "A New Electric Sign," "Making Garden-labels," "A Cheap and Interesting Crystal Set," "A Useful Test Set," "A Table Bookstand, and How to Make It," "Smoothing and Finishing Hard-wood Surfaces," "In the Metalworker's Shop: Accuracy in Mandrel Work," "Overhauling a Motor-cycle."

Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS Agency Limited, Saturday, April 3, 1926.

AN ALL-STATION LOUD-SPEAKER SET

THE NEW "N" CIRCUIT

Amateur Wireless
And Electrics

Vol. VIII. No. 201 SATURDAY, APRIL 10, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

AT RADIO PARIS

The photograph shows an engineer adjusting the aerial-tuning circuit of C F R.

Plug in a LEWCOS Coil—*and listen!*

Each LEWCOS Coil is tested in our laboratory. It is then boxed, sealed up, and reaches you in perfect condition. Be sure the LEW seal is unbroken.

THAT'S the test. It makes *all* the difference when you tune in with a LEWCOS Coil. Listeners everywhere have been quick to realise the quality and advantages of this guaranteed coil. Ask your dealer for a demonstration.

LEWCOS *Inductance Coil*

3 LEWCOS advantages

1. High electrical efficiency, with great mechanical strength.
2. Great selectivity resulting in extremely fine tuning.
3. Exceptionally low high frequency resistance with increased signal strength.

The LONDON ELECTRIC WIRE CO., & SMITHS LTD.

Manufacturers of Glazite

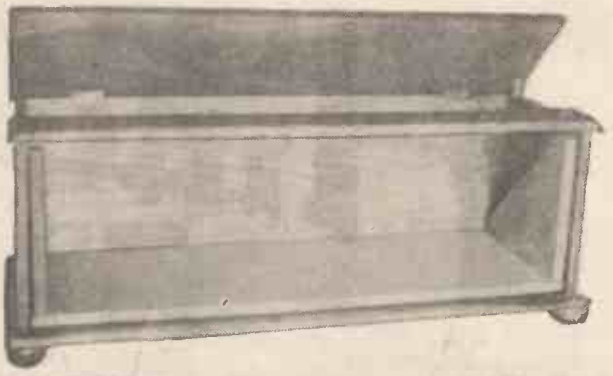
Playhouse Yard, Golden Lane, London. E.C.1.

JUDD

CAXTON 4-VALVE CABINET

Made for Sets, "As good as money can buy," "Harmony Four Receiver," "The Melody Three"

Special Cabinets made to Customer's measurements. Prices quoted.



Cash with Order. Fumed Oak ...	£1	5	0
Dark or Jacobean Oak	£1	10	0
Real Mahogany	£1	14	0

Detachable 7" deep Base Board to mount 21" by 7" panel to slide out of Cabinet front.

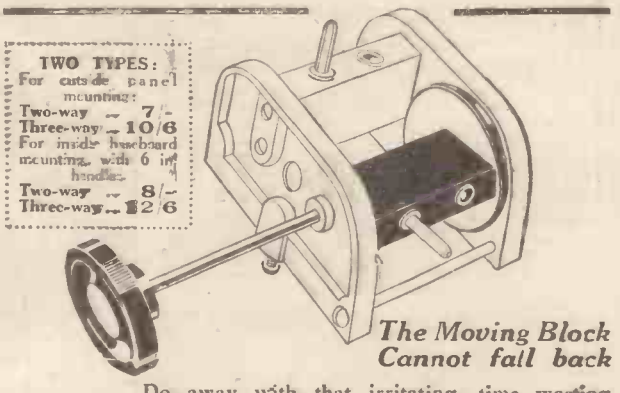
Also supplied at 10/- extra with two beaded front doors placed 2 ins. in front of the enclosed panel.

Ebonite or Radion Panels Supplied and perfectly Fitted at low extra cost.

All Polished with the new enamel that gives a glass hard surface that cannot be soiled or scratched. SENT FREE.—Catalogue of standard Wireless Cabinets in various sizes and woods.

Packed and delivered free in U.K. No. C3

CAXTON WOOD TURNERY CO., Market Harborough



The Moving Block Cannot fall back

Do away with that irritating, time wasting fading away of volume caused by the falling of your moving block!
Fit a Lotus Geared Vernier Coil Holder and get really accurate tuning. Has an easy Vernier movement which reduces the speed by eight times, and stays where it's put—exactly!
Fit in any position, with any weight of coil—you'll be satisfied with the results.

Bakelite mouldings for the side plates, coil blocks and knobs; heavy Nickel Plating for the metal parts.

LOTUS VERNIER COIL HOLDERS

From all reliable Radio Dealers:

Garnett, Whiteley & Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.

Makers of the New LOTUS BUOYANCY VALVE HOLDER

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. VIII. No. 201 — APRIL 10, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

KEEPING HIGH TENSION HIGH

TO the average amateur a high-tension battery is just a high-tension battery. He goes into a shop, puts down his 8s. 6d. or 10s. 6d., whatever it may be, sees a voltmeter needle swing round to 60 and stop, listens for a minute to the dealer's glowing account of the latest super-het, and departs with a cake of paraffin-wax and cardboard under his arm. He then connects his new battery to his set, tunes in his favourite station and loses himself in the strains of Stravinsky or Irving Berlin, whichever he prefers, and promptly forgets his recent purchase.

At least he forgets all about it until some weeks later he discovers the expenditure of another 8s. 6d. or 10s. 6d. is necessary.

Replacement

The next time he wants a battery, it strikes him that 60 divided by 4½ equals a little over 13 and that 14 pocket-lamp batteries can be bought for 5s. 3d. A few connectors, say, in addition, and for 6s. he has a battery for which he used to pay 8s. 6d. Besides, if one small battery goes, how easy it is to take it out and insert another—all for 4½d.

All goes well for a few weeks, and then it happens that the economist sees a nice-looking box with a hinged and socketed lid in which to put flashlamp batteries. It's only 5s. and he buys it. He puts the batteries in, scraps the connectors he previously used, and until crackling noises herald the expenditure of another fourpence halfpenny, all is forgotten once more.

Then, with wander-plugs removed, an attempt is made to raise the lid of the battery box. First the fingers, then a penny, finally a knife is used to raise the lid. It has stuck somehow. It is raised finally, however, to disclose a solidified cake of dirty-looking damp powder. In disgust the amateur decides to spend his 8s. 6d. or 10s. 6d. as before.

This type of thing, or some slight variation of it, is always happening. It is expensive. It is annoying. It is everything that is not nice. What can be done about it? Unfortunately, not very much; but there are reasons for these unhappy incidents, and there are ways of saving money and trouble by understanding the causes of battery failure.

First of all, let it be stated quite bluntly that if you are using a set employing anything larger than three general-purpose valves it is mistaken policy to buy the ordinary small H.T. batteries—you will lose money in the long run.

Nearly all the cause of the trouble with dry batteries is that no one has yet eliminated their two ailments known as "polarisation" and "local action." Unfortunately, both of these ailments have more effect on a small battery than a large one. There you have it in a nutshell. But what are they?

Without going too deeply into technicalities, it may be explained that the effect of polarisation is to reduce a cell's voltage and current output, due to an increase in internal resistance while discharging. The cause of polarisation is an emanation of hydrogen round the carbon element of the cell. All cells have a "depolarising agent" in their composition; but while this reduces the trouble it does not eliminate it. The greater the current one attempts to get out of a cell the more that cell will tend to polarise.

Local Action

Local action is quite a different effect, and is intimately connected with a cell's current-producing elements. It is a chemical effect by which the zinc element becomes eaten through long before its proper time. Cells of all sizes are affected by it, but almost equally. Small, inexpensive cells have very thin zincs—hence it often happens that they become eaten through long before the proper normal life of the cell has passed. Again the big battery scores. In this instance it scores whether any attempt is made to take a heavy discharge or not. It also scores whether lengthy resting periods are given or not, for local action often takes place while a cell is on open circuit.

(Concluded at foot of first column on next page)

WHY THE LOCAL STATION MUST BE BEST

The Imperfections of DX Reception

ALL of us pass at some time or another during our wireless careers through a phase in which we scorn to listen to transmissions from our local station and think nothing worth hearing unless it comes from a distance of several hundred miles. But the phase does not endure. Sooner or later we return in the main to the local station, though we may occasionally amuse ourselves by making long-range tours round the European and possibly the American broadcasting stations. It has been said that there are two kinds of wireless enthusiast. The first goes in for long-range reception and the second for quality. Between the two there is a great gulf fixed, which at present cannot be bridged. What I mean is that though you may possess both the receiving set and the skill necessary for tuning-in, say, Oslo or Rome at good strength, you will not be able to get them, as things are at present, with anything like the same purity as a station that is within thirty or forty miles of you.

Selectivity

To single out these transmissions from those of our own stations or from other Continental stations your set must be distinctly selective. Now, broadcast transmissions take place not upon a single sharply defined wavelength but upon a band of waves. This is due to the fact that the original pure carrier wave is modulated by the frequencies of speech and music which are impressed upon it. The result is that in broadcast wireless we have the carrier wave accompanied by what we know as "side-bands." It is generally accepted that these correspond to frequencies of about 5,000 cycles a second above and below the frequency of the carrier wave. It can be shown mathematically that not even a selective receiver using two or three tuned circuits should be able to cut out these side-bands. Yet in actual practice a receiver selective enough to single out one transmission from the babel of the crowded broadcast waveband does cut them out, and does therefore spoil the reception of music by eliminating the harmonics and the overtones which give it its full beauty.

Crystal Purity

No one will deny that there is nothing to beat the plain crystal for purity of reception. This is due in part to the fact that no crystal set can possibly be so selective as to cut out the side-bands. If you wish to make a comparison, try first of all in "hook-up" form a fairly selective valve set capable of bringing in your local station at loud-speaker strength, and, secondly, a set consisting of a crystal followed by as many stages of low-frequency amplification as are required to produce the same strength. Provided that your low-frequency amplifiers are properly designed — resistance-capacity coupling gives the purest results of all—you will award the palm every time to the crystal receiver. The more selective your valve set is the more will it suffer by comparison with the crystal set, simply because it is cutting out the side-bands.

Now when we use a normal valve set for the reception of a near-by station we do not—in fact we cannot—tune it sharply, for the signals come in over a fairly wide range of settings of the condensers. The result is that the side-bands are there and that we receive musical transmissions with their full beauty.

Reaction Distortion

And there are many other points to consider. To obtain selectivity we must eliminate damping by getting rid of the greatest possible amount of high-frequency resistance in our circuits; or we may cancel out the effects of damping by making use of reaction, either magnetic or by capacity. In any case the result is the same, the set becomes wonderfully sensitive. In this condition it is capable of picking up, and actually does pick up, tiny impulses which the more broadly tuned receiving set ignores. Mush comes in, forming a woolly background, whilst tiny atmospherics, inaudible when the set is not too sensitive, produce a hissing or rushing noise.

Further, if there is the slightest noisiness in the receiving set itself, due to faulty contacts or to defects in the accumulator, the high-tension battery, the valves, the grid leaks, the condensers or the resistances, this is magnified, with the result that anything like a silent background is out of the question when the receiving set is in a sensitive condition.

Oscillating Receivers

Again, the more sensitive the receiving set is the greater will be the amount of interference, due to signals upon the same wavelength and to faint heterodynes, that it will bring in. And the question of howling must not be left out of account. The broadly tuned receiving set brings in only the chirps and the squeaks due to the misdeeds of near-by howl-fiends. A very sensitive receiver which permits knife-edge tuning is affected by radiation from receiving aerials at quite big distances. With a sensitive receiver you can eliminate interference upon wavelengths *other* than that of the transmission that you desire to receive, but interference upon the *same* wavelength will be magnified enormously.

So far we have spoken only of the shortcomings of the receiving set; it must not be forgotten that the transmitting station has also its limitations at great ranges. For some reason which is not too well understood fading is very pronounced upon the broadcast waveband at ranges of a hundred miles and over. If you tune in Brussels or Hamburg, or even one of our home stations which is situated at a good distance, you will probably find that signal strength waxes and wanes in a more or less periodic manner. The strength of the transmission grows gradually until it is very big indeed. It then begins to die away until it has fallen to a mere whisper or even to nothing at all. No adjustment of the tuning controls will keep the strength steady.

If you wish your wireless set to bring in music that really is music, you must rely upon the station that is within fifty miles of you. The most fortunately situated from a wireless point of view are those who live roughly midway between two of our main stations. They can have at will really excellent alternative programmes, but the rest of us, if we wish for real quality, must rely always upon the local statoon H. R. J.

"KEEPING THE HIGH TENSION HIGH" (*continued from preceding page*)

Now with regard to pocket-lamp and block batteries; the former certainly have the advantage that when they have not been tightly squeezed together it is possible to remove a bad one and replace it quickly and inexpensively. But as a rule they are not so well protected as the block battery. They are not completely covered in wax, and the damp attacks them as a consequence. Again, the inter-cell insulation is not so good. In addition, it is seldom that the user goes to the trouble of soldering their strip connections together, with the result that parasitic noises are set up through imperfect contact. On the whole, the block battery is to be preferred.

The small battery does not have a chance to give of its utmost when power valves are used. The continuous and heavy drain soon exhausts it and reduces its voltage. The modern high-capacity battery, however, has been designed to give large outputs for long periods without rest. The writer has personal experience of two such batteries. One battery still shows 43 volts and the other 41, and they were only 50 to start with! 6R J.

A "SWITCH-ON-AND-OFF" LOUD-SPEAKER SET

A two-valve loud-speaker set which, when adjusted for local reception, has merely to be switched on and off

IT appears to be the considered opinion of the B.B.C. that the bulk of their patrons are keen "listeners" rather than wireless enthusiasts. Hence their policy up to the present has been one of attempting to provide as large an area of the country as possible with good local services that can be received with simple apparatus.

There are roughly two ways of "listening-in." Firstly, with a crystal set and headphones, and, secondly, with valves and loud-speaker. On account of the great improvements that have of late been made in the design of loud-speakers and valves the army of loud-speaker users daily grows. It would probably grow faster if those who contemplate installing a loud-speaker were not in some cases awed by the complication they see in the management of a suitable valve set.

Many undoubtedly feel that such a set requires an "expert" to maintain it in proper working order. Undoubtedly the majority of loud-speaking sets are somewhat complicated, but for purely local reception, say up to twelve miles, it is quite feasible to construct a set reduced to the simplicity of control of an "on-and-off" switch. Such a set is here illustrated and described.

Simple Control

It is true it is necessary for an expert to install the set in the first place, but once it has been set up anyone can switch it on and off. Non-microphonic dull-emitter valves are now available at quite moderate prices. These work very satisfactorily off dry-cell batteries; thus the accumulator-changing nuisance can be completely cut out. Dull-emitter valves and dry-cell batteries are used in the set shown. The batteries for the valve filaments last approximately two months when using the set constantly. Their replacement is both simple and inexpensive.

The necessary current for heating the valve filaments is supplied by six ordinary Ever-Ready cycle-lamp batteries arranged in parallel. The No. 126 model is suitable and obtainable from practically all cycle shops and ironmongers. Actually those shown in the photograph are a special model of the same battery arranged with three terminals. One of the No. 126 type is seen connected up for supplying grid bias to the amplifying valve. How these batteries are connected up in parallel is indicated diagrammatically in Fig. 1.

The Complete Receiver with Loud-speaker.

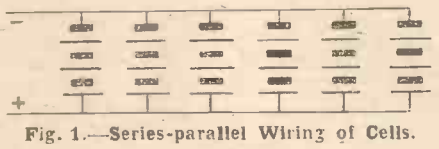


Fig. 1.—Series-parallel Wiring of Cells.

Each unit gives 4½ volts and consists of three cells connected in series. The six units have each of their outside plus terminals connected together and each of their outside negative terminals also connected together. The result is a composite battery still 4½ volts, but of six times the current-yielding capacity of one unit.

Suitable dull-emitter valves for the set take .06 ampere each, which is .12 ampere between them. As the six batteries arranged in parallel share this demand between them, each unit has only to supply .02 ampere. The six units giving .02 ampere each make the required total of .12 ampere.

Filament Control

There is no rheostat on the set. The valves used are of the 3-volt type, and as the battery when new gives 4½ volts, a resistance is introduced into the negative lead of the filament to reduce the pressure across the valve to its proper value of 3 volts. One British firm at least makes special fixed resistances for this purpose. On the set, however, a 4-volt pocket lamp is used as a resistance, screwed into the holder designed for the purpose. The price of the holder and bulb complete is 10½d.

Apart from the economy in cost, there is another advantage in using the bulb for a resistance. Should the high tension be accidentally connected across the valve-filament circuit, the lamp filament, being so much shorter than the filament of the valves, would in all probability be the first to fuse. Thus it would break the circuit and save the valves.

Some may argue that the method of just switching the valves on and off is what is colloquially known as "asking for trouble." The writer can only state that he has had under observation a set working constantly under such conditions in which all valves have now stood up to the "ill treatment" for over fifteen months. Note the valves are dull-emitters, not bright valves, which probably make all the difference.

The circuit used is shown in Fig. 2, and employs the Reinartz tuner. A fixed reaction condenser is shown and an adjustable one for tuning the closed circuit.

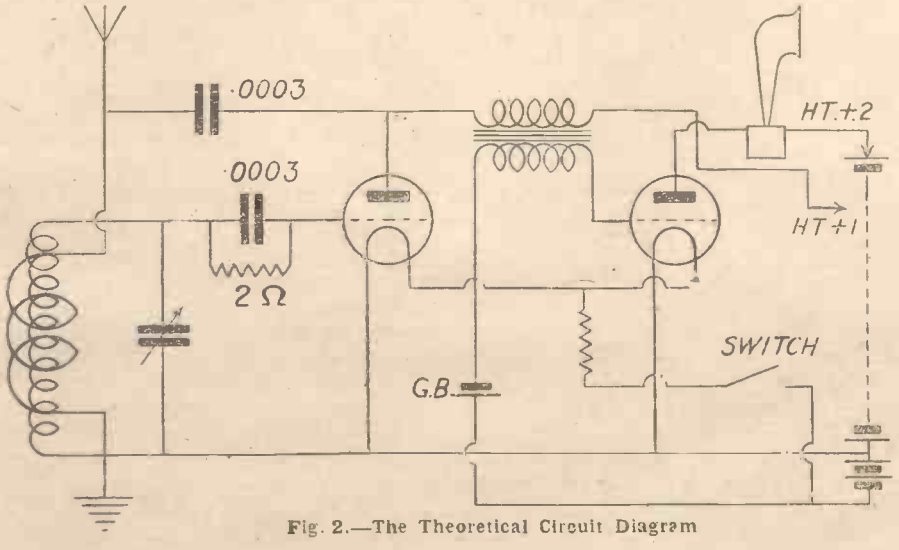
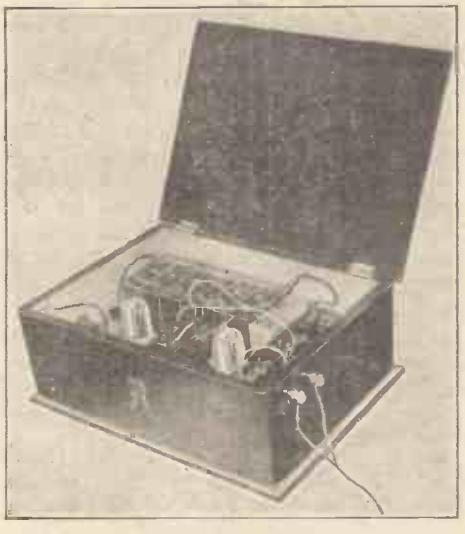


Fig. 2.—The Theoretical Circuit Diagram

The actual variable condenser employed is one of Autoveyors' spiral mica-dielectric condensers. The tuning coil shown is an adapted Igranic standard fifty-turn duolateral. Having removed the celluloid band, eighteen turns of 22 gauge d.c.c. copper wire were wound over the coil. The band was then replaced and the ends



The Receiver Open.

of the supplementary coil taken to a couple of terminals attached to the sides of the coil socket. These special terminals were made of parts out of the "junk" box, and their method of construction is shown in Fig. 3. It is not imperative to make up this special arrangement, as the Igranic firm market a similar coil which they term the Unitune Major.

The Cabinet

The cabinet in which the set is assembled is of the very popular pattern, and meant to take an ebonite panel measuring 14 in. by 10 in. and is 5 in. deep. The lid, which is hinged where the panel should go, is just a plain piece of mahogany and was supplied and polished by a local joiner for quite a small sum.

Of the four terminals for aerial, earth and loud-speaker mounted in the sides of the cabinet, three are set in ebonite bushes. It is doubtful if this is absolutely necessary. The one not insulated in this manner is the earth terminal. Flexible leads within the cabinet make connection with the high- and low-tension batteries. Other connections are made by insulated connecting wire as sold by most dealers.

Wiring the Receiver

The internal arrangements are shown quite clearly in Fig. 4, and each connection is drawn in the actual position taken. Flexible leads are also provided to make connection with the side terminals of the special tuning coil. When the set is complete it is merely necessary to connect a suitable aerial and earth to the input terminals and the loud-speaker to the output. The station is tuned in with the spiral condenser, and the voltage on the plate of the first valve is afterwards adjusted so as to be as high as possible without putting the set into oscillation.

Coil Connections

The connections to the supplementary windings of the tuning coil should be tried both ways, as one way will usually give considerably better results than the other. This done, the instrument can be left until the low-tension battery "fades away" towards the end of its life. When the battery becomes weak it is possible to cut out the lamp resistance, but this should only be done in an emergency, and is not really advisable, as the low-tension battery is likely to recover to very nearly its full voltage after a rest; then when it is next switched on damage to the valves might result. One way of cutting out the resistance of the lamp is to take a burnt-out bulb, smash the glass, and twist the two filament supports together.

Some types of dull-emitter valve will be found to work best with the usual grid condenser but no leak at all.

A list of complete set of parts required follows, from which it will be seen that the set as described is quite inexpensive to assemble.

Component Parts

Cabinet, 14 in. by 10 in. by 5 in., with lid; special coil, or Igranic Unitune Major; variable condenser, Autoveyors' Spiral; fixed condenser, .0003; fixed condenser, .0003 with 2-megohm leak; coil-holder for baseboard mounting; two valve holders for baseboard mounting; transformer, R.I.; break switch for flush panel mounting; pocket-lamp bulb, 4½ volts, and holder; four terminals, flex and connecting wire; three sets of terminal bushes; high-tension battery, 66 volts; six hand-lamp batteries, 4½ volts.

The whole set, loud-speaker (Sexton Barnes) complete, should not cost more than £7 10s.

D. G. H.

PANEL LEAKAGE

GRADUAL decrease in signal strength is frequently caused by the collection of dust on various parts of the receiver. Dirt collecting between the variable condenser vanes and on various parts of the panel where there is only a small space between metallic parts (as between valve legs and coil sockets) is also the cause of a number of microphonic noises usually attributed to "atmospherics." A few minutes spent in removing dust with the aid of a bicycle pump or a pair of bellows will in nearly every case be repaid by an increase in signal strength and range.

R. H. B.

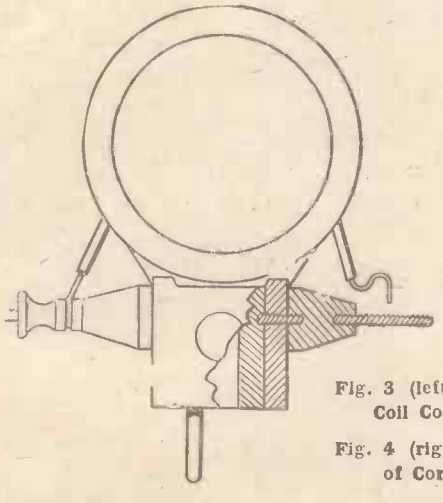


Fig. 3 (left).—Details of Coil Connections.

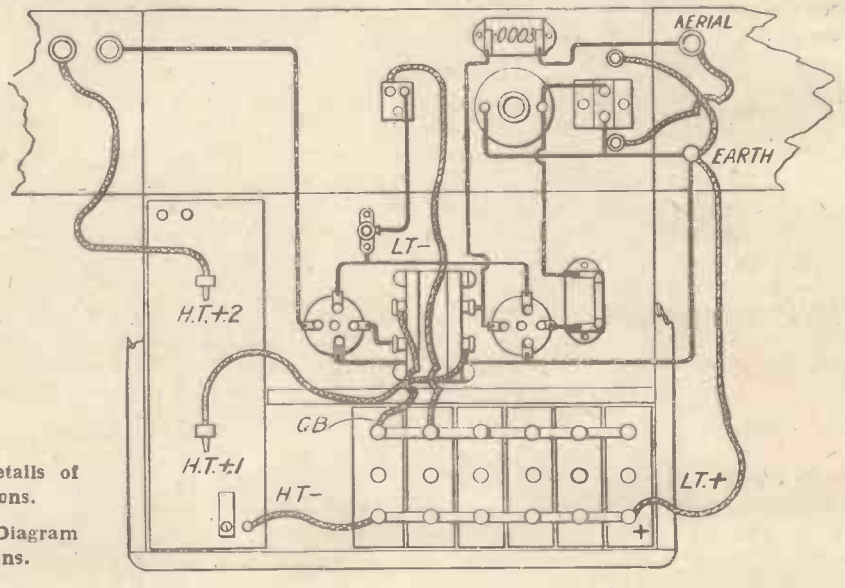
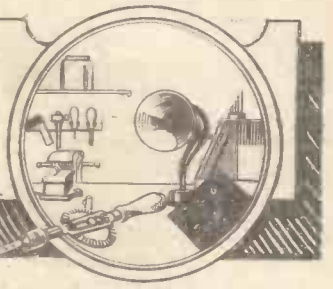


Fig. 4 (right).—Diagram of Connections.

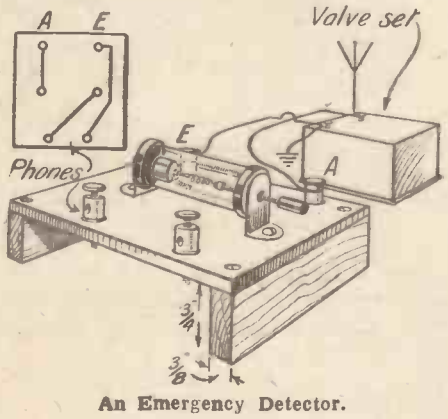
PRACTICAL ODDS AND ENDS



An Emergency Detector

OWNERS of valve sets are sometimes debarred from receiving the broadcast programme owing to the fact that the accumulator has run down. The crystal detector attachment shown in the accompanying diagram is a very handy "stand-by" component, as it can be connected to almost any type of aerial tuner and will permit good reception of the local station.

The crystal detector, aerial, earth and phone terminals are all mounted on a scrap piece of ebonite about 3 in. by 3 in. Two wooden supporting pieces are screwed to the ebonite to prevent the terminal shanks touching the bench. The necessary under-panel connections are shown in the sketch. G. D.



An Emergency Detector.

H.T. Cell Containers

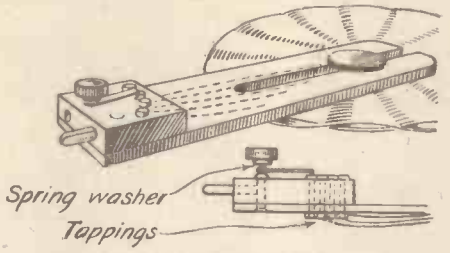
CONTAINERS for the cells of a "wet" H.T. battery can be cheaply constructed from celluloid obtained from an old accumulator container. The case is cut in two so that six large containers can be obtained from a 6-volt accumulator, and these can be subdivided into a large number of small containers about 1¼ in. by 1¼ in. Amyl-acetate should be used for joining together the various partitions.

On no account must the containers allow the electrolyte to leak, and any gaps must be carefully sealed up with scraps of celluloid and amyl-acetate. The elements for these batteries should be constructed as described in "A.W." No. 195.

These containers are very easily made, are of light weight, and have one great advantage over the usual glass containers in that celluloid cannot be cracked by vibration. A battery of this description can be rendered portable, since all the containers can be connected together with amyl-acetate. A. S.

Tapped Plug-in Coil

DETAILS of a useful tapped plug-in coil are given in the accompanying diagram. The method of tapping employed (by a miniature rotary switch on the



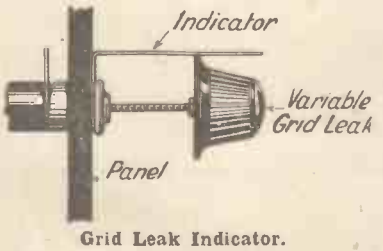
Details of Tapped Coil.

side of the plug) is quite efficient and saves a deal of trouble in changing coils. With this tapped type of plug-in coil wavelengths equivalent to those reached with No. 35, 50, 75 and 100 coils can be obtained.

The coil may be wound in any convenient "low-loss" manner, and tappings should be taken at the thirty-fifth, fiftieth, seventy-fifth and last turns. The tappings are taken to the contact studs on the side of the coil plug. Details of the switch arm are clearly shown. N. H. B.

Grid Leak Indicator

MANY grid leaks have no indicator for the adjusting knob. A simple device for accomplishing this is shown in the diagram. A piece of thin brass strip is cut and bent to shape as shown, the dimensions being made to agree with the type of variable grid leak used. A clearance hole



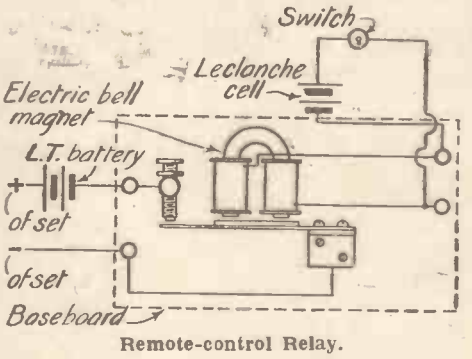
Grid Leak Indicator.

should be drilled in the indicator sufficiently large to pass over the single-hole mounting screw of the grid leak itself. The indicator arm just touches the external diameter of the largest flange on the knob of the leak. Marks may be made on the arm with a fine file or chisel. When the device is assembled on the panel it will thus be easy to record any desired position. R. D. O.

Remote-control Relay

WHEN the loud-speaker or phones are not situated in the same room as the receiver, it is often desirable to include some form of remote control in circuit. Much time and trouble can be saved by means of the device illustrated.

By a slight modification in the wiring an electric bell can be turned into an effective relay. The electromagnet and interrupter of the bell are mounted on a baseboard and connections taken to terminals on it as shown. The L.T. accumulator is wired according to the diagram to the relay instead of to the L.T. terminals. A Leclanché cell or small accumulator suffices to operate the relay, which is controlled by an ordinary tumbler switch placed in the battery leads. These leads, of course, are the extension wires to the



Remote-control Relay.

remote control; the relay and Leclanché cell are placed near the receiver. The great advantage of the arrangement is that there is no voltage drop in the L.T. circuit owing to the resistance of the extension leads. F. W. R.

Testing Transformers

WHEN a disconnection is suspected in either the primary or secondary windings of an intervalve transformer, the following simple test will prove useful in locating the fault.

Connect one lead of a 4-volt battery to one primary terminal, wet two fingers of one hand and place one on each of the secondary terminals. At the same time lightly brush the free primary winding with the other battery lead. If the transformer is functioning correctly a slight shock will be felt across the secondary coil. This gives a reliable indication of the condition of the transformer. A pair of phones and a battery should then be put in series with each winding in turn to test for continuity. H. F.

LONGER LIFE FROM YOUR VALVES

THE chief limiting factor in the life of a valve, whether it is a bright- or dull-emitter receiving valve or a transmitter, is the filament, and it is often not fully realised to what extent the temperature at which the filament is run affects its ultimate life.

Emission

Fig. 1 shows the relation between the thermionic emission obtained from an ordinary bright-emitter tungsten filament and the evaporation of the tungsten and consequent decrease in life. This curve also shows the corresponding watts which will have to be put into the filament of the valve to obtain the emission required. Now it will at once be obvious that the curve showing the evaporation of the tungsten is much steeper than the increase of emission obtained by increasing the filament temperature; that is to say, that the life expected from a filament becomes very much shorter when the temperature of the filament is pushed beyond a certain limit, and the reduction in life is not by any means compensated for by the extra thermionic emission obtained at a lower expenditure of filament watts.

Temperature Range

From the curves it will be noticed that the useful range of temperature in a tungsten filament is between 2,300-2,600 degrees absolute (K), although the life at the latter figure is relatively short. The standard R-type valve is designed to give about 800 to 1,000 hours' life with a filament current of about .67 ampere and an emission of about 7 or 8 milliamperes.

Now it has been shown that the increase

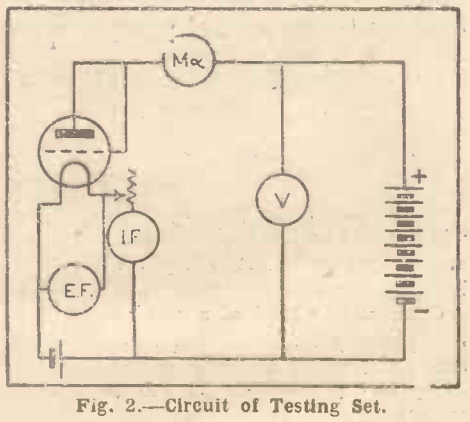


Fig. 2.—Circuit of Testing Set.

or decrease of filament voltage by 5 per cent. will halve or double the life of the filament, and these values correspond to about a 3 per cent. variation of current. In the same way as the life of a bright-emitter valve is limited by the evaporation of the tungsten, so the dull-emitter valve life is limited by the evaporation of the thorium film or other coating applied to the surface of the filament.

Fig. 2 shows a simple testing set for obtaining the relation between the filament volts and the thermionic current in the anode circuit. If several readings are

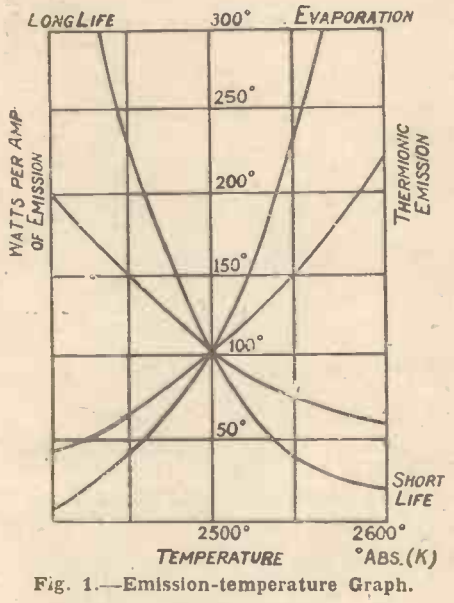


Fig. 1.—Emission-temperature Graph.

taken, the curves shown in Fig. 3 may be plotted out, and it will be noticed that for each value of applied anode voltage, that is, V2 or V3, the curve will ultimately saturate, which is to say no extra plate current will flow for an increase of filament volts, and the only effect of the increase will be a reduction in the life of the valve. Apart from the evaporation of the tungsten, if there is any gas in the valve the life of the filament will be decreased because it will be bombarded by positive ions. From the foregoing remarks the following hints will help the amateur to increase considerably the life of his valves.

Valuable Hints

(1) Use a voltmeter in the filament circuit and keep the reading at the value that the makers specify, as they have calculated and designed the filament to have a long life at this value.

(2) Remember that by controlling the temperature of the filament by means of a voltmeter, and not by keeping the filament current constant, about three times the life is obtained because the filament becomes thinner during life and in consequence its resistance becomes greater. Now if the current is kept constant the filament temperature must increase with life; on the other hand, the filament current will only drop off slowly if the filament voltage is kept constant, and the consequent fall in emission will not be great.

(3) Switch on the filament current slowly through a resistance and switch off in a similar manner; this will add to the life of the filament, because the general opinion is that sudden changes of temperature have a very bad effect.

Reversing the L.T.

(4) When a D.C. source of current supply heats the filament, such as an accumulator or dry battery, one leg of the filament, that is, the negative end, will be hotter than the positive, because it will also be carrying the space or electron current flowing in the valve, as this consists of negatively charged electrons. This may ultimately cause a burn-out at the negative end of the filament.

In the case of receiving valves, and often in the case of low-power transmitters, one is forced to use a direct-current source of supply, and the only thing to do under these circumstances is to change the positive and negative leads round at intervals; it is, of course, understood that this must be done without altering the grid bias that is required for satisfactory operation of the set. In the case of power rectifying valves for use in transmitting stations, it is better to use alternating current to supply the filament, as this will greatly increase its life.

(5) Lastly, in the case of transmitters, do not allow the plate of the valve to become overheated—that is to say, above the value for which the valve is designed—as apart from any other ill effects caused by the gas, it must reduce the life of the filament for reasons already pointed out.

A. H. H.

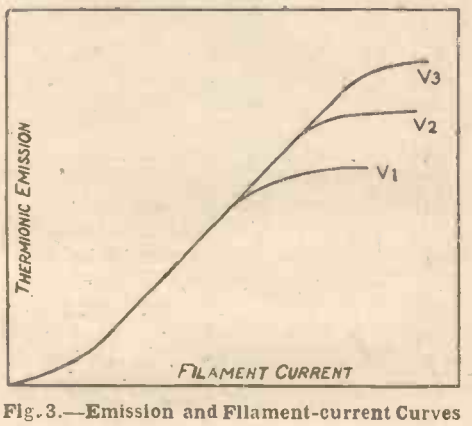


Fig. 3.—Emission and Filament-current Curves

In Glasgow a scheme to provide poor schoolchildren with a seaside summer holiday is being helped by the Radio Circle.

The Royal Dutch Choir will visit the London studio on April 11, when it will broadcast for the first time in Great Britain.

On Your Wavelength!

A Vast Improvement

WHEN I last wrote about the condition of the broadcast waveband, by which I mean the belt of wavelengths between 250 and 550 metres, I was in a rather despondent frame of mind, for never had I known it in such an appalling state of chaos as was the case a few weeks ago. Of late matters have improved enormously. Certain changes in the wavelengths of individual stations—in some cases quite considerable ones—have been made, and there are now far fewer heterodynes as well as considerably less interference of other kinds.

During the last week I have spent about half an hour each evening in trying for foreign stations, and the results obtained have been distinctly gratifying. The lowest number logged on any one evening was twelve and the greatest nineteen. When I say "logged" I mean registered as clearly audible. I do not count a station whose transmissions are either so distorted or suffering so much from interference that they cannot be properly heard. In every case tuning was done direct on to the loud-speaker and there was no "hunting for carriers." Had head telephones been used it is probable that the number of stations would have been very greatly increased at every sitting.

If any reader has given up in despair the attempt to receive foreign stations owing to the bad conditions which prevailed until recently, I strongly advise him to try again. He will probably be surprised to find how great is the improvement that has now come about.

A Question of Ethics

Speaking of D.X. reception, I would like to call attention to a matter which has recently become exceedingly important. Many listeners seem to have the idea that though they must not howl when our own stations are working, they can do what they jolly well like when they have closed down. The result is that what was once the best period of the week for long-distance broadcast reception has now become the worst. I am speaking of Sunday evenings between the hours of 5.30 and 8 p.m. At this time all of our own stations are usually silent, whilst dozens of those on the Continent are working. One used to be able to bring in station after station by starting at the bottom of the condenser dial reading and working gradually upwards. Now one brings in howl after howl. If you want to hear a real pandemonium from this cause, tune next Sunday evening to the neighbourhood of 400 metres, and you will find it if Hamburg is working. This station has a peculiar attraction for single-valve men with fat reaction coils, who fairly let themselves go when it is working. In any part of the broadcast band where a transmission is coming through pretty strongly you will find the howlers clustered about it like wasps round a jampot.

So far as I can remember the regulations governing the use of receiving sets do not lay down times and seasons in which howling may be indulged in. It is definitely prohibited at all times. The net result of the activities of the howlers when our own stations are silent is that it is rapidly becoming impossible for anybody to hear any foreign station at those times.

Dis-Lodged!

Sir Oliver Lodge's new circuit appears to make the aerial really aperiodic, a feat which has hitherto not been accomplished by any wireless inventor or designer. It is good to hear that the "howl dis-Lodger" will add very little to the cost of receiving sets. Some people may have been sorry to see the statement that it will hardly be possible to incorporate it in existing sets, but this will be no blow to the ardent wireless man, who is only too glad to have any excuse of pulling his receiver to pieces and rebuilding it on new lines. Sir Oliver Lodge is one of the most cautious of present-day scientists. He has always refused to make any claims for any inventions of his until he has proved them up to the hilt by experiment. You may feel quite sure, therefore, that the new anti-radiating device is not a "stunt" and that its adoption will enormously increase the pleasure of listening to wireless programmes.

A New Use for Valves

It has been known for a long time that all sensations are transmitted to the brain by means of the nerves, which form a kind of telegraph system throughout the body. Thus when you touch, say, a piece of emery-cloth the message is despatched from the tiny nerves near the surface of the skin at the point of the finger. After passing through several junctions it reaches a "trunk line" and is sent on to the brain, where it is decoded and produces the sensation of roughness. So small are the nerve impulses that it was always considered to be quite impossible to attempt to detect or to measure them by means of instruments. Now, however, the thermionic valve has been pressed into service by scientists for the purpose, and by means of a three-stage amplifier it has been found possible to magnify the amplitude of the nerve impulses several thousand times. A relay, working roughly on the lines of the morse recorder, has enabled the impulses to trace themselves upon a photographic plate. So far what we may call Nature's morse has not yet been decoded; but there is no doubt that the wireless valve will enable scientists to discover a great deal more than is known at present about the way in which the nerves and brain do their work.

An Accumulator Point

There is one point about accumulators that comparaively few people realise: Dirty connections may lead to a very serious drop in voltage. As I use dull-emitter valves, a 4-volt accumulator suffices for all my needs. The other day, when the set was not behaving as it should, I put a voltmeter across the filament legs of each valve in turn. The reading should have been 3 volts in each case, but it was not; it was just over 2.5. When the voltmeter was placed across the L.T. terminals it showed that here also there was a shortage of about half a volt. This was a little surprising since the battery had only just been recharged and the specific gravity of the electrolyte had been tested and found correct. I disconnected the accumulator and applied the voltmeter to its terminals. Still a shortage. When I had cleaned the battery terminals up with emery-cloth the voltage was found to have risen to 3.75 volts. My accumulator has two terminals to each cell, the connection between the cells being made by a stout lead strip. On removing the strip I found that its ends were dull, whilst the contact surfaces of the terminals required attention. Once more emery-cloth was applied, the strip was replaced and the voltage of the battery was taken. It was now over 4 volts.

Another important point is that dirty connections in the L.T. battery may lead to an annoying and most mystifying kind of noisiness in the receiving set. In the case of accumulator high-tension batteries, it is even more important to see that all connections are clean, for noisiness and loss of signal strength are bound to occur if cleanliness is neglected.

Spring Fever

At this time of the year a curious unrest creeps over the wireless enthusiast. Though he still boasts about the perfection of his receiving set he grows secretly more and more dissatisfied with it and decides to build something that will be the last word in simplicity, selectivity, stability and signal strength. He decides, as I have decided every spring for the last five years, to build a really permanent set that will not require to be replaced at the end of a year or less. He pores over the circuits given in AMATEUR WIRELESS, he studies the advertisements, he gladdens

On Your Wavelength! (continued)

the heart of the man behind the counter in the wireless shop by purchasing all the latest gadgets. Eventually the "last word" is put together, and his friends would hear all about it if only they would listen. This they will not do, since their only desire is to tell him all about their "last words." The builder now decides that he is in for a blissful spell of rest so far as constructional work is concerned.

But in a week or two it occurs to him that a slight alteration or addition would greatly simplify matters. A little later a little improvement in the circuits suggests itself. And so the process goes on. By the end of the summer the set contains such a weird collection of odd knobs, dials, switches and terminals, and the wiring within the cabinet is in such a patchwork state that clearly a rebuilding is called for before the autumn and winter season comes on. Another set that is to be the last of all last words is built and used during the darker months. To continue the story you have only to return to the beginning of the paragraph.

Howling Range

I have often been asked by wireless enthusiasts, expert and otherwise, if anything definite is known about the range at which howling due to an oscillating receiving set can be heard. It is usually stated that a howl will cause interference with every receiver operating on the same wavelength within a radius of at least three miles. This is, I believe, a very conservative estimate. An oscillating receiver becomes, for the moment at any rate, a transmitting set and transmission over ranges of eight hundred miles or more has been accomplished with ordinary receiving valves working with a plate current of 50 or 60 volts. I often notice when I am sitting up into the small hours in the hope—it is a very poor hope this year—of receiving American stations that I can hear a very faint chorus of howls. These are inaudible when the loud-speaker is used, but with the headphones they are unmistakable. But they are obviously not of local origin, and my own belief is that they come from London, which is nearly thirty miles away as the crow flies.

Some time ago, before the days of regular broadcasting, a friend and I experimented with howling ranges. His aerial is three miles from mine, but when either of us made his set oscillate we found that there was a loud response upon the other's set; it was, in fact, possible to transmit signals of great strength by varying the reaction coil coupling so as to form dots and dashes in howls. A similar experiment but at much greater range was tried last year in America. It was arranged that a receiving set should be made to howl out "dashes" of several seconds' duration in one town, whilst an attempt was made in another to pick them up by means of a super-heterodyne set. The attempt succeeded. And what do you think the distance between the two towns was? A little matter of six hundred miles!

A howl is of no great importance so far as the user of a receiving set is concerned unless it is loud enough to be audible when a transmission is coming in. I am inclined to believe that the range at which an oscillating set can cause interference by producing howls loud enough not to be drowned by an incoming signal of reasonable strength varies from five to ten miles, according to the goodness and the badness of a particular locality in a wireless sense.

Brussels and Fading

The transmissions of Radio-Belgique, the Brussels station which works on 262 metres, have always suffered a great deal from a very pronounced type of fading. I have been trying recently to discover whether this fading is in any way periodic—that is to say, whether the signal strength takes a definite time to rise from minimum to maximum and to fall again. So far I have not been able to make out any regularity in the fading. Sometimes the loud period lasts for several minutes and fading, when it sets in, is quite gradual. In these circumstances fading is often complete; the station may die away altogether and not become audible again for some little time. On other occasions fading is more rapid but less pronounced, the loud periods lasting less than a minute and not being followed by complete inaudibility.

Many explanations of fading have been given but none of them seems to be completely satisfactory, for none quite fits in unless the rise and fall are more or less regular. When you listen to Brussels you may be bothered, by the way, by signals from another station. This is Elberfeld, whose wavelength is 259 metres. As the wavelengths of the stations are so close together some people may wonder why there is not a constant heterodyne whistle. If you work it out you will find that the frequency difference between them is about 13,000 a second, which corresponds to a note so highly pitched that it would be inaudible to the average human ear.

Short Waves

Speaking of reception of foreign stations, do not forget that there are now quite a number which work on wavelengths of 300 metres and below. Many of these are not at all difficult to pick up with anything like an efficient receiving set, and it is worth while to provide a set of coils or transformers that will allow you to drop down to 250 metres when you want to, for then you can receive quite a number of Continental stations even when our own are working. Amongst them are Radio-Lyons (250 metres), Malmo (270 metres), Brussels (262 metres), Seville (300 metres) and Gothenburg (288 metres). Many of the German relays also work on wavelengths between 250 and 300 metres, and as most of them are 1.5-kilowatt stations they are not difficult to tune in. It is most useful at times to be able to get down to them. Supposing, for example, that there is a particular item from Münster that you wish to hear and that you cannot obtain direct owing to interference of some kind, you can get it often from either Elberfeld (259 metres) or Dortmund (283 metres), both of which relay Münster. It is really astonishing to find when you drop down below 300 metres how many transmissions there are going on the shorter wavelengths and how well such stations come in.

High-tension Voltage

Not everyone realises that either bright or dull-emitters may be rapidly damaged by making the plate voltage too high. The majority of valves in general use are not designed for a higher plate potential than about 100 or 120 volts. Some amateurs are in the habit of using H.T. voltages considerably in excess of these figures, and they find that their valves deteriorate very rapidly. The reason is that when the H.T. potential is very high the electrons from the filament acquire enormous speeds. Though we are in the habit of imagining that there is a complete vacuum inside the bulbs of our valves, this idea is actually very far from the truth. When a bulb has been exhausted by the finest process known at the present day there still remain some 4,000,000,000 molecules of the various gases that compose air in every cubic millimetre of the interior of the glass.

Filament Shock

When electrons rush out from the filament some of them collide with these molecules, and if the speed is very great, as it is when the plate voltage is big, the impact may suffice to drive out an electron from a molecule. It thus becomes a positive ion and rushes to the filament to obtain an electron. When it is remembered that a positive ion compares in size with an electron very much as a large church compares with a cricket ball, it will be realised that the filament experiences severe shocks if it is bombarded by these big fellows. The bombardment is, in fact, sufficient to wreck the filament altogether in quite a short time if it is allowed to go on. Soft valves, of course, contain vastly more gas molecules than hard ones, and bombardment of the filament by positive ions takes place even at low plate voltages. That is why a soft valve, even if carefully used, has never a very long life. THERMION.

MAKING A TAPPED PLUG-IN COIL

Photograph of Tapped Coil.

THIS article describes how to make a tapped plug-in coil which covers the whole of the range for which in the usual way a complete set of coils are required. The design chosen, which is neat, substantial and compact, is thoroughly efficient in every detail. The windings are sufficiently spaced to give low capacity effects. The actual coil is shown in the photograph.

Material

The material which will be required for the construction of the coil is as follows:

A quantity of thin sheet fibre; ¼-lb. reel of No. 26 S.W.G. enamelled wire; one coil adaptor; eight 4 B.A. screws and nuts.

Construction

First cut off two rectangular pieces of sheet fibre, each piece measuring 3¾ in. by 5 in. Next proceed to shape one of the pieces in accordance with the details and

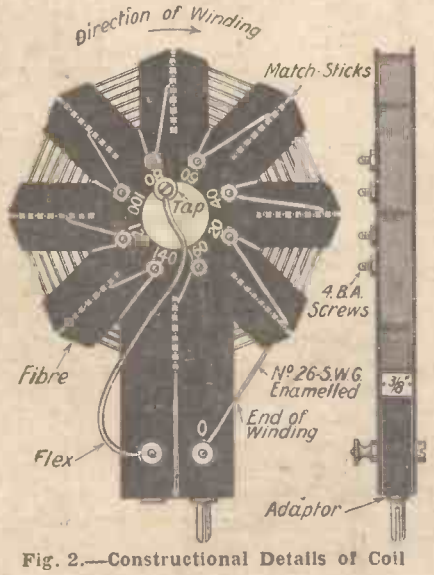


Fig. 2.—Constructional Details of Coil

dimensions given in Fig. 1. First draw with a pair of compasses a circle 3¾ in. diameter, and from the same centre two further circles, one 1¼ in. in diameter and the other ¾ in. in diameter. Divide the large circle into six equal parts by marking round the circumference distances equal in length to the radius of the circle. Draw lines through the centre of the circle to each of these points. The rest of the outline is now easily described. The holes shown should be 4 B.A. clearance. Having completed this side piece, it may be used as a template for cutting a further one which will be required. The second side piece is similar in every detail to the first, with the exception of the fact that the eight holes in this case are omitted.

Coil Spacers

The spacers are made from ordinary match-sticks, which are cut as shown. Sixty-four such pieces in all will be required. Each piece is $\frac{9}{16}$ in. long with V-cuts made as indicated in Fig. 1, these being ⅜ in. apart.

Winding

Before commencing the winding insert a 4 B.A. screw in each of the eight holes arranged circumferentially on one of the fibre side pieces. Secure each screw in position by means of a nut, as shown in Fig. 2, which shows clearly all the constructional details of the completed coil. Next place a prepared match-stick spacer in each of the eight slots. The V-cuts in the match-sticks will fit into the slots in the side pieces and thus hold each side in true opposite positions. Commence winding by securing the beginning of the wire to the screw marked 160, pass the wire through the slot shown and wind in a clockwise direction over the match-stick spacers, thus making 20 turns in all. Now bring the wire out via one of the slots to screw 140. Bare the wire at this point and secure firmly beneath the nut. Arrange another series of spacers, as before, and continue to wind over this second layer for a further 20 turns.

Carry on in this manner until screw 20 is reached. Having made this point, wind a final 20 turns and secure to the end of the wire to terminal marked 0, having first secured in position the coil adaptor, as indicated in Fig. 2. The flex lead is finally taken from the other terminal of the coil adaptor as indicated. To the extremity of this lead is secured the screw tap, which may be made from a 4 B.A. terminal head and an adjusting screw. Alternatively, a spring clip may be used for this purpose.

The Coil in Use

The coil is quite simple to use. It is plugged into the existing coil holder on the set in the usual way. The free tap is screwed on to the coil screw required. These tappings range from 0 to 160, thus covering the entire range obtained from an ordinary set of plug-in coils. A .0005-microfarad capacity variable condenser should be used for tuning in conjunction with the coil.

Different Sized Coils

This idea may also be applied to making a highly efficient set of plug-in coils, the tapping being eliminated. A set made in such a manner would comprise, say, seven separate coils, each having the following number of turns: 35, 40, 45, 50, 75, 100.

In this case all the coils may be made of exactly the same size, which is a considerable advantage where coupling is employed. The windings in every case are made in eight layers. Each layer is interspaced by means of the matches as described. If the same gauge of wire is used throughout for this purpose, each layer may be space wound for low-capacity. For a 40-coil we would thus have eight

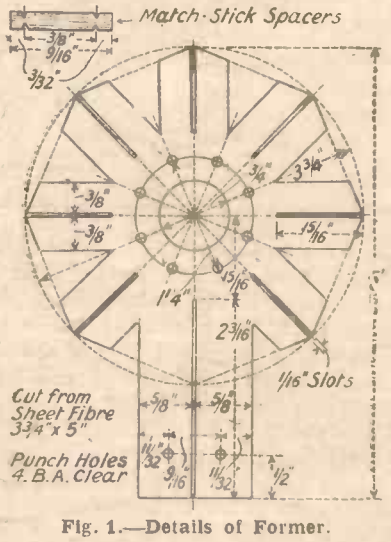


Fig. 1.—Details of Former.

layers, each layer having five turns. Alternatively different gauges of wire may be used in accordance with the turn numbers.

RADIO.

SOME USES FOR SEALING-WAX

SEALING-WAX, red or black, dissolved in methylated spirit can be used as enamel for coating the tops of terminals, covering wire, or renovating a shabby black component. Put some small pieces of the wax in a vessel with sufficient methylated spirit to cover them, and let it stand for at least twenty-four hours. Apply in thin coats, and allow each to dry thoroughly.

G. S.

RECEIVING ON A COUNTERPOISE

The Advantages of a Little-used System

THE necessity for a really efficient aerial and earth system cannot be over-emphasised. While many readers are, no doubt, in a position to obtain good earth connections there may be some whose local conditions are entirely unsuitable. For example, take the case of the reader who lives in a flat or maisonette in the middle of a tall building. Connection to the nearest water-pipe may be some dozen yards away, and then it is high up in the building. This is obviously far from an efficient earth. Even if permission can be obtained to bury an earth plate in the garden, a very long earth lead at the side of the house up to the third or fourth floor is again far from efficient.

Then we may have the case of the reader who finds that the ground under the aerial is covered with cement or concrete, and, moreover, the nearest water-pipe is a very considerable distance away. The obvious solution to the problem in these cases is to make use of a counterpoise.

The very earliest type of wireless receiver actually made no use whatever of an earth connection, two substantially equivalent aerials, or receiving wires, being employed. An aerial in conjunction with a counterpoise is practically identical with this early arrangement. The theory of the counterpoise or earth screen is far too complicated to consider now, but a few notes on some practical arrangements of a counterpoise will no doubt be of interest, since the counterpoise is far more than a mere substitute for an earth connection, its chief use being with transmitting radiating systems.

A counterpoise consists of a number of wires insulated from the earth, but spread out a few feet above its surface directly under the aerial. The factors determining a counterpoise suitable for reception are quite different from those determining one intended for transmission. The most important point to remember is that as far as possible the aerial should "electrically cover" the counterpoise. For example, if we took three wires, as shown in Fig. 1, arranged in the form of a fan, and we were using a double aerial, the aerial should preferably be arranged symmetrically—that is, over the centre wire.

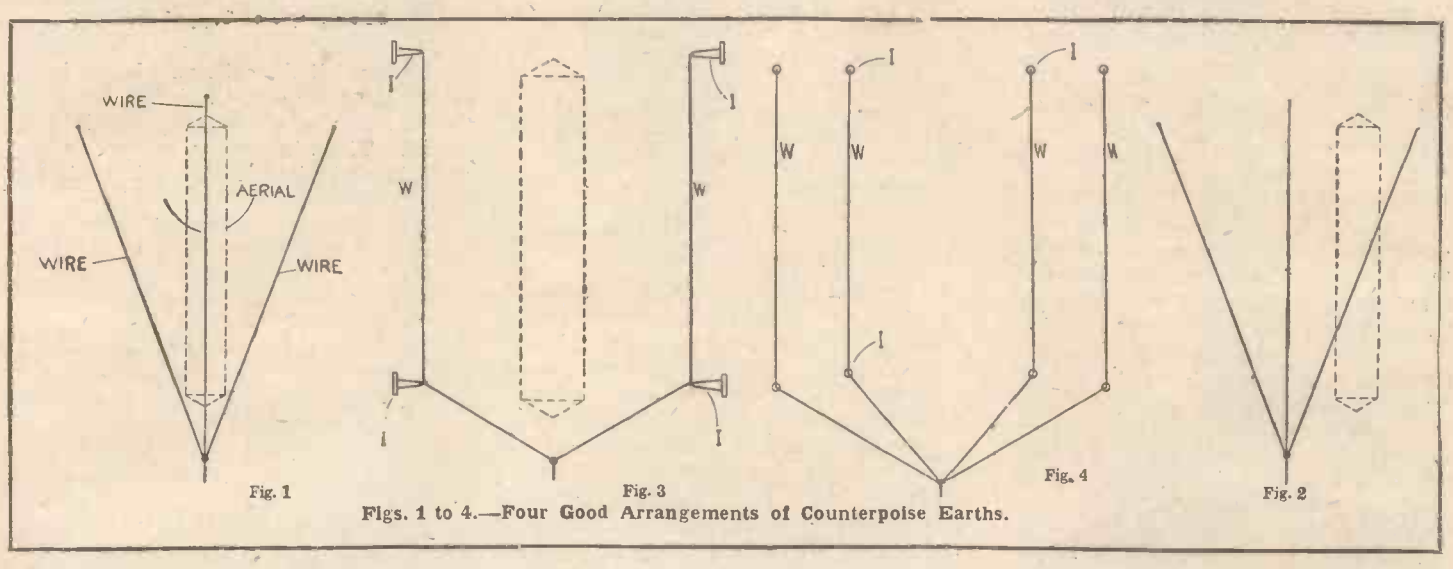
An arrangement such as is shown in Fig. 2, while giving probably fair results, is not so good. The aerial and the counterpoise really constitute a condenser, and we can imagine lines of force existing between the aerial and the counterpoise. If our aerial is not symmetrically placed with respect to the counterpoise it is obvious that some of the lines of force may link with earthed or semi-earthed bodies outside the area of the counterpoise, and its efficiency will not be great.

It is surprising, however, what exceedingly good results can be obtained from theoretically inefficient arrangements. It has been pointed out that the counterpoise should cover the earth underneath the aerial. From an amateur's point of view this is rarely possible, since it would mean covering the garden with a series of wires a few feet above the ground, an experiment which is not likely to prove too popular with the other members of the family. However, by arranging only two wires in the manner shown in Fig. 3 a very efficient arrangement is obtained.

The two wires W are supported on insulators I, which may conveniently be of the stand-off type fixed to the fence or wall. The counterpoise and counterpoise lead-in must be as equally well insulated as the aerial lead-in, as otherwise the arrangement will be inefficient. Fig. 4 shows an arrangement which is slightly superior to that shown in Fig. 3, and is suitable for a garden in which the counterpoise wires can be placed over flower beds. Probably the best height for the wires is about 3 ft. above the ground, but if there is any liability of the wires coming into contact with plants and bushes, it is infinitely preferable to place them a few feet higher rather than run the risk mentioned.

Yet another type of counterpoise which was employed quite successfully by the writer under rather peculiar circumstances comprises a small cage, as shown in Fig. 5.

(*Concluded on page 573*)



Figs. 1 to 4.—Four Good Arrangements of Counterpoise Earths.

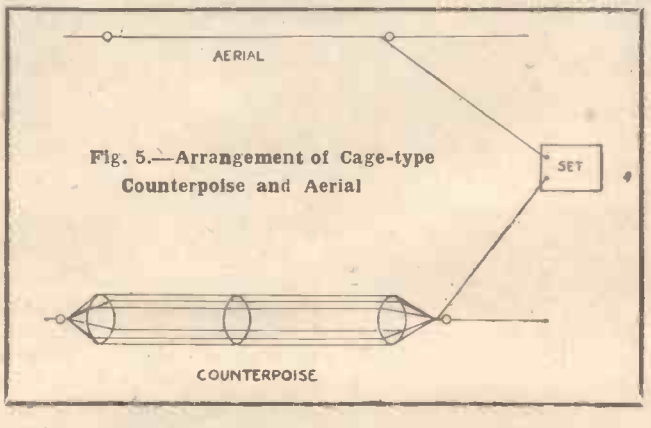


Fig. 5.—Arrangement of Cage-type Counterpoise and Aerial

HOW A PICTURE IS SENT BY WIRELESS

By T. THORNE BAKER

READING the many recent accounts of the sending of pictures by wireless is apt to make one wonder how a picture can be resolved into electricity, transmitted through space, and turned into a picture again at some distant place.

There is nothing very remarkable in the idea of sending a picture by wireless, because it is just as easy to resolve a photograph into small parts corresponding to the letters of a word as it is a word itself.

Half-tone Composition

The picture shown in Fig. 1 is a portrait which is split up into dots of different sizes by means of what is known as a half-tone screen. Each photograph, before it is reproduced in a newspaper, is broken up into dots in this way, the dark parts of the picture being represented by masses of large dots and the light parts by small dots. In an average picture there are probably not more than a couple of dozen different sizes of these dots, and once we compare them with the twenty-six letters of the alphabet we can see that the small sections of a picture and the letters of a telegraphic message are not widely different.

One of the first methods of sending pictures by wireless was to take an image made up of dots like the one shown in Fig. 1, and to go carefully over it dot by dot and line by line, giving each dot a number or letter corresponding to its size. These letters are sent as an ordinary wireless telegraphic message. The receiver of the telegram has a piece of squared paper, with as many squares to the line as there were dots to a line in the photograph, and according to the size represented by each letter he would fill in the correct square with small or large marks.

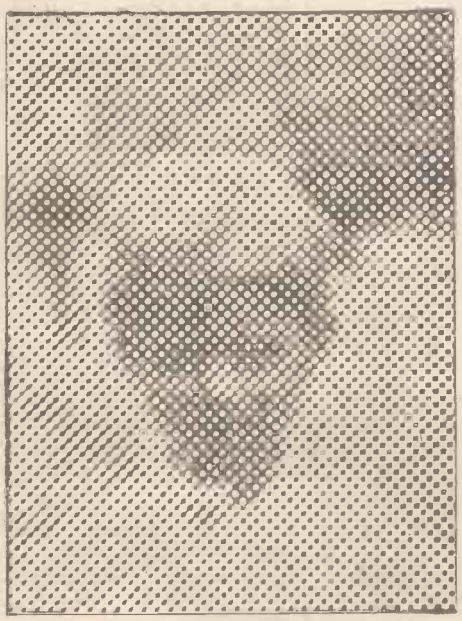


Fig. 1.—Composition of Half-tone Picture.

The result will be a remarkably good reproduction of the original picture, the chief drawback being the very laborious nature of the work involved. Various instruments have been devised to make the resolving of the dot picture and the marking of the squared paper mechanical, and with such systems both Professor Korn and Mr. Bartholomew have succeeded in obtaining quite practical results.

Recent Systems

Having once realised how a picture can be dealt with in tiny pieces like this, it it easy to understand the more recent systems, where instead of a picture composed of dots of varying sizes, a transparent photograph printed on ordinary celluloid film is used. A narrow beam of light is passed *through* the photograph, and is thus dimmed in intensity by an amount depending exactly on the depth or "density" of the picture at that spot. Now imagine the photograph mounted on a glass cylinder and revolved like a phonograph record, with the beam of light as the sapphire or stylus tracing a spiral path over its surface, and we can see how the strength of the pencil of light that gets through the picture varies each instant as light and dark parts come into play.

Inside the cylinder is some form of photo-electric cell, which responds to the changes in degree of illumination, and thus produces more or less current. The current fluctuations are impressed upon a carrier wave and transmitted in the ordinary way.

This is very similar to the early method of sending photographs over the telephone wires introduced by Professor Korn in 1907, an example of which (telegraphed from Paris to London) is seen in Fig. 2.

We come lastly to the question: How is the photograph received?

Clearly we have at the receiving aerial incoming fluctuations of a carrier wave which, after detection in the usual way, become a current of varying amplitude. It may alternatively be received as current interruptions, that is, short- and long-period currents of varying lengths representing the various tone units in the picture being transmitted.

The Transatlantic pictures sent by the Marconi Co. from this country to New York, using the Francis Jenkins photo-telegraphic system, are received by means of an electric "pen," the simplest form of which is seen in Fig. 3. Here A and B represent the poles of two weak electro-magnets, T a small armature attached to a bent arm which moves about a fulcrum F; the extension of this arm terminates in a pen P, nearly touching the revolving drum D, over which is placed a sheet of paper. There is a small bias on the magnet which keeps T attached to the pole B so that the pen is kept clear of the drum; but each current received from the transmitter after amplification excites the magnet A, so that it attracts the armature and forces the pen P upon the paper on the revolving drum.

Fig. 2.—Reproduction of Photograph Transmitted from Paris to London.

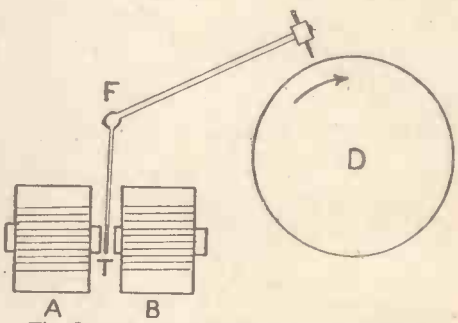
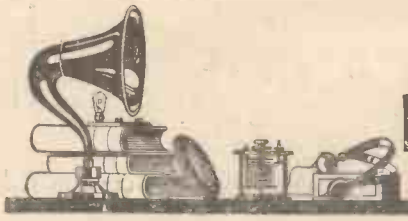
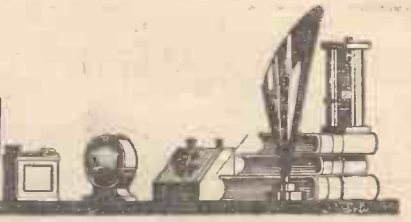


Fig. 3.—Diagram of Jenkins' Receiving Apparatus.

In this way, signal for signal, a dark or light mark is imprinted on the paper, corresponding in size or intensity to the depth of the image of the photograph at the corresponding instant. When the cylinder has run its course a reproduction of the original photograph will have been obtained.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 584).

Six-valve Circuit

Q.—*What would you recommend as being the best six-valve straight circuit?—H. N. (Eastbourne).*

A.—The question as to which circuit of any particular type is the "best" is (and will probably always remain) a matter of opinion. There are few, if any, advantages in using more than two H.F. stages on broadcast wavelengths and there are many disadvantages of so doing. Thus two H.F. stages followed by the detector valve would be a suitable arrangement, leaving the other three valves to be used as L.F. amplifiers. These latter should not be all transformer-coupled, but sufficient volume should be obtained if resistance-capacity coupling is used in each case. If desired, however, one of the L.F. stages may be transformer-coupled and the other two coupled by the resistance-capacity method.—B.

D.E. Valves

Q.—*When a valve rated at, say, 3 volts .06 amps. is used, is it more important to make sure that not more than 3 volts are placed across the filament or that not more than .06 amp. flows through it?—D. G. T. (Lancaster).*

A.—The voltage and the current are interdependent and one cannot be said to be of more importance than the other. If the characteristics of the valve agree with the rating .06 amp. will flow through the filament when 3 volts are applied across it and whenever .06 amp. is flowing through the filament a potential of 3 volts will exist across the ends of it. It will, however, be easier to measure the current accurately (with a suitable milliammeter) than it will be the voltage as, unless a very high resistance voltmeter is used, the conditions of the circuit may be appreciably altered when the voltmeter is placed across the filament.—J. F. J.

Extension Leads

Q.—*My aerial and earth leads enter the house at the back (both aerial and earth are outside) and the set is used in a room at the back of the house. It is, however, occasionally desired to use the loud-speaker in one of the front rooms and I understand that some loss of efficiency is unavoidable. What I would like to know is whether it will be better to remove the set to the room in which reception is desired by continuing aerial and earth through the house, or to leave the set where it is at present and run extension leads from set to loud-speaker?—C. P. (Northampton).*

A.—The latter method will be by far the better of the two, and losses will not be very great provided the extension leads are fairly well spaced from each other and from walls and floors. There is, of course, likely to be some difficulty in effecting such spacing, but you should do the best you can in this direction. The losses due to capacity will be far less if the currents passing along the extension leads are of speech frequency than would be the case were the oscillatory aerial currents thus led to the set. The most serious trouble is likely to be due to interference picked up by the extension leads from the electric lighting mains (if such exist in the house), especially if the supply is A.C. Careful spacing, however, will prevent this.—R. W.

Size of Aerial Condenser

Q.—*Which is the best size for the aerial tuning condenser for broadcast wavelengths, .001 or .0005?—B. A. (Brighton).*

A.—It is best to use a .001 if the condenser is to be used permanently in series with the aerial as a small condenser would offer a fairly high impedance to the signal currents, which must all flow through a series aerial condenser. Not very long ago this size of condenser was used almost universally for tuning the aerial circuit either in series or parallel. Strongest signals are obtained, however, when any capacity in parallel with the tuning coil is kept low, and a condenser in such a position should not exceed .0005 microfarad capacity. The tuning range with a given coil is reduced slightly, but halving the capacity of the aerial condenser does not mean halving the tuning range. The wavelength is only increased as the square of the capacity, and so, while the first half of the movement of a .001 condenser produces a considerable change in wavelength, the second half of the movement has very little effect. Therefore very little tuning range is lost by cutting down the capacity to .0005. In many cases it is of advantage to use only a .0003 condenser in parallel with the aerial coil, but one must then be prepared to use a fairly large number of coils finely graduated as to size.—R. W

OUR WEEKLY NOTE

SELECTIVITY

When desiring to receive over long distances with the local station transmitting only a mile or two away, the method by which the required selectivity is to be obtained is an important one.

Taken all round it may be said that loose-coupling is the most efficient way of getting selectivity as the strength of the desired signals is reduced very slightly. Wave traps, on the other hand, can be made to cut out the very worst interference but, unless the stations to be separated use very different wavelengths, the signals from the required station will be greatly cut down in strength. A circuit with loose coupling bteween aerial circuit and the first valve, and also between the H.F. valve and the detector is a very selective arrangement, especially if the receiver is screened so that interference cannot be picked up on the internal wiring or by the tuning coils.

THE BUREAU.

Frame Aerials

Q.—*When a frame aerial is used, by how much is the sensitivity of the set reduced compared with what it would be if a good outside aerial were employed?—T. P. (Yorkshire).*

A.—It is quite impossible to answer this question directly, as so much depends upon conditions. There is, for instance, the question of exactly how good the outside aerial is and how efficient (or inefficient) the frame. Then again, the distance of the station to be received and the circuit used in the receiver must be taken into account. For the reception of a station within, say, twenty miles distance a circuit employing two H.F. stages would probably work just as well on a frame as on an outside aerial. This is due to the fact that H.F. amplification makes very little difference to the strength of powerful signals owing to the detector only being able to handle a certain amount of energy. On the outside aerial the H.F. stages would be mere "passengers" where a near station was concerned, and although they might be working "all out" when a frame aerial was employed, the net result might be the same. Usually, however, one or two more H.F. stages would have to be employed in a set to enable it to give the same results when used with a frame aerial as are obtainable when a good outside aerial is used.—B.

Telephone Transformers

Q.—*Of what use is a telephone transformer with a ratio of 1 to 1?—D. S. N. (Ashford).*

A.—This transformer is, of course, designed for use with high-resistance telephones. Its use enables such telephones to be used without the necessity for passing the plate current of the last valve through the telephone windings. This eliminates the risk of the windings being burned out and also protects the wearer of the telephones from shocks.—R. W.

WORKMAN: "Do you want me to shave your pole, mum?"
LADY: "What impertinence! I am not even bobbed, let alone shingled!"

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

A Useful Voltmeter

A SMALL and useful pocket-type voltmeter for testing high- and low-tension batteries is produced by Ward and Goldstone, Ltd., of Pendleton, near Manchester. There are three terminals on the voltmeter, two projecting from the case and the third attached to a short length of flex passing through the top of the instrument. The needle normally points to a central zero, on the right of which is a scale graduated in steps of 10 volts up to 100 volts, the left half of the scale being graduated in steps of 1 volt up to 10 volts.

On test we found the instrument accurate enough for ordinary purposes, although the 100-volt scale is not large enough to give definite readings to the nearest volt. The current consumption of 30 milliamps.

A Useful Voltmeter.

is on the high side for measuring small dry batteries, but so long as the instrument is not left on for long no harm will be done.

The accuracy of readings on the low-tension side was high, being within 3 per cent. of our standard, but for the reason previously indicated we were unable to obtain close enough readings on the high-tension side for direct comparison with our standard.

Six-sixty Valves

WE have received from The Electron Co., Ltd., of Triumph House, 189, Regent Street, London, W.1, samples of their range of valves. We are now in a position to report on two of their types—the S.S.7 and the S.S.1.

The S.S.7 is a dull-emitter power amplifier, and for such is one of the least microphonic valves we have tested. It was noted that under correct working conditions no glow is visible from the filament—a property which is exceedingly valuable. The amplification obtained per stage is high, and the valve is capable of handling large volume without distortion, possessing characteristics similar to the Marconi DE4, the Mullard PM4 or the B.T.H. B6.

The S.S.1 type is a general-purpose bright-emitter, and on test has given ex-

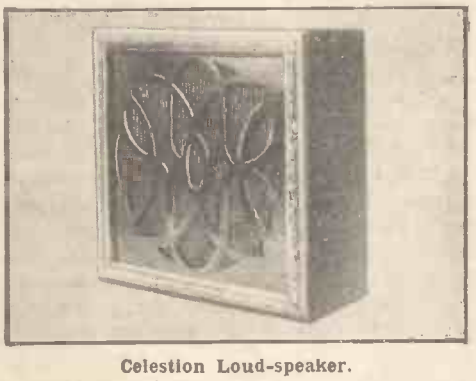
Characteristics	Valve	
	S.S.1	S.S.7
Type	General purpose	Power amplifier
Rated filament voltage	3·7	3·7
Tested filament current	.65	.106
Total emission in milliamps.	8.1	20.4
Impedance	28 000	9,000
Amplification factor	8.5	7·4
Suitable anode voltage as detector	45	—
Suitable anode voltage as H.F. amplifier	70	—
Suitable anode voltage as L.F. amplifier	80	100
Grid bias required as L.F. amplifier	−4½	−6

cellent results as an H.F. and L.F. amplifier and as a detector. As an H.F. amplifier results were exceptionally good, the valve possessing a fairly high anode impedance.

The electrical properties of the two types of valves are given in the accompanying table.

The Celestion Loud-speaker

WE have received from the Celestion Radio Co., of 29, High Street, Hampton Wick, Kingston-on-Thames, a sample of a new model loud-speaker—the Celestion Radiophone—which we have tested. Owing to foreign patents pending, we are requested not to describe the in-



Celestion Loud-speaker.

terior, but we may mention that the loud-speaker works on the conical diaphragm principle, the diaphragm being made of a special material reinforced in a unique manner. The diaphragm and magnetic system are housed in an elegantly designed cabinet having a highly polished surface and having apertures in the form of ornamental tracing. The terminals and adjusting screw are at the back of the instrument.

On test we found that the volume obtained from the Celestion loud-speaker was quite as great as any of this type that we have tested, whilst the resonance curve drawn between frequencies of 100 to 5,000 cycles per second is remarkably free from peaks, thus eliminating the artificial effect due to the prominence of certain notes. The magnetic system itself is unusually large and, together with the diaphragm, is capable of dealing with as much volume as is ever required. In this respect we were unable to overload the instrument using two power valves in parallel. The tone of the loud-speaker is quite natural, being free from the high or low timbre found in some instruments.

Ormond Filament Rheostat

A WELL-MADE filament rheostat embodying a novel vernier attachment is produced by The Ormond Engineering Co., 199 to 205,

New Ormond Component.

Pentonville Road, King's Cross, London, N.1. The component consists of an annular strip of heat-resisting insulating material on which the resistance wire is wound, clamped to a small aluminium frame, through the centre of which passes the spindle operating the slider. To the end of the operating spindle a small metal segment is attached, with a projecting metal lug at each side. When the spindle is rotated in one direction one of the lugs comes in contact with the slider arm and causes it to rotate. On reversing the rotation of the operating spindle the segment moves through 90 degrees before the other lug comes in contact with the slider and causes it to rotate in the opposite direction. During this idle rotation of 90 degrees the segment (which has a small slider of its own) is making contact with a single turn of resistance wire connected in series with the main resistance winding.

As with other Ormond components, this rheostat is well made and finished and possesses a very smooth "feel." The vernier attachment gives a very fine adjustment. On test the maximum resistance of the sample submitted was 27.8 ohms.

THE "CONC

A LOUD-SPEAK ALL STA

By J. HARTLE

ANY reader who makes up the set to be described in this article will find himself possessed of a really powerful receiver. For some time past I have been working with a five-valve set which, though it is capable of picking up practically every British and Continental station and not a few of those in America, is yet not quite big enough to allow the loud-speaker always to be used with comfort. To obtain full loud-speaker strength it is sometimes necessary, when distant stations are coming in, rather to press the high-frequency valves, which nearly always leads to a great falling off in the quality.

I had so often wished that I had one more low-frequency valve which could be brought into play when wanted that I decided to design a six-valver which would take up no more room than the average set employing five valves. The "Concert Six" fits into a cabinet made to take a vertical panel measuring 24 in. by 8 in., and its baseboard has a depth of 9 in. It must therefore be admitted that space has not been wasted in the design; at the same time there is no crowding of components, as will be seen from the photographs, and owing to their careful spacing no interaction effects are noticeable.

Building the Set

Those who do not care about going to the expense of constructing a six-valver "right off the reel" may start quite well with three only—V2, V3 and V4 in the diagram which is seen in Fig. 1. In this case I recommend that the panel, baseboard and the valve bridge (of which more later) should be of the full sizes stated, the components being arranged in their proper places as indicated in the lay-outs. The panel should also be drilled entirely, or at all events centre-punched, in the first instance. Other stages can then be added with ease at later dates.

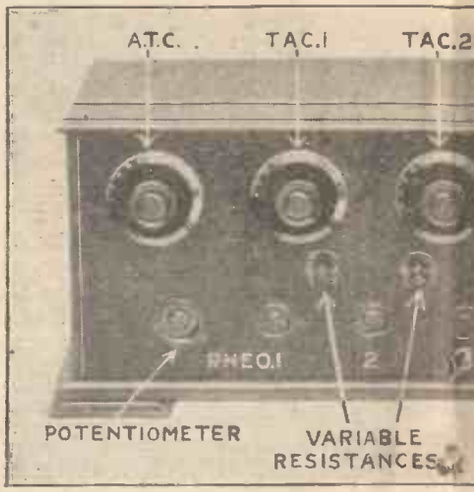
A reference to Fig. 1 will show that the circuit embodies several distinctive features. The method used for stabilising the tuned-anode-coupled high-frequency valves is not new, though I do not remember ever having seen the design of a practical receiving set embodying this system. Each of the anode tuning coils (L2 and L3) is shunted by a variable resistance which should have a range of from 50,000 to 200,000 ohms. In practice this provides a most simple and satisfactory method of obtaining absolute stability with a very efficient high-frequency coupling.

Low-frequency Coupling

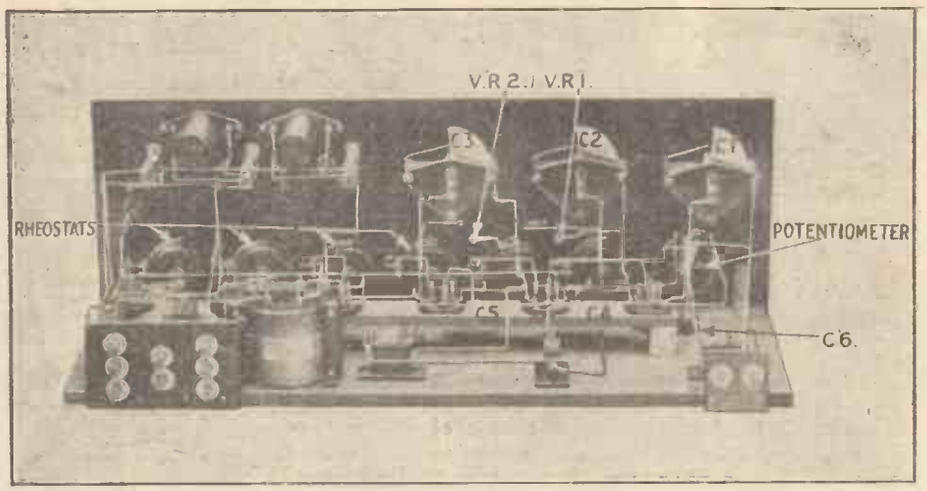
On the low-frequency side of the set transformer coupling is used between the rectifier and the first note magnifier; the remaining note magnifiers are coupled by the choke-capacity method. This was chosen for several reasons. Experiments have convinced me that if good quality with great strength is desired no more than one low-frequency transformer should be used in a receiving set.

The two methods of intervalve coupling which remain are the resistance-capacity and the choke-capacity systems. The first of these is excellent in one way—given a good resistance it produces absolutely no distortion. It has, however, a great drawback. Since the resistance to be efficient must be of a high order, the use of power valves is at once ruled out. The average power valve has an internal resistance of about 5,000 ohms. If, therefore, we use a 50,000-ohm resistance in its plate circuit, an enormous high-tension voltage will be necessary in order to supply the necessary potential to the plate, since 50/55 of the voltage drop takes place across the resistance and only 5/55 between the plate and the filament of the valve. Now for very big amplification it is essential to use power valves, since those of the general-purpose class cannot deal with the large voltage changes applied to their grids. Choke-capacity coupling (though theoretically it does not give the same perfect purity as the resistance-capacity) allows power valves to be used, and in actual practice it will be found that no distortion occurs with it.

It will be seen that four, five or six valves may be thrown into circuit at will by the use of the jacks J1, J2 and J3, the loud-speaker leads being attached to a plug. In plugs and jacks we have one of



View of Panel a



Back-of-panel View of Receiver.

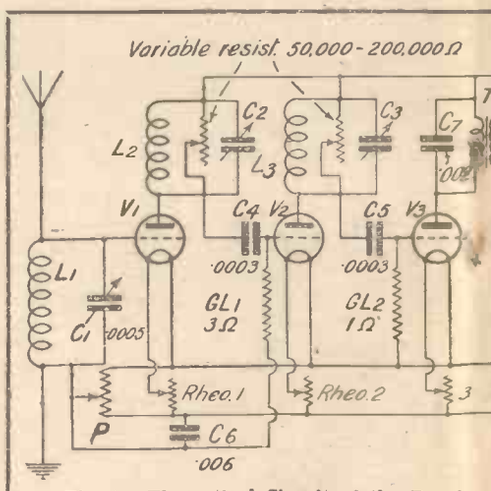
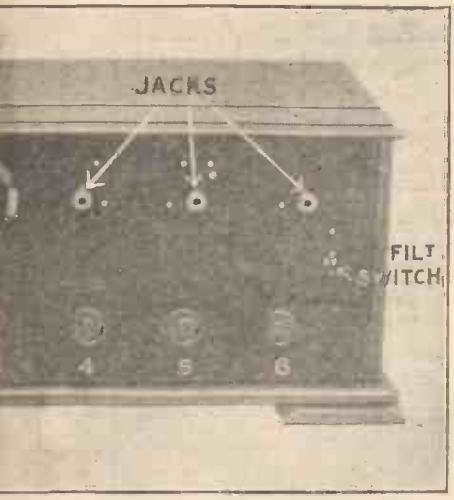


Fig. 1.—Theoretical Circuit of the Receiver

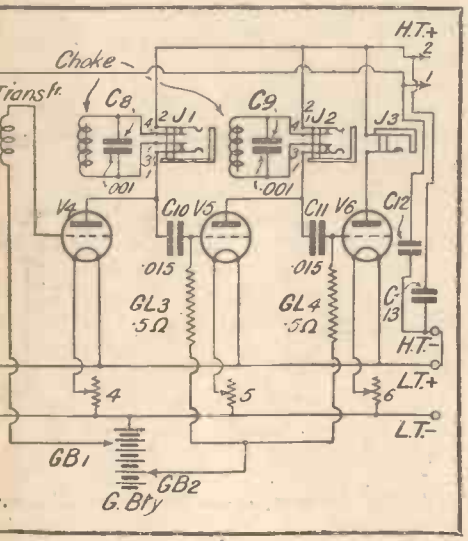


and Controls.

CERT SIX"
KER SET FOR ATIONS
Y REYNOLDS

the handiest methods of throwing in or cutting out low-frequency valves. It is infinitely better than switching, and those who try it for the first time will be delighted with it.

Two high-tension positive busbars are used. The first feeds the rectifier and the two high-frequency valves, whilst the second supplies the three note magnifiers. Whether a power valve is used or not for the first note magnifier a high plate voltage is desirable, and as this valve has its own grid battery tapping the plate current can be kept down to reasonable dimensions when a general-purpose valve is in the holder.



It is most important that when the set is constructed the spacing of the components upon the high-frequency side should be carefully adhered to. The actual positions occupied by the three inductances L1, L2 and L3 is the result of a great deal of experiment, for the set was made in "hook-up" form half a dozen times before the final design was arrived at. By spacing the coils as shown all interaction effects are eliminated and the set becomes exceedingly easy to handle.

On the low-frequency side it will be seen that the transformer coupling the rectifier and the first note magnifier is mounted on the baseboard, whilst the two chokes are fixed to the panel, one between the first and second jacks and the other between the second and third. This is done for two reasons. In the first place it enables the chokes to be separated from the transformer, and therefore helps to eliminate interaction effects, and secondly it allows them to be placed close to the jacks to which they are connected, thus avoiding long leads.

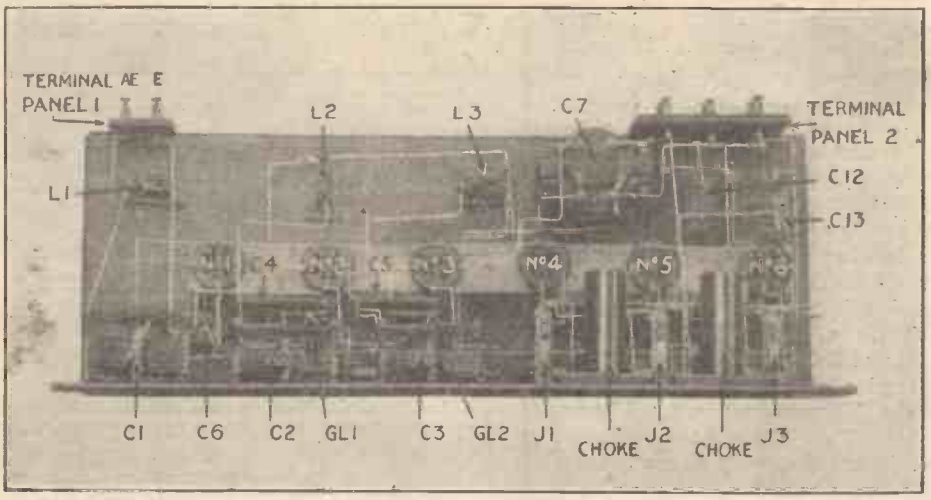
The Connections

An examination of Fig. 2, which gives the actual wiring connections, will show that these are of a simple and straightforward order. Actually they are less complicated than they look in the drawing, since the three parts of the set—the panel, baseboard and the terminal panels—must all be shown in plan. Wiring should be done with square rod or with stiff bare wire, all joints being soldered. In this way a sound, neat job can be made, and if care is taken to keep the leads at different potentials as far apart as possible from one another, unwanted capacity effects will not be noticeable.

The first step is to obtain a panel of really good ebonite measuring 24 in. by 8 in. Do not forget that there is ebonite *and* ebonite. It seldom pays to buy cheap stuff, for the insulating qualities of such material are often of the poorest, and its use may give rise to all kinds of trouble. If you buy ebonite of guaranteed quality from a firm of repute there is no need to remove the glossy surface; otherwise it is best to rub down the panel first with fine emery-cloth, then with worn glasspaper of the finest grade, and finally with a cloth damped with turpentine.

Panel Layout

Fig. 3 shows the layout of the panel. For the condensers, the variable resistances, the potentiometer and the rheostats 3/16-in. holes will be required. The Edison-Bell jacks which I employed in constructing this set require rather larger holes. Should you not have a drill big enough for the purpose I would advise you to punch-mark the centres accurately and then to have these three holes drilled for you by your dealer. Marking-out and punching should be done upon the back of the panel, which should be placed both during this operation and when drilling is in progress on an old dust sheet folded several times so that the surface may not be scratched. Do your marking out with a scriber, for a pencil, if used, is apt to leave high-resistance leaks between various parts of the panel. The filament switch may be any convenient type of small "tumbler," mounted either upon the panel or flush with its surface.



Plan View of Baseboard.

In Fig. 4 is seen the layout of the baseboard. Two inches from what is to be the back edge of the board rule a line and make cross lines upon it, the first 2¼ in. from the left edge of the board, the second 5½ in. from the first and the third 5½ in. from the second. The points of intersection of the lines will give you the centres for your coil holders.

The position of the low-frequency transformer is not indicated exactly since this will depend to some extent upon the type used. That seen in the photographs is the Marconi Ideal, with a ratio of 2.7 to 1, which certainly gives splendid results. Close to it is the .002-microfarad condenser (C7 in Fig. 1), which is shunted across the primary. The high-tension battery condensers (C12 and C13 in Fig. 1) are placed in any convenient position towards the right-hand edge of the board. The condenser wired between low-tension negative and the slider of the potentiometer (C6), which has a value of .006 microfarad, should be placed approximately in the position shown in the drawing, since this allows the necessary leads to be short.

The valve bridge is placed 4 in. from the rear edge of the panel, 3 in. from the left-hand edge and 1 in. from the right. Details of its construction are shown in Fig. 5. It consists of a piece of ½-in. white wood 20 in. long by 1½ in. in width. It is mounted on three supports of the same material, each 1½ in. high, being fixed to them by means of screws. The bridge itself is fixed to the baseboard by means of screws driven upwards from below the board into its supporting pieces. The centre of the first valve holder is 1¼ in. from the left-hand end. The remaining holders are spaced 3½ in. apart centre to centre, which leaves a further space of 1¼ in. at the other end. A very convenient type of holder, which was used in the construction of the set under description, is the Magnum made by Messrs. Burne-Jones. This is very easy to mount, and since it contains only the minimum

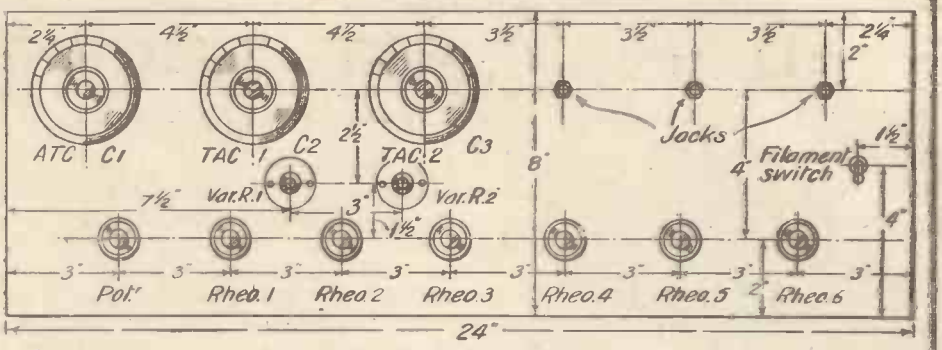


Fig. 3.—Panel Layout.

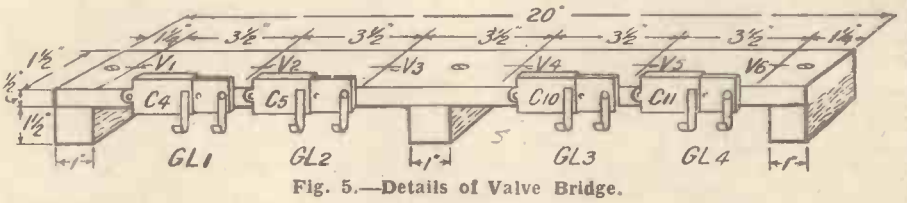


Fig. 5.—Details of Valve Bridge.

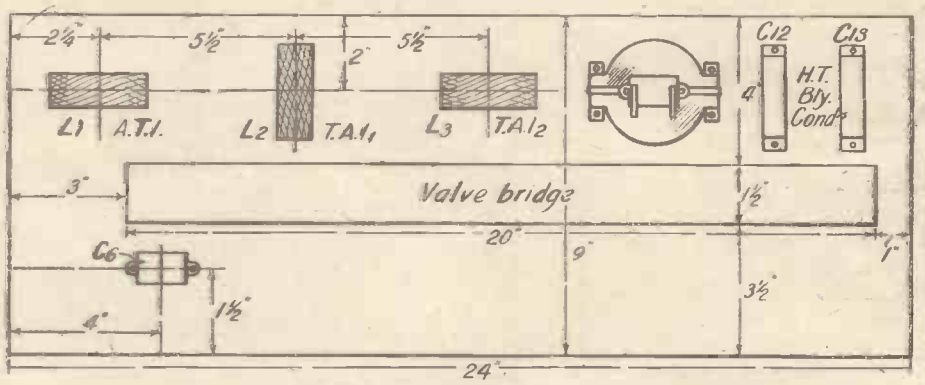


Fig. 4.—Layout of Baseboard.

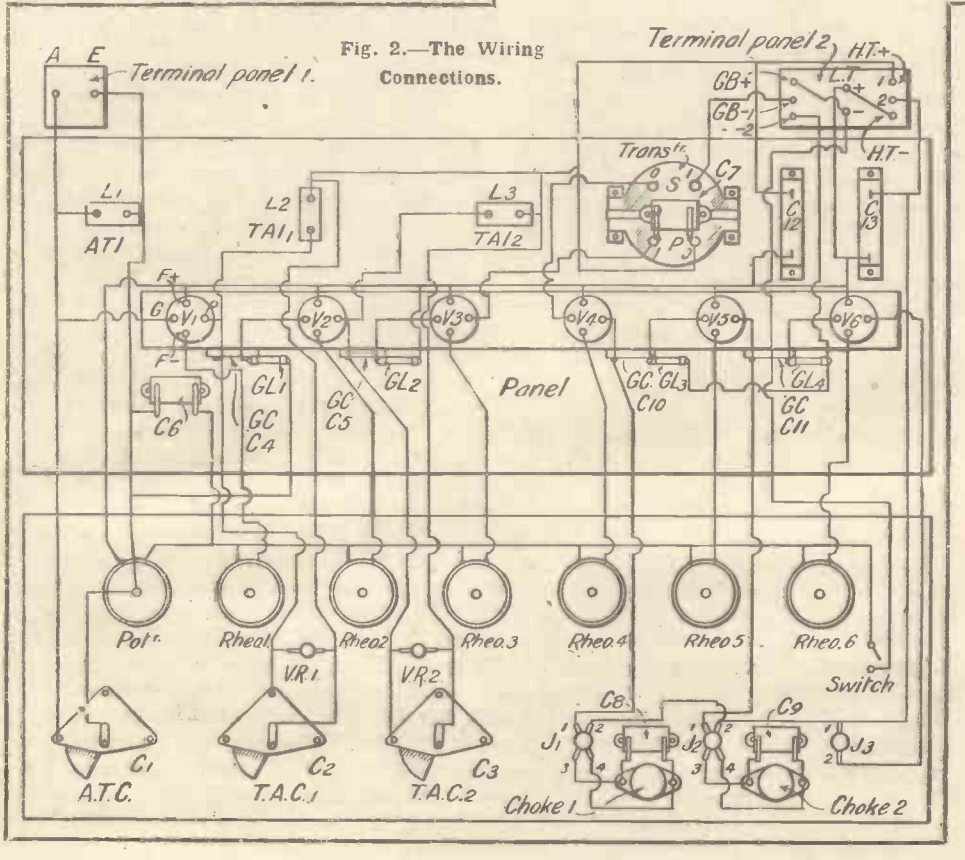


Fig. 2.—The Wiring Connections.

necessary amount of ebonite it eliminates to a great extent capacity between the legs.

The four coupling condensers, C4, C5, C10 and C11, are mounted upon the edge of the bridge which faces towards the panel. Those used were of the well-known Dubilier make, and this company now provides a very useful little fixture in the shape of a grid-leak extension holder which enables the leaks to be placed either in series or parallel with the condenser at will. As the leaks never require to be in parallel in this set it is just as well to cut off the unwanted clips on the condensers so that a mistake cannot be made inadvertently when putting them into place. C4 and C5 should each have a capacity of .0003 microfarad, whilst the capacity of C10 and C11 may be either .01 or .015 microfarad. The resistance of the first grid leak is either 2 or 3 megohms, that of the second 1 megohm and that of the third and fourth .5 megohm.

When the bridge has been constructed and fitted with its components it may be mounted upon the baseboard; the condensers and other parts required may be fixed to the panel, and the latter may be secured to the baseboard by means of a pair of angle brackets. J. H. R.

(To be concluded.)

ALL MEASUREMENTS WITH ONE INSTRUMENT

The second and concluding article on how the milliammeter can be made to do the work of five instruments

TO make the instrument shown in the photographs in the last issue we require an ebonite panel 9 in. long and 5 in. wide. This is laid out and drilled in the way shown in Fig. 9. All the holes in the diagram were 4 B.A. clearance, with the exception of the 3/8-in. hole made for the reception of the bush of the selector arm. The resistances are most easily mounted by using Meccano right-angle brackets with two holes in each arm. The selector switch has ten studs, five of which are "dead," in order to avoid any chance of throwing an unintentional overload upon the milliammeter. The stop pins of this switch are so arranged as to allow the laminated arm to make contact with the extreme left-hand stud alone, whereas when it is turned as far as possible to the right it makes contact with two studs at the same time.

Wiring-up

The wiring diagram is given in Fig. 10 and it is not thought that this will present any difficulty. A pair of terminals for the milliammeter has been provided, though in the photographs it is shown mounted on the panel. It was found more convenient to provide these terminals, since owing to their presence the instrument can be detached when desired for use in another circuit.

We come next to the ammeter shunt,

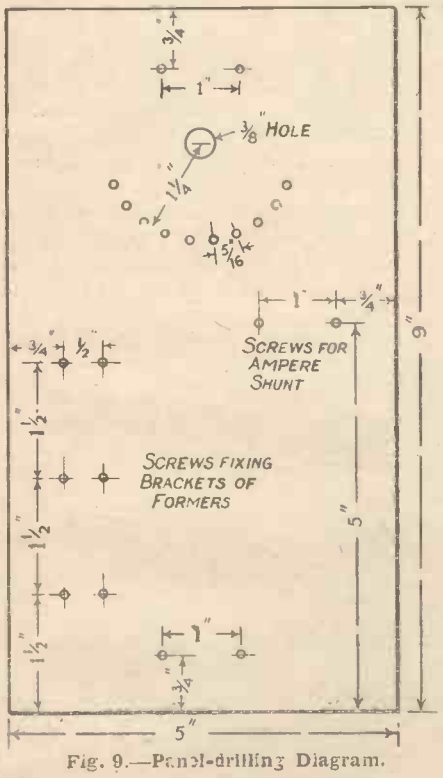


Fig. 9.—Panel-drilling Diagram.

whose principle has already been explained. In order to make this it is best to borrow an ammeter and to use the circuit shown in Fig. 6 (p. 529 No. 200). Should you be unable to obtain the loan of a suitable instrument you can get round the

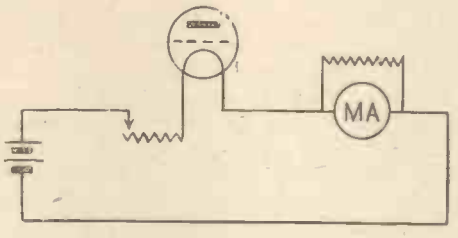


Fig. 7.—The Ammeter Shunt.

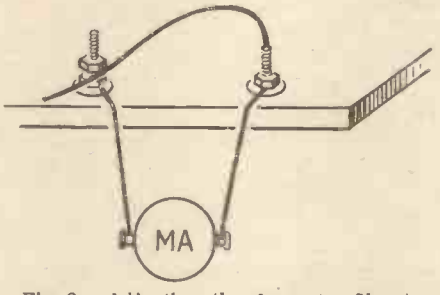


Fig. 8.—Adjusting the Ammeter Shunt.

difficulty in the following way: Take with you to the charging station when you go to fetch your accumulator a valve, which should be of a type which passes from .4 ampere of current upwards, and a rheostat. Connect the valve and the rheostat to your accumulator, and let the battery remain under load for some time. Then get the man at the charging station to measure the current passing in the circuit. By means of the rheostat adjust this until it is an exact number of tenths of an ampere, that is, .3, .4, .5 and so on. Now measure the voltage across the filament legs of the valve by means of the o-to-5-volt scale of your converted milliammeter. On reaching home you can wire up the circuit once more and adjust the rheostat until exactly the same potential is obtained across the filament of the valve. The measured current will then be flowing, and you can make your tests by means of the circuit shown in Fig. 7.

The Ammeter Shunt

The value of the shunt will depend upon the internal resistance of the milliammeter itself. As a rule the shunt will have a resistance of only a fraction of an ohm. It should be made of No. 22 bare Eureka wire, and whichever means of testing you use, the way of finding the correct length of wire is that shown in Fig. 8.

On your panel you have two screws 1 in. apart which are to serve as the shunt contacts. To the tip of one of these solder one end of your resistance wire. Leaving only an inch or so of wire between the terminals, clamp the nut of the second down as shown in the drawing. Connect the milliammeter between the two terminals and make up either the Fig. 6 or Fig. 7 circuit.

Let us suppose that the current flowing is .6 ampere. When the shunt is exactly right the reading will be 6 milliamperes on the original scale. You will probably find that with a very short length of resistance wire in the shunt the reading is much too small. Switch off the current (do not forget this) and increase the length of the resistance wire between the screws. Go on until you obtain exactly the right reading, then cut the wire and solder it to the tip of the second screw.

Should it be desired (instead of the o to 5 volts, o to 25 volts and 2.5 amperes ranges that have been described) to make the instrument read from o to 12.5 volts and from o to 5 amperes, then only two resistances are required. The 5,000-ohm resistance is constructed as already described, and in addition to this we require one of 500 ohms. The ammeter shunt is made by the method detailed above, except that each milliampere-scale division corresponds to a current of .2 ampere.

J. H. R.

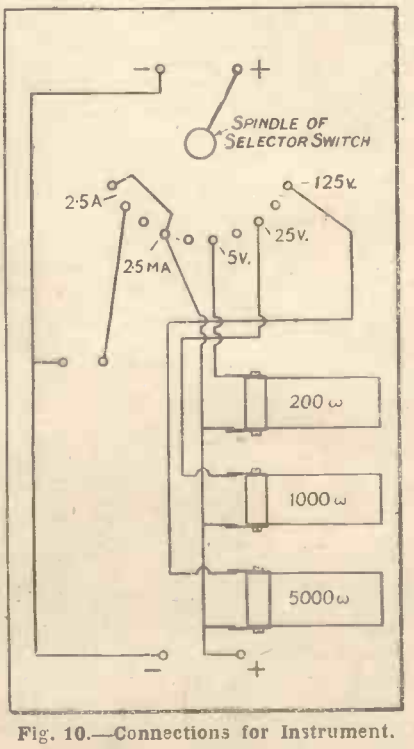


Fig. 10.—Connections for Instrument.

Constance Izard.

NEXT WEEK AT 2LO

By "THE LISTENER"

In the Coming Programmes

IT is satisfactory to note the lighter texture of the programmes of next week and the inclusion of more dance bands which, if the programmes are only rigidly adhered to, should give listeners little cause for grumbling.

Sunday is the anniversary of Dr. Charles Burney, an English composer of the early eighteenth century, and a special concert will be relayed from the Royal Hospital at Chelsea. Later in the afternoon will be heard the famous "Besses o' the Barn" Band, conducted by Harry Barlow. The evening programme consists of light symphony works, the conductor being Geoffrey Toye, and the vocalists the Oriana Singers, who will render sixteenth-century madrigals.

Good dance music is promised for Monday, commencing early in the day with De Pietro and Joan Revel at the New Princes Restaurant, followed in the evening by Alex Fryer's Band from the Rialto Theatre. The half-hour pianoforte recitals throughout the week will be devoted to the works of Haydn, and the pianist is Gordon Bryan. On Tuesday a brief interlude of dance music is promised in the afternoon from the orchestra at the Shepherd's Bush Pavilion, and later will follow Sidney Firman's Dance Band from the studio at 2 L O. The feature is a performance by Jay Whidden and his Midnight Follies Band at the Hotel Metropole.

Commencing the idea of relaying well-known seaside orchestras during the summer months, Wednesday next will bring us the music of the band of the Royal Marines (1st Division) from Brighton at the Horticultural Show. Later from the studio will be heard the London Radio Dance Band, and the feature will consist of the sketch, by Stanley Logan, *The Poor Rich Girl,* performed by Mabel Green, the well-known musical comedy star.

A distinguished classical pianist, Hilda Dederich, appears in the Children's Hour of Thursday. The London Radio Dance Band will be heard later, followed by the speeches and the first part of the programme at the dinner given by the Musicians Benevolent Society and at which the speaker is the Rt. Hon. Lord Darling. The programme will be carried out by well-known artistes, including Harold Williams and the Æolian Players (Constance Izard, Rebecca Clarke, Joseph Slater and Gordon Bryan). The evening concludes with the Savoy Orpheans and Tango bands.

An interesting experiment is being made on Friday, when a performance of Verdi's opera *La Traviata* is being given at the Chenil Galleries, Chelsea, and relayed to 2 L O. The artistes include Gertrude Johnson, Gladys Palmer, Tudor Davies, Harold Williams, Robert Gwynne and Stanley Riley. The feature is a performance by Joan Revel, de Pietro and Alfredo's Band at the New Princes Restaurant.

A variety programme will be relayed from the Chenil Galleries on Saturday night, when the artistes include Leo Ospovat, of comedy-sketch fame, Yvette in songs and stories, Fred Brogden and Gladys Newth. Later will be heard Alec Chrentrens, the French entertainer, and the revue *Listening Time,* concluding with the Savoy Bands. Truly a varied and enjoyable programme.

THE NEW "N" CIRCUIT

An invention of Sir Oliver Lodge to prevent "howling"

CONSIDERABLE interest has been aroused in wireless circles generally by a report stating that Sir Oliver Lodge has produced a new type of receiving circuit which renders it impossible to create local disturbance by "oscillating" a valve set.

At first sight it seems peculiarly appropriate that the famous physicist who, in the early days of wireless, first evolved the principle of electrical tuning, should now find a remedy for the widespread nuisance caused by indiscriminate "condenser swinging."

"Swirl" Current

The main feature of Sir Oliver's latest contribution to radio progress is the use of a special loop circuit interposed between the aerial and the grid of the first valve. The aerial, which is untuned, feeds potential impulses into the loop or "N" circuit, as it is called, through a single-point tapping, and in this way rapidly builds up an internal "swirl" current of large amplitude.

The built-up voltages are applied from the loop circuit direct on to the grid of the valve, and give rise to a magnified plate response in the ordinary way.

In practice the arrangement amounts to the provision of a one-way coupling between the aerial and the valve. Small impulses can pass from the aerial into the tuned loop circuit and are there built up by resonance to exert a powerful influence on the grid voltage, but as the aerial is untuned, and there is no electro-magnetic coupling between it and the "N" circuit, no appreciable amount of energy can be transferred in the reverse direction.

No Re-radiation

Currents flowing in the plate circuit are therefore prevented from getting back into the aerial and creating local disturbance. No matter how the set is mishandled, it cannot energise the aerial and cause it to heterodyne a neighbouring receiver.

The whole action depends upon the "N" circuit being very accurately adjusted to the desired signal frequency. When this is the case the "swirl" current builds up rapidly—just as the balance wheel of a clock responds to impulses properly timed—but the tuning must be highly critical to get satisfactory signal strength.

Apart from its being a non-radiator, the new receiver is stated to be highly selective in operation, owing to the fact that the "N" circuit, when properly tuned, acts as a filter and protects the grid from all frequencies other than the particular one to which it is tuned.

A Modification

Mr. Melinsky, who has apparently been working on the same lines as Sir Oliver Lodge, has recently invented an improved form of receiver in which, in addition to utilising the feature of the "N" circuit, he connects the anode of the first valve to earth, either directly or through a condenser.

The low-tension battery, instead of being earthed as usual, is left "floating," the only connection between the aerial and the set being the single tapping through the "N" circuit. It is understood that the two inventors are now working in collaboration.

W. TOCK.

SIMPLE TESTS WITH A GALVANOMETER

An easy means of eliminating faults

A WELL-MADE sensitive galvanometer is a most necessary and useful instrument, not only for the constructor, but for anyone undertaking repairs to house-lighting, telephones or bell circuits. A suitable galvanometer for all-round work is a fairly expensive instrument to buy new, but second-hand G.P.O. pattern galvanometers may be picked up very cheaply.

Six Ways of Testing

The following tests will serve to indicate the many ways in which a galvanometer may be used for testing various portions of a wireless installation. It might be as well to mention that the particular galvanometer employed is made with two windings, one for use with comparatively large currents and a very fine wire winding for testing high-resistance circuits and minute currents. There is also a small switch which operates a one-fifth shunt for use when circuits carrying large currents are being tested.

The Aerial

The writer has frequently been asked by a friend to locate the cause of poor reception. In many cases the trouble has been caused by the lead-in from the aerial being a non-soldered joint, the poor contact not being apparent when the aerial was first erected, but becoming evident after dirt and damp had corroded the wires. By connecting one terminal of the galvanometer to the aerial terminal on the set, and the other, via a 4-volt battery, to the free end of the aerial (this having been lowered for the occasion), it will at once be seen if the aerial connections are good. A good joint will be indicated by a steady reading on the dial, while a poor or intermittent connection will cause the needle to fluctuate, the actual swing of the needle also being considerably less.

The Earth

If earth plates are used they must be in damp soil to be effective. A good test is to join the galvanometer and battery to the earth-plate connection, running a wire from the free terminal of the galvanometer to a main water-tap. On touching the tap with the wire a good deflection of the needle should be obtained. It may be necessary to increase the voltage from 4 to 6 or 8 volts if the earth plates are situated any great distance from the point where the water mains enter the earth in order to overcome the resistance of the earth itself. Comparative tests should be made before and after the earth plates have been thoroughly soaked with water.

H.T. Battery

Each cell may be tested separately by using the high-resistance winding of the galvanometer. Naturally the actual voltage will not be indicated on the dial, but the degree of deflection of the needle will show which cells are good and those that are practically dead. The dead cells can then be shorted by means of a small copper bridging strip.

Transformers

It is a comparatively simple matter to trace broken connections, "burn-outs" or "shorts" by using the high-resistance winding of the galvanometer and a fairly high voltage battery. A partial connection will give an unsteady reading, while an actual break will naturally give no reading at all.

Telephone Leads

Poor signals may often be traced to worn-out or badly frayed telephone leads. To test these, disconnect them from the receiver and join up to a dry cell and galvanometer. A partial connection will show itself if the leads are moved about slightly, the needle fluctuating violently as the broken wires rub together.

Filament Rheostats

It is sometimes found that the selector arm on a filament switch does not make perfect contact at every point on the resistance coil. By means of the galvanometer, however, it is a simple matter to find exactly where the poor contact occurs.

The tests described here are only a few of the many which may be carried out with the aid of a galvanometer. Not only is this instrument of value to the wireless man, but bell circuits, lighting and telephone and general electrical systems may be tested and troubles traced in the shortest space of time. A. W. HULBERT.

CONTINENTAL COPYRIGHT FEES

IN view of the information recently given before the House of Lords Committee in respect to the fees paid by the B.B.C. for the broadcasting of musical compositions, it is interesting to note that in Continental countries other methods have been adopted by the stations for the payment of these taxes.

In Germany, for instance, the Reichsfunk, acting on behalf of the entire broadcasting organisation, has concluded an agreement by which a lump sum will be paid yearly, but this will not include the right to broadcast complete musical works, such as operas. In this case the fee varies from 300 to 2,500 marks for each performance. On the other hand, the Ravag Co. of Vienna has declared itself willing to pay an annual sum equivalent to 2 per cent. of the amounts derived from the sale of listeners' licences, but for studio performances of complete musical works the fees range from 100 to 400 Austrian shillings.

The Radio Raadet, Denmark, for the year ending April 26, 1926, will pay the sum of 12,000 Danish crowns, but this does not include fees for the broadcasting of dramatic works. In Spain conditions appear to vary from city to city, but Union Radio, Madrid, and Barcelona (E A J 1), for a period of twelve months, each paid a sum of 500 pesetas to the Society of Authors and Playwrights, and in the case of operas have agreed to a tax of 25 pesetas per act.

In Sweden no clause of the Copyright Act would appear to affect the broadcasting stations, but the Radiotjaenst has voluntarily offered a contribution of 4,000 Swedish crowns per annum. For the year 1925 Zurich paid the small amount of 1,800 francs, and, finally, in Czecho-Slovakia the Radio Journal Broadcasting Company has earmarked a sum equal to 3 per cent. of the total revenue for the payment of these fees. GRIDDA.

A NEW problem play competition has been organised by the B.B.C. to be broadcast in May next. It will consist of four or five dramatic episodes working up to a climax, and several solutions of each episode will be possible.

For the coming summer the B.B.C. proposes to make some slight alteration in its evening programme, inasmuch as it will be divided into two parts, namely, from 8 to 9.30 and 10 to 11, the second general news bulletin being given at the end of the first transmission. Dance bands will follow as usual from 10.30 until midnight, three times weekly. It is not expected that this arrangement will come into effect before the week beginning April 25.

Miss Pat Reed, who has appeared many times before the microphone in Australia, will be one of the attractions of the programme to be broadcast from the London station on April 12.

On the occasion of the dinner of the Musicians' Benevolent Fund, which will be held at the New Princes Galleries on April 15, the speeches made by Lord Darling and Mr. J. R. Clynes will be relayed to all stations.

The choir of King's College is to broadcast. On the afternoon of Sunday, May 2, listeners will hear Evensong relayed from the Chapel of King Henry VI Foundation.

To commemorate the fiftieth anniversary of the death of Dr. Samuel Wesley, the famous composer and organist, a short choral recital is to be given from London and Daventry on April 18.

"The Broadcasting Committee thinks that a moderate amount of controversial matter might be admitted. It overlooks the fact that outside bare news and statistics obtainable from Whitaker's Almanack and other works of reference, nothing that is uncontroversial is of the slightest interest."—*Bernard Shaw.*

There are nearly 1,000,000 receiving sets on farms in the United States, according to estimates made by the Department of Agriculture.

A broadcasting station has recently been established in Cairo by a French company. It has a power of 2 kilowatts and works on a wavelength of 325 metres.

Commander P. T. Dean, V.C., is to describe the attack on Zeebrugge and give his own impressions of that glorious achievement from the London station on April 23.

On its return from a successful tour of Canada the Besses o' the Barn Band will broadcast from Newcastle on April 14.

It is proposed to relay the speeches to be given by Lord Derby, Sir Austin Chamberlain and the French Ambassador on the occasion of their presence at the United Associations of Great Britain and France luncheon held at the Hotel Victoria on April 26.

A pianoforte recital will be given at the Bournemouth studio on April 9 by Mme. Anna Clischer, Court pianist to the Court of Holland.

The Military Band of H.M. Marines First Division (Chatham) will be relayed to the London station on April 14 from Brighton Flower Show.

On April 8 listeners will be given an opportunity of hearing a portion of the Bournemouth Musical Festival to be held in the Winter Gardens. An important feature of the programme will be the appearance of Solomon, the famous pianist.

An excerpt of the musical comedy *Wildflower* will be relayed from the Adelphi Theatre on April 9.

The B.B.C. is now completing arrangements for a special service for the sick to be broadcast from all stations once a week. This will probably take place on Thursdays between 4 and 4.30 p.m.

The Prince of Wales's address at the Boys' Brigade meeting at the Albert Hall on May 11 will be relayed to all stations.

Dancers are to be given a wireless lesson and demonstration of the "Charleston" from a London ballroom by the experts, Miss Dorothy Cole and Mr. E. Scott Atkinson. The date has not yet been fixed.

In South Africa the wireless "pirate" will soon be liable to a fine of £50 and three months' imprisonment. A very comprehensive Bill has been drawn up dealing with every phase of wireless transmission and reception, and if this comes into force wireless amateurs will be placed under very strict control.

Two hospitals in Plaistow, the Invalid and Crippled Children's Hospital and St. Mary's Hospital for Women and Children have been presented with wireless receivers.

It is proposed to broadcast the Evensong set to special music at the annual festival of the Canterbury Diocesan Choral Union Choir, consisting of 1,000 voices, on June 16 next.

The Brighton Competitive Musical Festival, held at the Royal Pavilion and Dome on May 15, will be broadcast through the London station.

A suitable programme is being compiled for St. George's Day, April 23.

The Tunbridge Wells and Counties General Hospital has been fitted with a receiver provided by the Local Hospitals Wireless Fund (organised by the Tunbridge Wells and District Wireless Society).

Alex Fryer's band from the Rialto Theatre will be heard on Monday, April 11, and Sidney Firman's Dance Band will broadcast from the studio on Tuesday.

The Poor Rich Girl, a sketch by Stanley Logan, will be performed by Mabel Green and broadcast on Wednesday, April 14.

Verdi's opera *La Traviata* is to be broadcast from the Chenil Galleries, Chelsea, on Friday, April 16.

An amateur broadcasting station has been erected at Antwerp in connection with the local radio club. Transmissions are made on a wavelength of 225 metres.

From April 13 5XX will broadcast the two alternative weekly programmes on Tuesdays and Thursdays.

Special concerts are broadcast every week from the Hilversum station for the benefit of hospitals.

The town of Klagenfurt (Austria) is shortly to have a broadcast transmitter.

Concerts are broadcast from the Union Radio Club of Liége every Monday, Wednesday and Friday at 9.30 p.m. A wavelength of 185 metres is used.

When the opera *Der Rosenkavalier* is presented for the first time in film form at the Tivoli Theatre on April 12 the music (which will be conducted by the composer himself, Richard Strauss) will be broadcast through many B.B.C. stations.

On April 24 it is hoped to give a further series of regimental reminiscences to include incidents both grave and gay from the historical records of famous units of the British Army.

The well-known pianist Lamond will give a recital at the London studio on May 6.

The Beano Concert Party, under the direction of Miss Ena Grossmith, will provide the Daventry programme on April 13.

The Roosters' Concert Party will be responsible for the evening programme at the London studio on April 15.

Amateurs in Milan are complaining of the restrictions enforced by the new Italian Wireless Bill, and it is probable that the cost of the licence will be reduced in the near future. Up to the present only 6,000 licences have been taken out.

KAY RAY

WONDERFUL LOW LOSS STRAIGHT LINE FREQUENCY

CONDENSERS

BRITISH MAKE.
Supreme SELECTIVITY.
Each station has a CLEAR TUNING SPACE.
CROWDING entirely ELIMINATED.
SIMPLIFIED tuning.
DISTINCT and DEFINITE Radio reception.
PRECISION workmanship.
HEAVY BRASS VANES.
Pigtail connection to rotor gives silent working.
Special Spring top Bush gives a firm but easy movement.

Including knob and dial as sketch. With vernier.
.0003 .. 7/11
.0005 .. 8/6

Including knob and dial. No vernier.
.0003 .. 5/11
.0005 .. 6/6

POST 6d. PER SET.

LOW LOSS

POST FREE

COILS.

MOUNTED COILS: STAR.—25, 1/3; 35, 1/6; 50, 1/9; 75, 2/-; 100, 2/3; 150, 2/6; 200, 2/9; 250, 3/-; 300, 3/6. GRAM (Patent 206233), air-spaced mounted, 25, 1/6; 35, 1/6; 50, 1/8; 75, 1/11; 100, 2/3; 150, 2/6; 200, 2/11; 250, 3/3; 300, 3/6; 400, 3/9.

IGRANIC (Honeycomb).—25, 35, 4/3; 50, 4/6; 75, 4/10; 100, 6/3; 150, 7/-; 200, 8/-; 250, 8/6; 300, 9/-; 400, 10/-; 500, 10/3; 600, 11/-; 750, 12/6; 1,250, 15/6; 1,500, 17/6; LISSEN.—25, 35, 4/10; 50, 5/-; 60, 75, 5/3; 100, 6/9; 150, 7/-; 200, 8/5. LISSEN-X.—50, 6/-; 60, 6/4; 75, 6/5; 250, 9/9; FINSTON.—35, 1/8; 50, 1/9; 75, 2/-; 100, 2/6; 150, 2/9; 200, 3/6; 250, 3/9; 300, 4/-. Igranic X 2 L O's stocked.

EDISON BELL.—Low Loss Coils.—25, 2/6; 35, 2/6; 50, 3/6; 75, 3/8; 100, 4/6; 150, 4/6; 200, 5/6; 250, 5/6.

LOW LOSS COILS.—Set of 3 for K.D.K.A., Mounted, 7/6.

"WONDER" AERIAL.—49 strands special phosphor bronze alloy, 110 ft., 3/3.

VARIABLE GRID LEAKS.—Lissen, Watmel, 2/6; Bretwood, 3/-; Lissen Anode, 2/6; Watmel, 3/6; Bretwood, 3/-.

LISSENOLA LOUD-SPEAKER UNIT. 13/6. Pleated paper, reeds, etc., all stocked.

ONE VALVE AND CRYSTAL SET.—With Permanent Detector, set only, 18/11.

SLOW MOTION DIALS.—Pelican new model, 6/6. "Combine" 180-1, 5/6. Many others stocked.

MARCONI DE2.—For 2-volt accumulator, 15/6. L.F. or H.F. Your old valve taken in part exchange.

H.T. BATTERIES.—Eveready 66v., 12/6; 108v., 21/-. L.T.3 for D.E. Valves, 7/6. Siemens H.T. 60v., 12/6. Hellesen's 60v., 14/6.

MARCONIPHONE.—Auto Series Par. Variometer, 16/-. Sterling Non Pong V.H., 3/6. Velvact Potentiometer, 9/-. Ideal L.F. Transformers, 30/-. (2-7-1, 4-1, 6-1, 8-1). Ideal Junior L.F., 21/-. Var. Res. 40,000 ohms., 8/6; H.F. Choke up to 4,000 metres, 10/6; Sterling Baby L.S., 50/-. Sterling Dinkie, 30/-. "Minilos" S.L.V. Condenser, .00025, 21/-; .0005, 24/-; .001, 30/-.

VALVES.—Cleartron 1.08 or C.15, 12/6. Power 6v., C.25, 15/-. Cosmos S.P. 18 Red or Green, 12/6. Neutron .06 H.F. or L.F., 12/6. Ditto 2v., 12/6. All Mullard, Ediswan, Osram, Marconi, Cossor, stocked. Bright D.E. and Power, 8/-, 14/-, 15/6, 16/6, 18/6, 22/6, 24/6, 20/-, £2. Mullard P.M.4, 22/6. Do. P.M.3, 16/6. 1 burnt-out valve taken in part exchange for any of above. Usable valves bought or exchanged.

LOUD SPEAKERS.—All makes. Amplions, all models, Brown's latest, 30/-, 120/-. N. and K. solid mahogany, dome centre, £4. Brandes Table Talker, 30/-. Sterling Mellowvox, 48/-. Telefunken Model, usually 35/-, few only at 16/11. Both, Lissen, Nesper Model, 12/6. Your old Speaker accepted in part exchange for any other goods. Post customers write first please. Re-exchanges.

"ULTRA."—This wonderful Loud-Speaker still holds its own, 27/6. Your old speaker taken part exchange.

Goods offered and sold on the understanding that Place of Payment is 27, Lisle Street, Leicester Square, London, W.C.2.

POST FREE

A.J.S. COILS.—Mounted, Ebonite cased, the last word in fine Tuning, a really superb coil at a ridiculous price, 25, 33, 50, 75, 3/- each; 100, 150, 200, 4/6 each; 250, 300, 5/6 each. A.J.S. cheke, 15/-. Choke unit, 20/-. A.J.S. Cabinet Loud Speaker, 75/-. A.J.S. 19 in. suit up to 4 valves, 37/6. A.J.S. standard, 95/-. Your old speaker or usable parts accepted in part exchange. These speakers are far in advance of many others at DOUBLE THE PRICE.

SPECIAL LINES

LOW LOSS PRANCO ULTRA Short-wave Tuner, 15/80 metres 14/-.

R.I. MULTI RATIO L.F., 27/6.

SEAMARK, Connode, 19/6.

EDISON BELL Plugs and Jacks. Jacks, SO, 1/8; SC., 2/2; D.C., 2/; S.F., 2/6; D.F., 2/4; 1 pr. Plugs 2/9.

IGRANIC-PACENT, Potentiometer, 2/6; 6 or 30 ohms Res., 2/.

2-WAY Coil stands, W.L.L. Universal for inside or outside mounting, 4/11.

NEWEY, 2 way geared for Back of panel, 6/6.

C.F.C. ditto, 1/6.

R.I. new type Aerial Tuner, 39/6.

LISSEN Centre Tapping X Coils. 50 x, 6/-; 60 x, 6/3; 75 x, 6/4; 250 x, 9/9 for super selective and neutrodyne circuits.

ORMOND Dual Rheostat for B. and D.E., 2/6.

CRAMOND Potentiometer, 2/6.

DIMIC COILS (McM). All wavelengths, 1/-. Base, 2/6.

CALLES AERIAL O.V.—"O.V." D.C.C., Indoor, 2/6. Super Flat 5/3.

GOSWELL.—Back of Panel 2-way "Link" Coil Holder, 5/6.

CRYSTAL DETECTORS.—Micmet, 4/6. Burndept, 4/-. Utility, 7/6.

PERMANENT DETECTORS.—R.I., 6/-. One-hole fixing, 7/6. Liberty Fixing, 3/6. Brownie, 3/-.

ACCUMULATORS
(See List)

RECOGNISED WEST END DISTRIBUTOR of the manufactures of Edison Bell, Jackson's (J B) Polar, Igranic, Peerless, Eureka, Magnum, Burndept, Lotus, Dubilier, Marconi, Dorwood, Sterling, Success, B.T.H., McMichael, Lissen, Woodhall, Utility, R.I., Bowyer-Lowe, Amplion, Formo, Brunet, Ormond, Newey, P. and M., and everything that is worth stocking. Every endeavour made to obtain goods not listed.

POST FREE

VALVE HOLDERS.—BENJAMIN, 2/9; Lotus, 2/3; Apex, 1/6; Excelsior, 1/-; Sterling Non Pong, 4/3; Burndept, 5/-; Magnum, 5/-; 2/6; Bowyer-Lowe, 3/-; Atholl, 1/3; H.T.C., 1/6; 1/9; Aeromonic, 1/3; Bretwood, 1/9.

FIXED CONDENSERS.—Dubilier .0001, 2, 3, 4, 5, each 2/6. .001, 2, 3, 4, 5, 6, each 3/-. Grid Leak, 2/6. Edison Bell, .001, .0001, 2, 3, 4, 5, 1/-. .002, 3, 4, 5, 6, 1/6. .0003 and grid leak, 2/-. Dorwood .0003 with grid leak clip, 2/6. McMichael with clips, .0001 to .0005, 2/6 each; .001 to .006, 3/- each. Watmel, .0003 and grid leak, 2/6. List priced fixed condensers.

VARIABLE CONDENSERS.—Polar Standard, 10/6. Junior, 5/6 each. Bowyer-Lowe Popular, 10/6. Igranic, 24/-, 21/-. Collinson's Low Loss, 21/-, 20/-. Utility, 8/6, 10/9. Vernier 2/6 extra. Utility Low Loss, stocked .0003 and .0005. J.B. (Jackson Bros.), Square Law, .001, 9/6; .0005, 8/-; .0003, 7/-; with vernier, 4/- each extra. Geared, .0005, 15/-; .0003, 13/6; Low Loss, 10/6, 9/-. Ormond new geared friction drive, .0005, 15/-; .0003, 13/6. Low loss, .0005, 8/-; .0003, 7/6; with vernier 1/6 each extra. Ebonite ends same price. Newey 4 point, 15/-, 17/6.

FILAMENT RHEOSTATS.—Ormond 6 or 30 ohms, 2/6. Finston, 6 ohms, 2/3; 30 ohms, 2/6. Wates' Microstat, 2/9. Lissen Wire, 7 or 35 ohms, 4/-. Do. Potentiometer, 4/6. Burndept, 4/6 to 7/6. McMichael, 4/6 to 7/6. Peerless 6 or 30 ohms, 2/6, Peerless Dual, 3/9.

COIL STACKS.—Lotus 2-way, 7/-; 3-way, 10/6; (extension handles extra). Polar 2-way, 6/-; 3-way, 9/6. Sterling Triple, 21/-. Kay Ray geared 2-way, 3/11. Back of panel, with knob and dial, 2/11. Panel 2-way, 2/-. Goswell, 3/-. Standard, 2/9. All makes stocked. Ebonite coil plugs, shaped brass sides, 9 for 3/6. Standard, 3 for 2/-. New Low Loss type, 2 for 2/-.

LISSEN PARTS.—Anode or Variable Grid Leak, 2/6 each; L.F. or H.F. Choke, 10/-; switches, D.P.D.T., 5 point Reversing, 4/- each; 2-way series Par., 2/9 each; Minor, 3/6; Major, 7/6; Universal, 10/6. Potentiometers or Wire Rheostat, 4/- each. Neutrodyne Condenser, 4/6.

L.F. TRANSFORMERS.—Ferranti A.F.3, 15/-; A.F.4, 17/6; Eureka Concert, 20/-; 2nd Stage, 21/-; Baby 1st or 2nd, 15/-; Reflex, 15/-. Formo shrouded, 10/6. Success (Black), 21/-. Royal, 20/-. Ormond newest model, 15/6. Wates' Supra, 10/6. Croix (newest model), 5/11. Marconi "Ideal," all stages, 30/- each. C.A.V., 15/-. Pye, 22/6. Gumbrell 2 stages, 25/6. Ideal Junior, 20/-. Lissen T3, 12/6; T2, 15/-; T1, 21/-. "Ace" Telsen L.F., 9/6, 12 months' guarantee U.S.A. super, 18/6.

EBONITE VARIOMETERS.—Ball Rotor, 4/6. Standard, 3/11. Duplex 5XX and B.B.C., 7/6. Tapped Variable Coupler, 200/800 metres, fine instrument, 8/11. Edison Bell, 10/6. West End depot for "MAGNUM" (Burne Jones). Baseboard Coil unit, 1/9. 2 coil type, L. or R., 9/6. 3-way, 12/6. Neutrodyne Condenser, 4/6. Anti-cap VH, 2/6. Vibro, 5/- Brackets, 2/- pr., 2½ x 1½, 3/- 3 x 3. Tapped coil for Simplicity or T.A.T., 8/- each. Kendall Low Loss Cross former, 3/-, adaptor, 1/- extra. Wave Trap Former, ABC, 5/6. H.F. Transformers, Neutrodyne, also 300/600, 550/1200, 7/- each.

SUPER SIZE AERIALS (Total length, 100 ft.).—Wire 49 Strands. Length 12 ft., width 4½ in. Ebonite Insulators, complete with rubber rings, ready to fix up, 4/6.

UNSOLICITED TESTIMONIAL

78, Copenhagen Road, Gillingham, Kent. 19/2/26.

Messrs. Raymond:

Whilst in town a short time ago I purchased 3 of your Low Loss Straight Line, etc., condensers, viz.: .0003, .0005, and .0005 with vernier. I banked up a straight one-valver, incorporating the .0005 without vernier. The results were absolutely astonishing, because I got a station with almost every degree of the dial. I got as far as Stockholm. The other stations were London (of course), Berlin, Bournemouth, Breslau, Brussels, Hamburg, San Sebastien, Paris, Hilversum and Daventry. I almost forgot to include Dublin. This station is rarely heard in this district, but it came in well on two pairs of phones. I have never used a better condenser and I felt that you would like to know. The hook-up was on a piece of board.

(Signed) A. BOWER.

POST FREE

VALVE HOLDERS.—BENJAMIN, 2/9; Lotus, 2/3; Apex, 1/6; Excelsior, 1/-; Sterling Non Pong, 4/3; Burndept, 5/-; Magnum, 5/-; 2/6; Bowyer-Lowe, 3/-; Atholl, 1/3; H.T.C., 1/6; 1/9; Aeromonic, 1/3; Bretwood, 1/9.

FIXED CONDENSERS.—Dubilier .0001, 2, 3, 4, 5, each 2/6. .001, 2, 3, 4, 5, 6, each 3/-. Grid Leak, 2/6. Edison Bell, .001, .0001, 2, 3, 4, 5, 1/-. .002, 3, 4, 5, 6, 1/6. .0003 and grid leak, 2/-. Dorwood .0003 with grid leak clip, 2/6. McMichael with clips, .0001 to .0005, 2/6 each; .001 to .006, 3/- each. Watmel, .0003 and grid leak, 2/6. List priced fixed condensers.

VARIABLE CONDENSERS.—Polar Standard, 10/6. Junior, 5/6 each. Bowyer-Lowe Popular, 10/6. Igranic, 24/-, 21/-. Collinson's Low Loss, 21/-, 20/-. Utility, 8/6, 10/9. Vernier 2/6 extra. Utility Low Loss, stocked .0003 and .0005. J.B. (Jackson Bros.), Square Law, .001, 9/6; .0005, 8/-; .0003, 7/-; with vernier, 4/- each extra. Geared, .0005, 15/-; .0003, 13/6; Low Loss, 10/6, 9/-. Ormond new geared friction drive, .0005, 15/-; .0003, 13/6. Low loss, .0005, 8/-; .0003, 7/6; with vernier 1/6 each extra. Ebonite ends same price. Newey 4 point, 15/-, 17/6.

FILAMENT RHEOSTATS.—Ormond 6 or 30 ohms, 2/6. Finston, 6 ohms, 2/3; 30 ohms, 2/6. Wates' Microstat, 2/9. Lissen Wire, 7 or 35 ohms, 4/-. Do. Potentiometer, 4/6. Burndept, 4/6 to 7/6. McMichael, 4/6 to 7/6. Peerless 6 or 30 ohms, 2/6, Peerless Dual, 3/9.

COIL STACKS.—Lotus 2-way, 7/-; 3-way, 10/6; (extension handles extra). Polar 2-way, 6/-; 3-way, 9/6. Sterling Triple, 21/-. Kay Ray geared 2-way, 3/11. Back of panel, with knob and dial, 2/11. Panel 2-way, 2/-. Goswell, 3/-. Standard, 2/9. All makes stocked. Ebonite coil plugs, shaped brass sides, 9 for 3/6. Standard, 3 for 2/-. New Low Loss type, 2 for 2/-.

LISSEN PARTS.—Anode or Variable Grid Leak, 2/6 each; L.F. or H.F. Choke, 10/-; switches, D.P.D.T., 5 point Reversing, 4/- each; 2-way series Par., 2/9 each; Minor, 3/6; Major, 7/6; Universal, 10/6. Potentiometers or Wire Rheostat, 4/- each. Neutrodyne Condenser, 4/6.

L.F. TRANSFORMERS.—Ferranti A.F.3, 15/-; A.F.4, 17/6; Eureka Concert, 20/-; 2nd Stage, 21/-; Baby 1st or 2nd, 15/-; Reflex, 15/-. Formo shrouded, 10/6. Success (Black), 21/-. Royal, 20/-. Ormond newest model, 15/6. Wates' Supra, 10/6. Croix (newest model), 5/11. Marconi "Ideal," all stages, 30/- each. C.A.V., 15/-. Pye, 22/6. Gumbrell 2 stages, 25/6. Ideal Junior, 20/-. Lissen T3, 12/6; T2, 15/-; T1, 21/-. "Ace" Telsen L.F., 9/6, 12 months' guarantee U.S.A. super, 18/6.

EBONITE VARIOMETERS.—Ball Rotor, 4/6. Standard, 3/11. Duplex 5XX and B.B.C., 7/6. Tapped Variable Coupler, 200/800 metres, fine instrument, 8/11. Edison Bell, 10/6. West End depot for "MAGNUM" (Burne Jones). Baseboard Coil unit, 1/9. 2 coil type, L. or R., 9/6. 3-way, 12/6. Neutrodyne Condenser, 4/6. Anti-cap VH, 2/6. Vibro, 5/- Brackets, 2/- pr., 2½ x 1½, 3/- 3 x 3. Tapped coil for Simplicity or T.A.T., 8/- each. Kendall Low Loss Cross former, 3/-, adaptor, 1/- extra. Wave Trap Former, ABC, 5/6. H.F. Transformers, Neutrodyne, also 300/600, 550/1200, 7/- each.

SUPER SIZE AERIALS (Total length, 100 ft.).—Wire 49 Strands. Length 12 ft., width 4½ in. Ebonite Insulators, complete with rubber rings, ready to fix up, 4/6.

SMASHING REDUCTIONS!!

CALLERS LINES NOW SENT BY POST
(INLAND ONLY)

Orders from these TWO Columns must be OVER 10/- in value, with 1/- per order extra for post and packing.

CASH WITH ORDER. NET PRICES. NO DISCOUNT.

AMERICAN TYPE BOXES.—Covered Leatherette, 12 x 8 x 8, 8/6; 16 x 8 x 8, 11/6; 18 x 8 x 8, 12/6. A Cheaper Line Stocked for Callers Only.

AERIAL EQUIPMENT.—Insulated Rubber Stranded Lead-in, per 10 yds., 1/3. Lead-in Tubes, 8d., 10d., 1/-. Twin Flex, Maroon, 12 yds., 1/4. Do. Red & Black, 12 yds., 1/6. Minature twin silk, 12 yds., 1/-. Heavy stranded Lead-in, 6 yds., 2/-. Copper Indoor, 49 strand aerial, 100 ft., 1/6. 7/22 Indoor full weight, 1/11, extra heavy, 2/3. Insulated hooks, 6 for 6d. Copper Earth Tubes, Climax Pattern, 2/11.

ACCUMULATORS.—Ignition Capacity. 2 v. 40 amp., 7/11; 2 v. 60 amp., 9/6; 2 v. 80 amp., 12/6; 2 v. 100 amp., 15/11; 4 v. 40 amp., 15/6; 4 v. 60 amp., 18/11; 6 v. 60 amp., 27/6; 6 v. 80 amp., 35/11.

SPECIAL CHEAP LINE.—4 v. 40 amp., 13/11; 4 v. 60 amp., 17/11; 6 v. 60 amp., 25/11.

AMPLIFIERS (L.F.).—Complete in Polished box, 16/11; 2 valve ditto, 32/6. Please say if for Bright or D.E. valves. No Royalty payable. Valves extra.

BATTERY BOXES 63-v.—Metal, take 14 batteries, 3/9. Leatherette ditto, 2/11. Both fitted Clips. Battery Testers, 4d. Bullseye Bulbs, 3d., 6 for 1/3.

BATTERIES, 60-v. H.T.—Fine value Empire, 6/11. Extra Long Life, "D," 8/11. B.B.C. Model, 8/11. Do. Extra large, 10/-. 36-volt, special, 5/6; 9-volt grid bias, 1/11, 2/3. (Tapped 1½ volts). 1.5 DRY-CELLS, 4½ in. by 2½ in., 1/9. (0.2 to 0.6 volts). All makes stocked.

BRASS PARTS, ETC.—Terminals, nut & washer. W. O. Pillar, phone, doz., 1/-. Nickel Ditto, doz., 1/6. Studs complete, ¼ by ¼, doz., 6d. Valve sockets, doz., 1/3. Spade or Pin screws, doz., 8d. Spade tags, doz., 2d. Nickel Soldering Tags, doz., 6d. Spades, Red & Black, 6 prs., 1/3. Switch Arms, 1 in. arm Brass, 9d.; Nickel, 10½. Do. 1½ in. arm, 8d. and 9d. Ampire tape, 12 yds., 6d. Panel Brackets, 6 in., pr. 1/-. Accumulator carrying cases, 2/3. Ormond Nuts and Screws 4 and 6 B.A., 6d. doz.

SWITCHES.—D.P.D.T. panel, 1/-. S.P.D.T. panel, 9d. On and off switch, 1/-. Double Switch, 2/-. Tumbler, 1/-. Push and Pull, 1/3.

CRYSTAL SETS.—Handsome design, for local or Daventry Station. Everything complete, ready to fix up, 18/11. Comprises Set, Coils, Headphones, Aerial Equipment. Extreme Value.

COIL PLUGS, ETC.—Ebonite shaped, Brass sides, 2 for 1/2. Standard, 6d. shaped with fibre, 2 for 1/3. Low Loss, "Kay Ray," Nickel sides, 10d. 2-way coil stand on base, 1/9. Ditto coil stand, nickel, 1/11. Both extension Handles. "Kay Ray" back of Panel 2-way with knob and dial, nickel, 2/6. Woodhall Pattern, 2-way geared Back of Panel Coil-holder, with knob and dial, 5/11.

SET OF 5 COILS (O'Keefe Patent).—Duplex wound, unmounted, 25/35/50/75/100, per set, 1/9.

COILS, MOUNTED (Inductance Type).—Very small, but sharp tuning, 25, 1/-; 35, 1/4; 50, 1/9; 75, 2/-; 100, 2/-; 150, 2/4; 200, 2/8; 250, 2/10; 300, 3/2.

VOLTMETERS, Dble. Rd'g. High and Low, 6/11. Single 0-6, 4/6. Best quality.

Lists of Parts Quoted For at Lowest Prices.

AMERICAN ORMOND PATTERN TYPE VARIABLE CONDENSERS.—Low Loss Model, Square Law, with knob and dial, .0003, 4/8.; .0005, 4/11. With Vernier, 1/- each extra.

COILS, MOUNTED, Air Spaced, perfect results.—25, 1/2; 35, 1/4; 50, 1/8; 75, 1/11; 100, 2/-; 150, 2/6; 200, 2/10; 250, 3/-; 300, 3/3; 400, 3/6.

COILS "KAY RAY" EBONITE CASED MOUNTED.—25, 2/5; 35, 2/6; 50, 2/8; 75, 2/9; 100 to 200, 3/11; 250, 300, 5/-.

UNMOUNTED DAVENTRY INDUCTANCE COIL with fixing wire for Inside use, 1/-.

CRYSTALS.—Neutron, 1/-. Shaw's genuine Hertzite, 8d.

DETECTORS on base, Enclosed Brass, 1/-. 1/3. Do. Nickel fittings, 1/6, 1/9. Micrometer, 1/9, 1/11. "Kay Ray" Permanent, 2/6 (one-hole fixing).

PLUGS AND JACKS.—Single open, 1/4; Single closed, 1/11; Double C., 2/6; S. Fil., 2/2; D. Fil., 2/11; Plug, 2/6.

BROWNIE NO. 2.—Latest model, 10/6. Complete with pair of high-class phones, 4,000 ohms, value 8/11. Aerial wire, lead-in, Daventry Coil, the lot, 18/11.

EBONITE PANELS 3/16.—For Crystal Sets, 6 x 6, 1/-; 7 x 5, 1/2; 8 x 6, 1/6; 9 x 6, 1/9.

EBONITE CUT TO SIZE.—While you wait, or posted. Best "Grade A" 3/16 at 4d. in., ¼ at 4d. sq. ins. Special Price Large Sizes.

FILAMENT RESISTANCES, "KAY RAY."—Dual with Dial, 2/3; 6 or 30 ohms, 2/3; Potentiometer, 2/3.

FRAME AERIALS.—New model, on base, directional well made, efficient, folds up in case, 17/6.

HEADPHONES, 4,000 ohms.—N. & K. Standard pattern, 8/11. Ditto Lightweight, 6/11. Adjustable, 10/11.

L.F. TRANSFORMERS.—Standard Ormond, 12/11. "Kay Ray," 5-1, 7/11. Croix, 5-1, 4/6. Wates Super Pattern, 7/11.

VALVES.—Guaranteed Genuine. For Unidyne Circuit, Phillips 4 pin, 8/11. Thorpe K.4 (5-pin), 8/11. 5-Pin Valve Holder, 1/-.

RADIO MICRO.—POWER 4-v., 10/9, SPECIAL, ".06," 7/6.

PHILLIPS VARIOUS.—Bright Emitter, 4 v., 2/9. .06 D.E., 3-3.5, 6/11, and 7/11. Power D.E., 4-6 v., 9/11.

VALVE HOLDERS.—Cheap line, 8d. Ebonite standard, 1/-. Excelsior, 1/-. Anticap, 1/-. Baseboard Nickel legs, 9½d., 10d., 1/- each, Lotus, Benjamin, Sterling, Bowyer Lowe, Magnum, etc.

VARIOMETERS FOR B.B.C.—Handsome Model, Ball Rotar, Ebonite Former, wound silk, 3/11. Our famous wound D.C.C. Grand Value, 1/11. Both with knob.

VERNIER CONDENSERS.—2 Plate, 2/3. Michrom, 2/3. Neutrodyne, 3/3. 3 Plate, 3/11.

TAPPED COUPLERS.—200/800 metres wound D.S. Beautifully made, 8/11. Ditto, S.P. for B.B.C., 9 x 9 x, 12/11. Complete with knob and dial.

SUNDRIES.—Adhesive Tape (black), 4d. Sets of 8 Drills, 1/3. Set of 5 Spanners, 6d. Set of Taps, 1/11. (O B A, 2, 4, 6 B A). Screwdrivers, 3d. Breast Drills, 0-½, 3/11. Soldering Irons, 8d. 2 B.A. Rod, 3 ft. 6d. Wander Plugs, pr., 3d. Extra quality pr., 4½d. and 6d. Valve windows, 6d. Basket Holders, 10½d. Extra quality 1/-. D.P.D.T. on china base, 1/3. S.P.D.T. on china base, 9d. and 1/-. 6-ft. Phone Cords, 1/3, 1/6. Loud Speaker Cords, 1/11.

WARNING!

This address is at the back of DALY'S THEATRE.

See K. RAYMOND'S name on Premises. This will assure you getting the goods I advertise.

Please ask: "Is this Raymond's."

K. RAYMOND

27 and 28a, LISLE ST., LEICESTER SQUARE, W.C.2

PHONE: GERRARD 4637.

1 minute LEICESTER SQUARE TUBE. Opposite DALY'S Gallery Door.

THE SUB-PANEL—ITS ADVANTAGES IN THE SET

THE original designers of most electrical and mechanical devices have but one object, that of making it perform certain functions, and they are not particularly concerned about the number of controls. But as the device is improved endeavours are made to reduce the number of controls so as to make it as simple as possible to operate, and we have many very complicated pieces of machinery and electrical apparatus which are operated entirely by a simple lever or push-button.

The earlier models of wireless receivers suffered from a multiplicity of controls. Let it be whispered that many a constructor put more knobs on his panel than were strictly necessary in an endeavour to impress his non-technical friends. But now we find that receivers are becoming very much easier to operate, and it is possible to obtain "one-knob-control" multi-valve sets.

There are several reasons for this tendency to simplification of control. Constructors have increased their knowledge, they are able to obtain more efficient parts at a lower price than formerly, so that they are able to afford a more ambitious set and do not have to extract the utmost capabilities from a few valves. Incidentally, there is far more credit in building a receiver which will give the desired results by simply turning one or two knobs which anybody can operate.

The reduction can, of course, be carried too far. The constructor who wants to make his receiver so simple that any non-technical member of his family can tune in the local station may decide to control all the valves by one rheostat But on evenings when he wishes to reach out for distant stations he will find individual rheostats of great advantage, and he may also have found that a variable grid leak is useful. Perhaps, too, he will wish to use one or two-power valves operating at a different voltage from the others, and separate rheostats then become essential.

A method which the writer has found very useful in the design of receivers intended to possess the utmost flexibility with simplicity of operation is the use of a concealed sub-panel. The main panel of the receiver he is at present using contains two variable condenser knobs, one rheostat and three jacks. The panel, consequently, is very neat and attractive, and the receiver very easy to operate. But below the main panel is another of the same length, but only a few inches wide. This sub-panel bears the individual rheostats, variable grid leak, certain switches and terminals, permitting of different circuits being used. Normally it is concealed by a door on the cabinet, but when the desire for distance comes, then it can be opened, and nothing has been lost by making the receiver extremely easy to operate for normal "family" use.

It is not necessary to give any details of construction, as the idea can be adapted so easily to suit different types of receivers, but the writer can confidently recommend sub-panels for those wishing to combine simplicity with flexibility of control.

R. H. B.

IS THERE A HEAVISIDE LAYER?

THE Heaviside layer does not, in many respects, afford a wholly satisfactory explanation of the fact that radiated ether waves follow the curvature of the earth instead of taking a straight path into outer space as they might reasonably be expected to do. In the first place, if it is to act as a true reflecting surface, the layer must be a practically perfect conductor, which in itself is inconsistent with any of the ionisation theories put forward to account for its formation. Moreover, such high conductivity would lead to heavy losses by absorption, and this is contrary to the long-distance results obtained with low-powered short-wave transmission.

According to Larmor and Meissner it is not necessary to assume the existence of a definitely localised zone of ionisation, such as the Heaviside layer, to explain the curved path of the waves. Their theory is that the "ionisation density" of the atmosphere increases gradually with its height above sea level, and that the upper wave front is bent back by refraction (just as a ray of light is bent when it penetrates an optically denser medium), until finally it again reaches the earth's surface at some distant point.

Professor Pickard has also recently pointed out that the permanent-magnetic field stretching between the North and South Poles may assist in imparting a curved path to the ether waves in much the same way as a ray of polarised light is refracted when passing across the poles of an electro-magnet, as was first discovered by Faraday. Light-rays are also refracted by the action of a transverse electrostatic field (the so-called Kerr effect), and it is possible that short-wave radiation, which is intrinsically the same form of energy as light, may be similarly affected by the electrostatic field associated with the earth.

L. M.

"RECEIVING ON A COUNTERPOISE" (*continued from page 560*).

This consists of four or six insulated wires arranged directly under a single-wire aerial. This was employed in a garden containing a number of trees and bushes which were too high to allow a counterpoise to be placed over them, in which case the cage was arranged over the path. It is interesting to note, however, that in this particular case the results obtained were not so good as those obtained from parallel wires as previously described. This was no doubt due to the fact that the experiment was conducted in the spring, when the sap in the bushes was well up, which tended to screen the counterpoise with semi-earthed bodies.

The wire used for constructing the counterpoise should preferably not be thinner than about No. 18 gauge, and, if desired, ordinary 7/22's aerial wire answers the purpose extremely well. It has previously been mentioned that the lead-in from the counterpoise should be very well insulated, and, as with the aerial down-lead, must be kept as far from the wall as possible. If it has to be brought into proximity with the window frame, heavy rubber-covered wire should be employed.

Instead of using a stand-off type of insulator, shown in Fig. 3, ordinary shell or similar types may be employed with a stay wire connected to some convenient hook. Where experiments are made with a counterpoise, and there is any liability of the counterpoise wire to come into contact with the flowers or bushes, well insulated wire should be employed for the whole length. A multi-strand rubber-covered flexible wire is very convenient for this purpose.

The effect of the counterpoise, of course, is that it considerably lowers the natural wavelength of the aerial system. This means that a large-sized tuning coil will be required. A counterpoise is sometimes found preferable for receiving short waves where a bad earth gives more trouble than with long-wave reception. Probably the most marked effect which the reader will find is that the substitution of the counterpoise for an earth connection very considerably reduces the damping of the aerial system. This results in very much sharper tuning, and, moreover, the set will oscillate more freely.

PAUL D. TYERS.

SOILED HANDS—A HINT

THE wireless amateur will appreciate the new soap powder recently marketed by Messrs. Vinolia in 6d. and 10½d. sprinkler-top tins. When smoothing the edge of ebonite or doing a job of soldering the hands easily become soiled. A little of the soap powder is sprinkled on to the hands and moistened with water, and the dirt and grease is at once removed. The powder is equally effective in hard, soft, salt or pond water, and every craftsman ought to have a tin handy. It is obtainable from any chemist.

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM, 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 308 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 324.5 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 323.5 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 304 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily (exc. Sun.), 7.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. G.M.T.*

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 535 m. (temp.) (10 kw.). 10.00, con. (almost daily); 14.30 con.; 18.25, news, weather, time sig., con., lec., news; 19.00, con.; 21.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 19.10.

BELGIUM.

Brussels, 262 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 19.00-22.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 09.00, con., news (Sun.); 18.00, lec., con. or dance daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 14.30, lec.; 16.30, children; 19.00, play; 20.15, news, con.; 20.5, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.): 19.00, lec., con., news, con.; 20.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 08.00, sacred service; 16.30-20.30, same as Copenhagen; 19.00 (Wed., Thurs.), lec., con., news, orch.

Hjoerring, 1,250 m. (1.5 kw.).*

Odense, 810 m. (200 w.).*

Sorö,* 1,150 m. (1½ kw.). Also occasionally relays 5XX from 22.00 G.M.T.

* Relay Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 17.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 20.10, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 260 m. (500 w.).

***Bordeaux**, 410 m.

* Relays of PTT Paris.

Montpellier, 238 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 308 m. (300 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 08.00, sacred con. (Sun.); 10.00, con. and tests; 11.55, time sig., news, weather; 14.00, educ. hour (Sun.), markets, time sig.; 16.00, orch.; 19.30, con., weather, news, time sig., dance music until 23.00 (nightly). Relayed on 1,300 m. by Königswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 10.30-11.50, relays Berlin (Sun.); 14.00, lec. (daily); 17.30, relay of Berlin (Vox Haus) con. (daily); 2,525 m. (5 kw.), Wolff's Buro Press Service: 05.45-19.10; 2,880 m.: Telegraphen Union: 07.30-18.45, news. 4,000 m. (10 kw.): 06.00-20.00, news.

Breslau, 418 m. (4 kw.). 11.00, con. (daily); Divine service (Sun.); 11.55, time sig. (Sun.), weather, Stock Ex., news; 15.00, children (Sun.); 16.00, con.; 18.00, lec.; 19.30, con., weather, time sig., news; 20.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.55, time sig., news; 11.55, Nauen time sig.; 15.00, con. (Sun.); 15.30, con.; 17.00, markets, lec.; 19.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (230 m.). Sundays: 06.25, time sig., weather, news, lec.; 08.15, sacred con.; 12.15, con.; 17.00, con.; 18.15, sports, weather, con. or opera, dance. Weekdays: 05.55, time sig., weather; 06.00 and 06.30 news, weather; 11.55, Nauen time sig., news; 13.00, weather, con.; 15.15 and 17.00, con.; 18.00, lec.; 18.55, weather, con.; 21.00, dance (daily, exc. Tues.).

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., weather, news; 15.30, con.; 16.00, con. (Sun.); 18.30, lec.; 19.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 07.30, sacred con. (Sun.); 10.00, educ. hour (Sun.); 11.00, con. (daily); 11.55, Nauen time sig., news; 15.30, con., children (Wed.); 19.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 10.30, lec., con. (Sun.); 13.00, time sig., news, weather; 15.00, orch. (Sun.); 15.30, con. (weekdays); 17.30, con. (weekdays); 18.15, lec.; 18.30, con. (Sun.); 19.30, con.

Münster, 411 m. (2½ kw.). Relayed by Elberfeld (259 m.); Dortmund (283 m.). 10.45, Radio talk, Divine Serv.; 11.00, news (Sun.); 11.30, news (weekdays); 11.55, Nauen time sig.; 14.30, news, time sig.; 15.00, con.; 16.00, children (Sat.); 18.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 23.00 and 03.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 10.30, con. (Sun.); 15.30, con. (weekdays); 16.00, con. (Sun.); 17.30, time sig., news, lec., con. (daily); 20.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 07.15-16.10 (exc. Mon. and Sat., when 1.10-11.10), news, Stock Ex.

Hilversum (HDO), 1,056 m. (2½ kw.). 09.40, sacred service (Sun.); 19.50, con.; 21.40, news, etc. Will shortly test on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 550 m. (2 kw.). 08.00, news; 11.00 and 14.00, weather, news; 16.00, dance music; 19.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 18.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 21.30-23.30.

ITALY.

Rome (1RO), 425 m. (2½ kw.). 09.30, sacred con.; 12.15, official communiqué; 16.00, children; 16.30, relay of orch. from Hotel di Russia; 16.55, news, Stock Ex., Jazz band; 19.30, news, weather, con.; 21.15, late news, Jazz band. Testing on 425-430 m.

Milan, 320 m. (2 kw.). 19.00-24.00, con.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 16.00, news (daily), con. Tues., Thurs., Sat.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 20.00-21.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 10.00, Divine service (Sun.), Stock Ex. (weekdays); 12.15, markets; 18.15, news, time, lec., con.; 21.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Aalesund, 515 m.

Bergen, 358 m. (1½ kw.). Testing.

POLAND.

Warsaw, 380 m. (700 w.). Daily: con., 17.00-19.00.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). Con.: 17.30-24.00 (almost daily).

Madrid (EAJ4), 340 m. (1 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). News, lec., con., 17.00-21.00 (Sun.), 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-24.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 21.00 or 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m (2 kw.). Daily: 22.00-24.00, con. (daily).

(*Concluded on page* 576)

"BROADCAST TELEPHONY" *(cont. from page 574)*

Cadiz (EAJ3), 360 m. (550 w.). 19.00-21.00 con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. Daily: 19.00-22.00, con.

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. Daily: 19.00-22.00, con.

San Sebastian (EAJ8), 343 m. (500 w.). Daily: 17.00-19.00, 21.00-23.00.

Salamanca (EAJ22), 400 m. (1 kw.). 21.00, con. daily.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 10.00, sacred service (Sun.); 11.30, weather; 13.00, con. (Sun.); 16.00, children (Sun.); 17.00, sacred service; 18.00, lec.; 20.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Joenkoeping (SMZD), 265 m.; Karlsborg, 1,250 m.; Karlstadt (SMXC), 221 m.; Linkoeping, 467 m.; Malmo SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 218 m.; Sundsvall (SASD), 540 m.; Trollhättan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 340 m.; Helsingborg, testing.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 19.00, lec., con. (daily).

Zurich (Höngg), 515 m. (temp.) (500 w.). 10.00, con. (Sun.); 11.00, weather; 11.55, Nauen time sig., weather, news, Stock Ex.; 12.30, piano soli; 16.00, con. (exc. Sun.); 17.15; children, women; 18.00, news, weather; 19.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 19.15, con. (daily).

Berne, 434 m. 09.30, organ music (except Sat.); 15.00, 19.30, con.

Basle, about 400 m. Testing.

CHIEF EVENTS OF THE WEEK

SUNDAY, APRIL 11

London	4.0	The Besses o' the Barn Band, conducted by Harry Barlow.
London	9.15	Light Symphony Concert.
Birmingham	3.30	Orchestral Concert.
Bournemouth	3.0	Concert and Organ Recital.
Glasgow	3.30	Symphony Concert.
Manchester	4.40	Chamber Music.

MONDAY

London	8.30	The B.B.C. Spring Series of Chamber Concerts.
Birmingham	8.0	Snaps and Snatches.
Bournemouth	8.0	Winter Gardens Night.
Cardiff	8.0	The Besses o' the Barn Band.
Glasgow	8.0	The Pianoforte Sonatas of Beethoven
Newcastle	8.0	Concert relayed from the Wingrove Hospital.
Newcastle	9.30	The Station Repertory Company in *Elegant Edward*.

TUESDAY

London	9.5	A Spring Programme.
Daventry	8.0	Concert Party.
Daventry	9.0	Concert by the Hotel Majestic Celebrity Orchestra.
Aberdeen	8.30	A Procession of Ballets.
Birmingham	8.0	Lightsome Music.
Glasgow	9.0	Variety.
Bournemouth	8.0	Operatic and Orchestral Programme.
Belfast	8.0	Light Orchestral Programme.
Manchester	8.0	The Besses o' the Barn Band.

WEDNESDAY

London	7.30	The Band of the Royal Marines (1st Division).
London	9.0	A Syncopated Concert.
Aberdeen	8.0	Scottish Programme.
Birmingham	7.30	Organ Recital relayed from the Town Hall.
Birmingham	8.45	Mainly Ballads.
Bournemouth	8.0	Popular and National.
Cardiff	8.0	Muses' Medley.
Edinburgh	8.0	Music, Drama and Some Humour.
Glasgow	8.0	Song and Pianoforte Recital.
Hull	8.0	Popular Night.
Liverpool	8.0	Request Night.
Newcastle	8.0	A Popular Concert.
Nottingham	8.0	A Tour of the Relay Stations.
Plymouth	8.45	Variety.
Sheffield	8.0	Nottingham Visits Sheffield.

THURSDAY

London	8.0	The Roosters.
Aberdeen	8.17	Vocal and Pianoforte Recital.
Cardiff	8.0	English Song: On Its Voyage Through the Ages.
Glasgow	8.0	Orchestral Concert.
Manchester	8.0	*The Web*

FRIDAY

London	8.0	*La Traviata*.
Aberdeen	8.0	Light Orchestra Programme.
Bournemouth	8.0	Mozart—Beethoven—Brahms
Belfast	8.0	Light Orchestral Programme
Glasgow	8.0	The Besses o' the Barn Band.
Manchester	8.0	Symphony Concert.
Newcastle	8.0	Music of Many Periods.

SATURDAY

London	9.0	4th Edition of *Listening Time*.
Aberdeen	8.0	An Hour in the Orient.
Birmingham	8.0	Sea Music.
Cardiff	8.0	"It's All Wrong."
Glasgow	8.0	Musical Comedy Selections.
Manchester	9.0	Instrumental and Vocal Programme.
Newcastle	8.0	Popular Classics.

"An Auto-coupled Two-valver." Constructors of this two-valver (described in No. 199) should note that the tuner employed is covered by Patent No. 235312, of which the Igranic Electric Co., Ltd., are the sole licensees.

Authorities in the west of Scotland admit that the schools are deriving considerable benefit from the education talks broadcast from Glasgow. During the summer term addresses on travel figure largely on the broadcast syllabus, while towards the end of the school year it is intended to produce scenes from the *Merchant of Venice* and other Shakespearean plays.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. GEORGE BALFOUR asked the Prime Minister whether his attention had been called to a speech broadcast by the B.B.C., advocating the Government electricity proposals as "Socialism in small doses"; whether he was further aware that on the same occasion the Chief Electricity Commissioner, Sir John Snell, in a speech delivered by him and broadcast, advocated the Government proposals; whether political propaganda was permitted in terms of the licence of the British Broadcasting Company, and what disciplinary action he proposed to take in connection with the action of the Chief Electricity Commissioner engaging in political propaganda in connection with legislation pending in the House and closely identified with the executive functions of the Electricity Commissioner.

Mr. Baldwin: "I have read the report of the speeches delivered on the occasion referred to. Permission was given for broadcasting on this occasion in accordance with the usual practice as regards public dinners and upon the usual understanding that the speakers would refrain from controversial statements of a political character. As regards Sir John Snell, I am informed that he gave a review of the electrical position in this country, and stated his view as to the line of technical improvement desirable. His only reference to politics was a statement that a Bill embodying the scheme was before Parliament, and it was not for him to hazard any opinion as to how it would emerge. He further appealed to the electrical experts present to give constructive criticism. I do not think that these references to Parliament in an after-dinner speech can be considered to be political, and I am assured by Sir John Snell that in his speech he was dealing with a technical problem in a technical manner."

AN OFFICIAL SHORT-WAVE TRANSMITTER FOR BERLIN

THE German Reichspost proposes to instal at the Berlin-Witzleben station a wireless telephony transmitter to work on a wavelength below 100 metres, as the authorities consider this would be of considerable help to all listeners both at home and abroad who are studying the peculiarities of short-wave transmissions. It is hoped to get the installation in full working order within the next two or three weeks, when the evening programmes of the Berlin Voxhaus studio will be broadcast on the short wave. J. G. A.

TRADE NOTES AND NEWS

THE General Electric Co., Ltd., has added another unit to their range of slow-motion variable condensers. The new addition has a maximum capacity of .0001 microfarad.

Using Mullard 0/150 transmitting valves, Mr. J. W. Riddiough (G 5 S Z) has succeeding in working with O-A 4 Z, Cape Town, South Africa. A power of only 24½ watts was employed.

Battery chargers for use on A.C. circuits are described in a folder we have received from The Carpax Co., Ltd., of 312, Deansgate, Manchester.

A cabaret performance by the Chez Fyscher Company from Paris will be relayed to 2 L O on April 9.

Part of the ancient liturgy of the Greek Church, sung by a special choir of Greek singers, will be simultaneously broadcast from London and Daventry on April 18.

Activity in Brazil amongst wireless amateurs is proved by the number of transmissions from that country now being heard in England. The wavelength employed is generally between 30 and 40 metres.

Owing to the fact that a number of nations have declined to give their support the International Radio Conference has been indefinitely postponed.

FELLOWS WIRELESS

FELLOWS COILS

The Fellows Coils have justly earned the reputation of being amongst the most efficient on the market. Besides having particularly low self capacity and low losses, they are effectively encased in crystalate and will, therefore, stand even rough handling without fear of damaging the windings.

They are made in a complete range to cover all ordinary wavelengths as below:

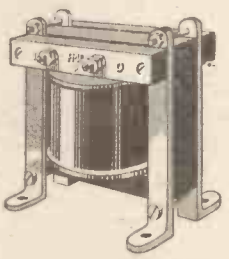
Coil No.	Wavelength	Price
B 1	250 — 400	3/-
B 2	320 — 545	3/-
B 3	370 — 660	3/-
B 4	560 — 930	3/-
75	600 — 1,100	3/6
100	870 — 1,500	4/3
150	1,340 — 2,520	4/6
200	1,800 — 3,350	4/9
300	2,460 — 4,200	5/-
400	4,000 — 5,750	5/6
500	5,500 — 10,000	6/-

The wavelength test was made on a standard P.M.G. Aerial with a 0.00075 mfd. condenser in the aerial circuit. When ordering please enclose 3d. postage for each coil.

Write for 44-page Illustrated Catalogue No. 11 Free

THE FELLOWS "SUPER" TRANSFORMER

The name Fellows has stood for pre-eminence in the making of magnetos and transformers for over 20 years, and to-day there is no better transformer on the market than the Fellows "Super" at any price.
Low self capacity, complete absence of distortion, made of the highest grade materials, this transformer represents the finest value for money that the Wireless industry has to offer. Send for one to-day and you will be amazed at the results.



Price **15/6**

Postage 6d.

All our apparatus is fully guaranteed and is sent on SEVEN DAYS' APPROVAL against cash. Remember that our policy of selling to you direct enables us to save you 6/8 in the £1 and still maintain the high quality for which we have always been famous.

FELLOWS WIRELESS — THE STAMP of QUALITY and VALUE

BUY BY POST AND SAVE MONEY

THE FELLOWS MAGNETO Co., Ltd.
CUMBERLAND AVENUE, PARK ROYAL, N.W.10

Branches:
LONDON: 20 Store St., Tottenham Ct. Rd., W.C.1. (Museum 9200)
CARDIFF: Dominions Arcade, Queen Street. NOTTINGHAM: 30 Bridlesmith Gate (Nottingham 5551)

E.P.S. 223

MATCHED TONE HEADPHONES

IF you're fond of sitting up in the wee sma' hours to stretch a hand across the world, Matched Tone are extremely able confederates. With radio you span continents and with Matched Tone it becomes easier, "comfier" and much more efficacious. Distant signals stand out clearly; Matched Tone grope in the ether with unfailing accuracy. The specially matched receivers make them super-sensitive and tone perfect. You are logging a new call-sign every day with Matched Tone.

20/-

Table-Talker	*Brandola*	*Audio Transformer*
30/-	90/-	17/6

Brandes

Brandes Limited, 296, Regent Street, W.1

From any good Dealer

34/563 B. SERVICE ADVERTISING

The Communal Aerial

SIR,—I feel sure that the following will be of interest to your readers.

A friend of mine in Berne (Switzerland) writes me that he is sharing an Electron aerial with two other tenants in the same block of flats.

They all have perfect reception with crystal sets. The aerial is tapped at each end and in the centre.

He would be interested to know whether anyone has had or heard of a similar experience in this country.—A. S. (London, E.).

The H.T. Problem

SIR,—With reference to THERMION'S difficulty regarding H.T. supply, I would suggest for his consideration the use of a wet H.T. battery composed of small cells of the sac-Leclanché type. Several firms market them, and personally I have found them very satisfactory.

In case THERMION or any of your readers are considering the adoption of a battery of this kind, the following hints, based on practical experience, may be useful.

As with dry batteries, very small cells should be avoided. Within practical limits the bigger the cells the better, and the more economical in the long run. I should put the life of a wet H.T. battery of good-sized cells at two years, provided that they are properly looked after. Recharging with fresh sal-ammoniac solution will not be required oftener than every four months or so, and the cost of recharging a large battery is negligible, though the labour is considerable. When purchasing, see that the zinc plates are of adequate size and thickness. In filling them, the greatest care should be taken that no solution gets anywhere except *inside* the cells. It is best to use for filling an ordinary fountain-pen filler fitted with a large bulb. The sal-ammoniac solution must not be saturated, or even nearly so, as any evaporation, or even a fall in temperature, will cause deposition of crystals and may start troublesome creeping. On no account should one of these batteries be assembled without separators between the cells. Strips of thick cardboard shellacked and baked, or soaked in melted paraffin-wax, and then arranged in criss-cross layers between the cells, are satisfactory and easily made.

While on the subject of H.T. batteries, I should like to add that some of the H.T. accumulators on the market are of too small a capacity for satisfactory use where the demand for H.T. current is fairly considerable, as charging is required much too frequently. There seems to be an idea rather prevalent that because the makers of H.T. accumulators state, with perfect truth, that their batteries will hold a charge for six months that they will *supply current* to a receiving set for six months without recharging, absolutely regardless of the capacity of the accumulators, the H.T. current taken by the set, and the average number of hours it is used per day. This is, of course, utterly absurd. H.T. accumulators should be tested regularly with the *only* reliable instrument for the purpose, a hydrometer, and recharged *whenever the hydrometer shows that they require it,* whether this be every three months or every ten days.—J. H. S. F. (Llandudno Junction).

Other Correspondence Summarised

REX (Wood Green) writes us that he thinks the gullibility of enthusiasts really colossal. He saw four people buy some coloured varnish in a market for 1s. which was *guaranteed* to increase signal strength if painted on the earth wires!

"The Season's Overhaul of the Small Car" is the title of the first of a short series of articles appearing in the current issue of THE AMATEUR MECHANIC AND WORK (3d.), and deals with the engine and its accessories. Other articles in the same number are: "Making Cardboard Vases," "Woodworm in Furniture: Its Causes, Prevention and Remedies," "Making a Photographic Enlarger," "Making an Embossed Leather Blotting-book," "Roof and Window for a Portable Workshop," "A Wireless Telephone-distribution Board," "A Two-way Plug-in Coil Holder," "A Simple Dressing-chest and How to Make It," "Dies for Drawing Fine Wire," "A Dual-ignition Device for Internal-combustion Engines," "A Dog for Removing Slide-rest Handles," "Choosing a Small Camera," "Starting a Two-stroke Motorcycle."

A new West End telegraph office has been opened by Marconi's Wireless Telegraph Co., Ltd., at 20, Duke Street, Piccadilly, where telegrams may be handed in for transmission to France, Spain, Austria, Canada, the United States and other parts of the world.

WHEN BUILDING YOUR SUPER-HET!

Points to watch for economy and efficiency

PERHAPS the sole drawback in the building of a super-het is the heavy initial cost, as this is a serious matter with most amateurs. The various components are somewhat costly; the transformer kit alone comes to several pounds. Fortunately most of the other parts may be taken from previous sets, and a considerable saving effected in this direction.

The Number of Valves

Before starting the actual work of construction the owner must decide how many valves are to be used. It does not pay in the long run to cut down the number of amplifiers. By so doing there is every chance of losing the chief advantage of a super-het. Not less than six valves will be required; the first and second detectors, three stages of H.F. amplification and the oscillator. For loud-speaker reception a note magnifier must be added. This is the standard combination, and amateurs are not advised to attempt any alterations.

Be careful to buy a suitable transformer kit. Keep to apparatus which is guaranteed to work in conjunction with British valves. On no account should the amateur attempt to wind his own transformers. It is difficult for him to do this properly, as the transformers must be exactly matched.

Low-loss tuning condensers are a great advantage to every set, and particularly so in the case of the super-het, which derives its energy from a small loop. There are several good low-loss condensers now on the market at a moderate price. It is equally important to provide some kind of vernier tuning for the grid and oscillator circuits. The super-het is so very selective that stations may be easily passed over if the condenser dials are turned too quickly.

Grid Leak Values

Another important point is the resistance of the first grid leak. The first detector valve of a super-het has to deal with such very small currents that the ordinary resistance is much too low. Five megohms is the best value for most valves. The second valve requires the usual 2-megohm leak.

Follow the conventional panel layout; that is, the rheostats and tuning controls on the front of the panel, and the rest of the components on the baseboard. The valves will go at the back of the panel together with the terminal block. Take care to provide different H.T. terminals for the first and second detectors respectively, as well as the amplifying valves and oscillator, also for subsequent stages of note magnification. If this rule is not followed there is every chance of failure, because the H.F. valves will not oscillate without sufficient plate voltage. On the other hand, if the voltage is too high the oscillation will be uncontrollable. The obvious moral is to have different tappings for the various valves. It is equally necessary to place a large condenser across each pair of H.T. terminals in order to by-pass the high-frequency currents. When soldering the connections be very careful to make really sound joints. Keep the grid and plate leads as short as possible and well separated from the other wiring. Build the set with the best components.

Do not be surprised if at first the results are not entirely satisfactory. Good results depend very largely upon good tuning, and the knack takes some little time to acquire.

G. J. M.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS CABINET, solid oak, extraordinary bargain. Photo and price, Edwards, Ingham Street, South Shields. [63

IS THERE AN ALL-PURPOSE RECEIVER?

ONE of the most difficult problems which troubles the amateur is that of deciding which circuit will fulfil most of his requirements. Consider, for instance, the experimenter living within ten or fifteen miles of 2 L O. Three or, with a good aerial, two valves will give him good loud-speaker strength from the local station, and these valves can be arranged in several different ways. Probably his receiver will be used chiefly for the reception of 2 L O, and he will wish to obtain the utmost purity with simplicity of operation, so that other members of his household can switch on and off if necessary.

Then there will be times when the Daventry programme is preferred and at others the desire will be for distant stations, so that the receiver must possess range and selectivity. Possibly for such work the experimenter will be prepared to use additional valves.

Is there a circuit which will fulfil all these requirements satisfactorily and economically? Let us consider some of the circuits which can be used for the different conditions of reception.

With a good aerial, a crystal followed by a two-valve amplifier will be economical, simple to operate and capable of very pure loud-speaker reproduction. It should also receive Daventry satisfactorily, although signals may not be so loud and a valve detector may be preferable. But with a crystal its possibilities end here, and for DX work a valve detector becomes necessary, whilst some experimenters will wish to use one or more stages of H.F. If, on the other hand, distant reception is considered first and H.F. stages are incorporated, the receiver will be too powerful for reception of the local station.

The most obvious solution of the difficulties is the use of switches, but switches, except in the L.F. portion, are undesirable; they take away some of the simplicity of operation and can cause a loss of efficiency.

If H.F. stages are incorporated and switches are not used, a frame or low indoor aerial can be used for local reception, but this is not economical.

Another method is to use two separate sets, one for local and the other for distant reception. But in this case it means changing over valves, batteries, aerial and earth and phones, a fairly tiresome occupation if it becomes too frequent, and productive of risk to the valves. H. B.

Croydon Wireless Society

Hon. Sec.—MR. H. T. P. GEE, 51, Chancery Lane, W.C.2.

MR. DENT, of the Igranic Electric Co., Ltd., demonstrated on March 8 the undoubted superiority of the super-heterodyne, as regards selectivity, on a six-valve set kindly lent by the above company. He gave a detailed account of the instrument, and followed by obtaining loud-speaker reception from 2 L O, Daventry, Brussels, and some other continental stations.

On March 22 members spent an interesting evening trying out a two-valve short-wave set, modelled on the Reinartz principle, which had been made by Messrs. Iserby and Pearson. Results proved highly satisfactory and some foreign stations were logged on the low wavebaud.

Radio Association: West London Branch

Hon. Sec.—THE HON. CHR. M. DE ADLERSPARRE, 37, Talgarth Road, West Kensington, W.14.

ON March 2 over a hundred members and their guests spent a most enjoyable evening when the West London branch held their fortnightly social function and wireless debate. All who are interested in this new attempt to combine social radio activities with technical radio activities are invited to communicate with the secretary.

Preston and District Radio Research Society

Hon. Sec.—MR. J. B. COOKSON, 14, Lune Street, Preston.

A LECTURE on "Low Frequency Amplification" was given on March 12 in St. George's Hall by Mr. A. Hall, A.R.C.Sc. Dr. T. H. C. Derham occupied the chair, and there was an attendance of about two hundred. The lecturer explained the benefits and disadvantages of various methods of low-frequency amplification, and showed that the most power per valve can be obtained when transformer coupling is used

Manchester Radio Society

Hon. Sec.—MR. GEO. C. MURPHY, Meadow View, The Cliff, Hr. Broughton, Manchester.

ON February 24 a lecture on "Resistance-capacity Coupling" was given by Mr. W. Symes. The lecturer went into the theory involved in this method of coupling, and also he showed that it was possible, without using excessive H.T. voltages, to operate a resistance-coupled amplifier, using anode resistances of the order of 1-megohm and grid leaks of about 3 megohms. His lecture was accompanied by a demonstration employing a crystal detector, followed by two resistances of 750,000 ohms each, and a plate voltage on each valve of about 120.

On March 3 a debate took place between Mr. Bird, chief engineer of 2 Z Y, and Mr. J. Baggs on "Transformer v. Resistance-capacity Coupling."

As a sequel to the debate which took place on March 3 a practical demonstration was given on March 17. A crystal set was used for detection, being adjusted to give the same input when used with either a resistance or a transformer coupled amplifier.

City of Belfast Y.M.C.A. Radio Club

Hon. Sec.—MR. J. J. COWLEY, 4, St. Paul's Street, Belfast.

ON March 10 Mr. Alan Andrews, the chief engineer of the B.B.C. station at Belfast, lectured on "Broadcasting." He explained, in an interesting manner, the system of broadcasting from the studio to the aerial, detailing the methods of control, amplification, etc., and the difficulties that had to be contended with in outside broadcasts.

Southport and District Radio Society

Hon. Sec.—MR. G. C. MURPHY, Meadow View, The Cliff, Hr. Broughton, Manchester.

ON March 12 a lecture was given on "General Radio Theory and Practice" by Mr. J. Baggs. He discussed the relative advantages of grid leak and anode rectification, and made some remarks on the types of valve to be employed in each portion of a receiver and amplifier.

Golders Green and Hendon Radio Society

Hon. Sec.—LT.-COL. H. A. SCARLETT, D.S.O., 357A, Finchley Road, N.W.3.

AN instructive lecture on "Valve Characteristic Curves and Their Interpretation" was delivered by Mr. L. F. Fogarty, M.I.E.E., on March 18. The lecturer showed the importance of knowing how to get the best out of valves, and illustrated his remarks by means of diagrams. He also gave a lucid explanation of how the valves behaved under different conditions, and detailed the characteristics required for each type of valve.

Bristol and District Radio Society

Hon. Sec.—MR. S. J HURLEY, 46, Cotswold Road, Bedminster, Bristol.

THE society held its usual weekly meeting at the Physics Theatre, University, Bristol, on Friday, March 6, when the chairman, Mr. W. A. Andrews, B.Sc., A.I.C., M.I.R.E., gave an interesting lecture on the construction and operation of short-wave receivers.

A lecture on "The Attainment of Sensitivity, Selectivity and Responsiveness" was given at the Bristol University on March 12 by Mr. Oswald Carpenter, A.M.I.R.E. The lecturer described efficient methods of "Detection and Rectification," passing on in easy stages to tuned anode, high-frequency, and neutrodyne methods to the supersonic-heterodyne principle.

On March 19 Mr. Johnson demonstrated his motor-car set consisting of a special portable eight-valve supersonic heterodyne receiver. The set was attached to a frame aerial, and also to a wire stretched across the room, when it gave very good results.

Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS Agency Limited, Saturday, April 10, 1926.

CHOOSING A CRYSTAL FOR SELECTIVITY

A ONE-DIAL FOUR-VALVER

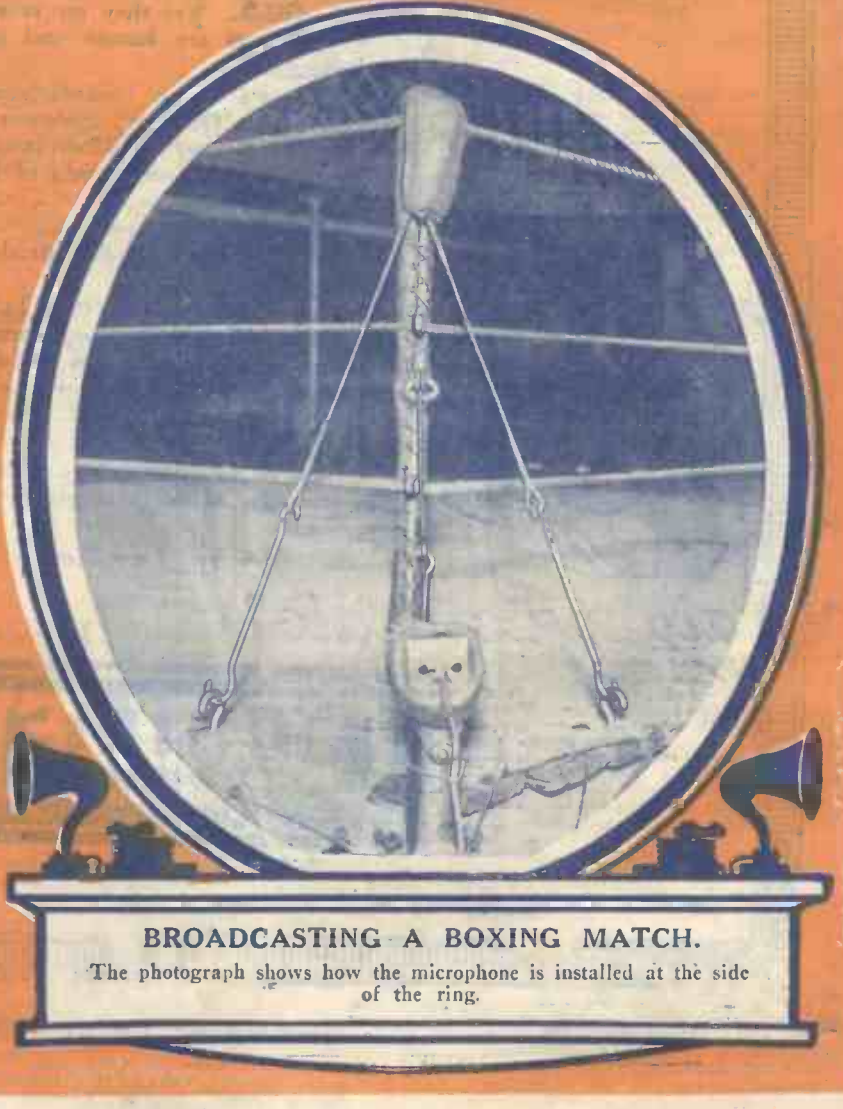
Amateur Wireless And Electrics

Vol. VIII. No. 202 SATURDAY, APRIL 17, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.



BROADCASTING A BOXING MATCH.

The photograph shows how the microphone is installed at the side of the ring.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. VIII. No. 202 — Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E. — APRIL 17, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher. "Amateur Wireless," La Belle Sauvage, London, E.C.4.

THE COMPROMISES OF WIRELESS

THERE is an old saying that unless you are careful you are liable to lose on the swings what you gain on the roundabouts. In the designing of wireless components or of a complete receiving set one finds oneself continually up against the "swings and roundabouts" problem. No set can be completely and entirely efficient; there must always be losses of some kind however we make our components or arrange our circuits. The main business of the designer is to see that he gains just a little more on the "swings" than he loses upon the "roundabouts."

High-frequency Amplification

Take, for example, the case of high-frequency amplification. In theory we should be able to obtain enormous amplification per stage; in practice we find that we are doing very well if we effect a voltage magnification of 2 with the first H.F. valve and rather less with the second. If we eliminate losses and damping in every possible way we shall produce an amazingly sensitive circuit—but it will be so hopelessly unstable that for practical purposes it will be of no value at all. The high-frequency valves will burst into oscillation upon the slightest provocation; actually they will fall into this condition long before we have sharpened our tuning sufficiently to produce even a fraction of the amplification that is theoretically obtainable. The set must be "held down" in some way; and whatever form of stabilising we may use seems eventually to resolve itself into the introduction of some kind of damping.

Stability, however it is produced, can be obtained only by reducing the amount of amplification that is theoretically obtainable; in the efficient set the compromise is such that the losses are not too great.

General-purpose Valves

The general-purpose receiving valve is an excellent example of the compromise which is found everywhere in wireless. It must detect efficiently as well as amplify well at both high and low frequencies. Now for perfect detection, using a grid leak and condenser, we require a valve in which a positive half-cycle reaching the grid will produce an appreciable flow of grid current. A small amount of grid current helps to stabilise the high-frequency amplifiers, though it must not be excessive or there will be a lack of both sensitiveness and selectivity.

In the low-frequency amplifier grid current is anathema, since it produces bad distortion. Yet valve designers have produced valves which, even when the same plate voltage is used throughout the set, give very fair results in all three positions. The general-purpose valve does not excel as an H.F. amplifier, a rectifier, or a note magnifier, but it gives good average results when used for any of these three purposes.

Aerial Compromise

The aerial plays two entirely different rôles in wireless reception; it may be the good fairy, bringing in the signals that we want to hear, or it may be the villain of the piece giving us also those that we do not want and so reducing selectivity. For big signal strength we want a large aerial; for selectivity we want a small one. We have to effect a compromise by making the aerial just big enough to bring in signals at good strength, but not so big that it prevents us from tuning out unwanted transmissions.

Tuning coils provide a further example. In theory the perfectly efficient coil would be one with no self-capacity and with a resistance approximating to zero. It is clear that we can never hope to achieve anything like this. We can reduce the self-capacity of a coil by spacing the turns fairly widely apart. But we cannot push this too far for several reasons. If we

(*Concluded at foot of next page*)

TAPPING THE GRID BATTERY

MOST amateurs use dry batteries of the flashlamp type in their work, either for testing and experiments or as grid-bias batteries.

The writer tried several methods of making connection with such batteries. At first short pieces of flex were soldered to the brass strips of the flashlamp battery. Unfortunately it was found that sometimes the batteries had been put aside with the bare ends of the flex leads touching each other; the result was a short-circuited battery useless for further work.

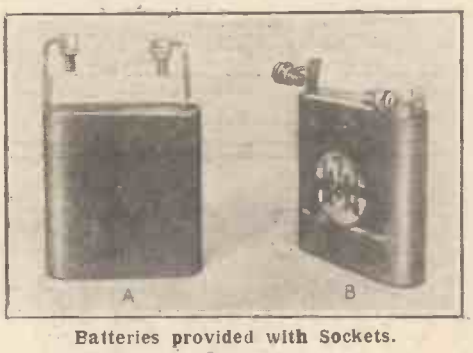
More Promising

The next method tried seemed more promising. Small terminals were attached to the brass strips projecting from the end cells, but the pressure inevitable during the drilling operations strained the top layer of the sealing compound, which came off in flakes, and the battery dried up very quickly, since the air had access to the interior of the cells.

The easiest, and incidentally the best, way of making connection is that shown in the photograph. Two short pieces of busbar are soldered to the brass strips; the free end of the busbar is shaped into an eye to take a Clix adaptor, the connecting wire or cable is fitted with a Clix adaptor plug, and a very efficient connection can now be made in an instant.

Needless to say, the busbar pieces are shaped and bent before they are soldered to the brass strips. When the battery is exhausted, the busbar pieces with their Clix fittings are unsoldered and attached to the new battery.

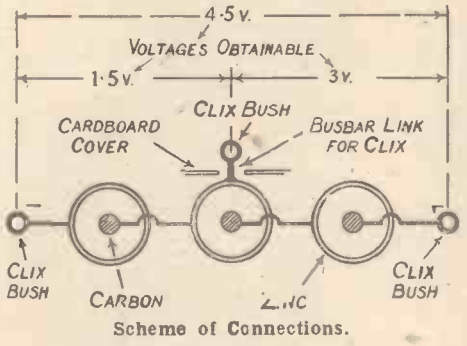
Two ways of fitting the Clix are possible. For some purposes it will be found better to have the busbar pieces in line with the brass strips of the battery, as shown at A in the photograph. Sometimes connections will be easier if the busbar pieces are at right angles to the brass strips, as shown in the second photograph B.



Batteries provided with Sockets.

Indicating Polarity

A further kink is as follows: Indicate the polarity of the battery before using it. The plus and minus signs can be painted on with drawing ink, using a small brush



Scheme of Connections.

for this purpose. It takes only a moment to do, but it may avoid costly mistakes.

Different voltages can be obtained from the standard three-cell flashlamp batteries if a central tapping point is provided. The sketch shows a cross section through such a battery and the voltages available at the different tapping points.

The cardboard cover of the battery is cut away at the centre of the unit and a busbar angle fitted with a Clix bush is soldered to the central zinc cylinder. Care should be taken to scrape the latter clean before soldering to make sure of a good joint.

We have now three voltages to choose from: The full voltage of 4.5 across the outer terminals; using the centre tap and the right-hand outer positive terminal we get 3 volts; while the centre tap and the left-hand minus terminal give us 1.5 volts. A very convenient and inexpensive grid-bias battery can be made in this manner.

C. A. O.

A GOOD EARTH

THE selectivity of a receiver depends to a great extent on the efficiency of the aerial system. If the resistance of the aerial, coil or earth is very great it is useless to expect sharp tuning. In this connection it is essential to see that the receiver is properly earthed; broad tuning will result if there is imperfect contact between the earth plates or pipes and the surrounding soil.

In summer the soil is dry and the resistance of the earth is apt to become abnormally high. This can be avoided by frequently soaking the soil in the neighbourhood of the earth connection and sinking short lengths of earthenware piping into the ground. Water can be poured down these and a wet earth of low resistance will result.

Go carefully over the soldered joints which connect the leads to the actual earth-plate and see that no undue resistance is set up at these points.

P.

"THE COMPROMISES OF WIRELESS" (*continued from preceding page*)

make the spacing between turns very big, we require more turns in order to obtain a given number of microhenries. This means that we need a greater length of wire, and thus the resistance of the coil is increased.

The most efficient of all coils from one point of view is a spaced solenoid, or single-layer inductance. If, therefore, we wind a coil in the form of a long solenoid we shall find that we are losing a great deal owing to the eddy currents which are set up in other coils and in conducting portions of components of the receiving set. The energy which sets up these eddy currents must come from somewhere. Actually it is drawn from the incoming oscillations. The net result is that if we wind coils which are in theory ultra-efficient we are likely to find that the losses caused by eddy currents largely offset the gains in other directions. We compromise, therefore, by making either short solenoids of fine wire or multi-layer coils. In either case the self-capacity and high-frequency resistance are greater than is theoretically desirable. We do, however, keep the losses due to eddy currents down, as well as making our coils of reasonable dimensions. If we lose in some directions, there is on the whole a net gain.

L.F. Transformers

Lastly, think for a moment of low-frequency transformers. The ideal transformer would be one with a primary impedance greater than that of the valve and with a big step-up ratio between primary and secondary. Actually it is impossible to obtain such qualities, since as we increase the turns on either the primary or the secondary, we increase also the self-capacity of the windings, and this capacity is just what we do not want. We must compromise by putting as much wire as we reasonably can on to the primary and winding it in such a way that self-capacity is kept as low as may be.

The number of turns in the secondary is limited definitely by considerations of bulkiness and of self-capacity. It follows that a big step-up ratio means a low impedance primary and that we can never obtain the note amplification that ought in theory to be possible.

R. J. H.

A VALVE-CRYSTAL RECEIVER FOR THE EXPERIMENTER

A simple arrangement which will enable you to test various circuits with the minimum of trouble

THE panel-and-baseboard type of experimental set, where most of the adjustable components are mounted on a sort of "dashboard" panel attached to one edge of a baseboard carrying other components, terminals, etc., is becoming very popular amongst home constructors, who find other systems rather too expensive and complicated.

The set to be described is arranged on the above principle, and with this outfit one is able to experiment with many different circuits employing a crystal or a single valve, or a combination of both, either "straight" or reflex. In construction and use the set is extremely simple and therefore particularly suitable for beginners. The components are fitted to a small vertical panel and a comparatively large baseboard, and terminals are provided at all points. The circuit connections are made by means of insulated leads provided with brass spades, the short

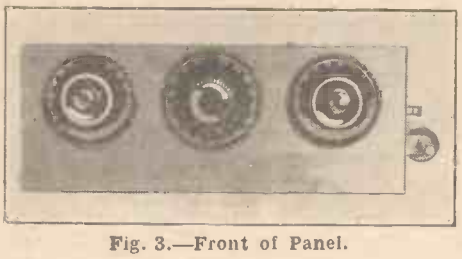


Fig. 3.—Front of Panel.

and medium leads being flexible and the long leads fairly rigid. It will be seen that everything is perfectly straightforward, that there are no complicated switching devices, and that the components are few and simple.

Components

To build a set identical to the original, the following components and parts will be required: A three-ply (or ebonite) panel, 12 in. long by 4½ in. wide; a ½-in. deal baseboard 12 in. square; two wooden battens, each 12 in. long by ¾ in. wide and about ⅜ in. in thickness; two Ormond .0005 variable condensers with vernier attachments; a Visicam two-coil holder; a single-coil holder (baseboard-mounting type); two baseboard-mounting valve holders; a Peerless filament rheostat to suit valve used; a Watmel variable grid leak; a crystal detector; an F.A.R. low-frequency intervalve transformer (5 to 1 ratio); four K-type fixed condensers with clips (two .001, one .002 and one .0003 microfarad); a

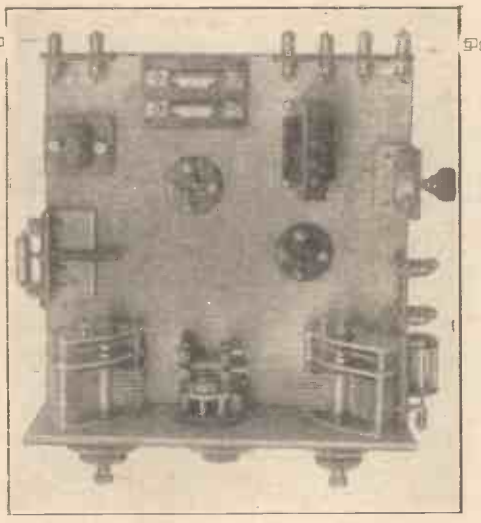


Fig. 2.—Plan View of Experimental Receiver.

small quantity of sheet brass, some odd pieces of sheet ebonite and a few terminals and wood screws.

There is, of course, no objection to the use of a three-ply wooden panel, as shown in the original set, providing it is first well rubbed down with glasspaper and then given a coat of shellac varnish; the coil holder is insulated from the panel, leaving only the two condensers end plates in electrical contact with the panel, and since the condensers are well spaced apart an ebonite panel is quite unnecessary.

Arrangement of Panel

The panel layout is given in Fig. 1, the central hole for the fixing bush of the two-coil holder being cut slightly oval for the following reason: The coil holder is designed for either panel or baseboard mounting, and by first fixing it temporarily to the panel, it can then be adjusted so that its base rests on the top of the baseboard when the panel is placed in position. It is then only necessary to tighten the panel bush and at the same time drive in the baseboard-mounting wood screws in order to fix the panel to the baseboard. Thus no other fixing screws are necessary unless the set is likely to be moved about from one place to another,

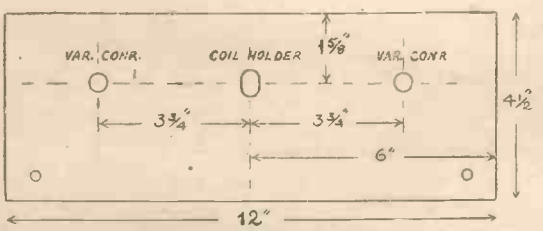


Fig. 1.—Layout of Panel.

in which case the panel should be also screwed to the baseboard at each end.

A general view of the complete set is shown in Fig. 2, where the positions of all components are clearly indicated. It will be seen that the crystal detector, phone terminals and filament rheostat are attached to the left-hand edge of the baseboard; the variable grid leak and condenser, and single coil holder, to the right-hand edge; and the H.T., L.T. and A and E terminals to the lower or back edge. The valve is placed in the holder on the left, the other holder being provided for plug-in high-frequency transformers. The position of the L.F. transformer should be noted, and it will also be seen that the fixed-condenser panel is mounted between the two terminal strips behind the holder for the H.F. transformers. Fig. 3 shows a front view of the panel, and Fig. 4 shows another view of the complete set ready to operate.

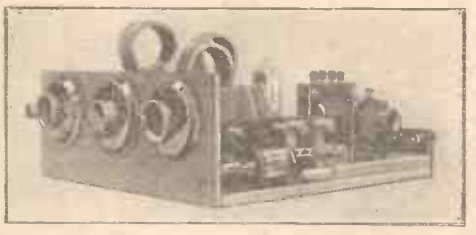


Fig. 4.—Three-quarter View.

The Sub-panels

The ebonite panels carrying the crystal detector, phone terminals, and H.T., L.T. and A and E terminals are let in flush with the edge of the baseboard, the recesses being cut before attaching the two battens, which, when fitted in position, greatly add to the appearance of the outfit. (See Figs. 2 and 4.) The panels carrying the filament rheostat, and the variable grid leak, are attached to the edges of small wooden supports, which are afterwards screwed down to the baseboard as shown in Fig. 2. If desired, these may also be screwed into recesses cut into the edge of the baseboard, but the above method is advisable, since considerable difficulty is experienced in cutting neat recesses at the points indicated, where the exclusive use of a saw is not permissible, as in the case of a recess commenced from an open corner of the baseboard.

Details of the small panels are given in Fig. 5: A and B represent the terminal

panels for the back edge of the baseboard, and C and D the crystal detector and phone terminal panels. The latter may be modified to suit individual taste; the arrangement here is as shown on the left in Fig. 6, where a pair of K condenser clips are cut down and soldered to the ends of two

Fig. 6.—Method of Mounting Grid Leak.

sheet-brass busbars, each 2 in. long by ⅜ in. wide (see E, Fig. 5), which are drilled and clamped to the ebonite by means of ordinary terminals and multi-terminals of the pillar type. Diagram F (Fig. 5) shows the rheostat panel, and diagram G the panel for the variable grid leak and condenser, the condenser clips being clamped to the ebonite by means of the terminals provided for making the connections to same, in the manner shown on the right in Fig. 6. The clips on the fixed condenser panel (diagram H, Fig. 5) are arranged in a similar manner, the panel being screwed down to the baseboard by means of fairly long wood screws and spacing sleeves. The small holes along the lower edges of all panels are countersunk to take wood screws.

The small connecting bolts on the filament rheostats are replaced with small terminals, but, if desired, the terminals may be mounted on the top of the panel and connected to the existing bolts. The variable condensers, coil holders, L.F. transformer and valve holders are, of course, already provided with terminals when purchased.

The shanks of the six terminals along the back edge of the baseboard are fitted with milled nuts so that the outer milled nuts may be used exclusively for the battery and A and E connections. These terminals should be marked in the following order: Left to right (Fig. 2), H.T. positive, H.T. negative, L.T. positive, L.T. negative and earth and aerial

It will be seen that the only connections made in the actual construction of the set are those from the panel components to terminals; even the rheostat is left free in order that it may be placed either in the positive or negative L.T. lead as desired, and the matter of changing over coil and transformer leads, grid-leak connections, series-parallel switching of the A.T.C., etc., becomes greatly simplified, since all components are entirely independent.

No attempt is made to illustrate

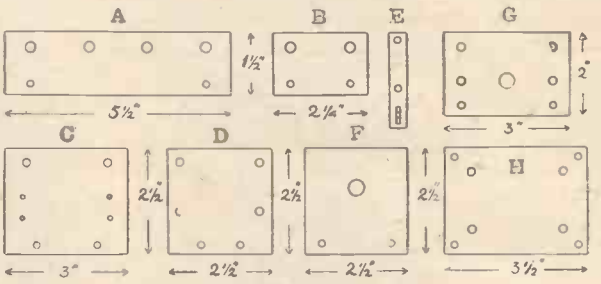


Fig. 5.—Details of Sub-panels.

examples of the many different types of circuits which may be tried out on the set. The beginner should first experiment with various different crystal circuits; using direct and coupled tuning coils, select the best arrangement and wire up the valve as a high- or low-frequency amplifier, then try the valve as a detector, using reaction, and afterwards experiment with various reflex circuits. For this purpose one cannot do better than use a general-purpose valve of any of the well-known makes. O. J. R.

CHOOSING A CRYSTAL FOR SELECTIVITY

By Lieut.-Commander H. W. SHOVE, D.S.O., R.N.

OF crystal sets, pure and simple, in use to-day probably 90 per cent. employ some sort of galena crystal, either natural or synthetic, with a fine metal catwhisker. In combination sets which include an H.F. valve the "permanent" type of perikon detector has a considerable vogue, but even here the galena probably more than holds its own. Carborundum, the first discovered of the detecting crystals, is now so much out of fashion that the writer recently experienced considerable difficulty in obtaining a crystal of this nature at several large wireless stores. Its unpopularity is no doubt due to the extra complication of the potentiometer and battery, which is commonly supposed to be absolutely necessary when using this rectifier. It would probably be still a favourite but for the perpetuation of this fallacy—for fallacy it is. Carborundum differs from other rectifying crystals chiefly in that the "bend" in the characteristic curve, over which it is necessary to work, is *not so commonly* at (practically) zero volts as with galena and most of the ordinary perikons. But it is also a fact that the position of the bend varies not only from sample to sample of carborundum, but even from point to point of the same piece. So that it is very often possible to select a contact at which no applied potential is necessary.

Now the ordinary carborundum-steel combination has only one generally recognised advantage to counterbalance the disadvantage of the applied potential, or of the sometimes tedious and disappointing search for a suitable contact where it is not required. This is the permanence of its setting. And in this it is so closely rivalled by many perikon arrangements, that it is to them that the amateur generally turns when exasperated by the "fiddling" adjustment of a catwhisker. What maintains the popularity of galena is, of course, its great sensitivity. But, besides difficulty of adjustment, this sensitivity is attained at the expense of other considerations.

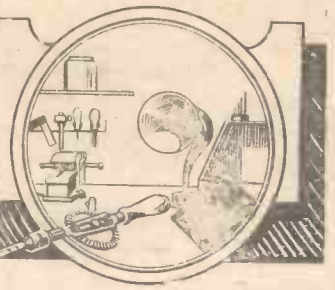
Signal Strength

Many crystal enthusiasts will have observed that at short ranges better signal strength is obtainable with a perikon detector, whereas for more distant reception the galena-catwhisker type gives better results. Though not universally true (for something depends on telephone resistance, tuner losses, etc.), this may be taken as a very fair working rule.

It does not seem to have been so generally recognised, however, that the galena has very serious drawbacks in the matter of *selectivity* when compared with some other rectifiers. The reason for this is its comparatively low resistance, which tends to increase the damping of the tuned circuit. Those troubled by interference may profitably experiment with other types.

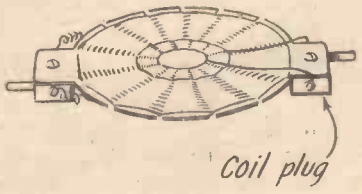
Carborundum-steel has been found by the writer to be markedly superior to galena in this respect, though much depends on the specimen of crystal in use; and carborundum generally falls far short of galena in sensitivity, in the absence of an H.F. stage. The R.I. type of permanent perikon detector has also been found selective. Probably the best in this respect of several types tried by the writer (and at the same time very fairly sensitive) was a Uralium (galena crystal) and carborundum perikon combination, used with fairly light pressure. Uralium-steel also makes a good detector for use with a preceding H.F. stage. It is not markedly selective, but seems to be more sensitive than the usual carborundum-steel, while fairly firm pressure can be used, so that a contact is very permanent. The steel element used by the writer consisted of a fine drill. No applied potential is required, but a little patience in finding the best point and pressure of contact is amply repaid. H. W. S.

PRACTICAL ODDS AND ENDS



A Plug-in Coupler

TO ensure the utmost selectivity it is necessary to employ some form of tuner in which the aerial is loosely coupled to the grid coil. There is, however, no need separately to tune both primary



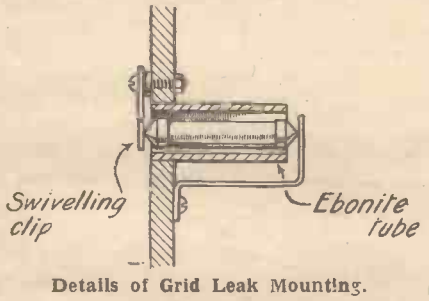
A Plug-in Coupler.

and secondary windings; it is sufficient to tune the secondary and to couple up the aerial by means of a few turns of thick wire forming an aperiodic coil.

Both primary and secondary coils may be wound on the same former, and the leads to each winding brought out to a separate plug. The primary, being the smaller coil, should be wound on first (say 12 turns of No. 22 s.s.c.), and the two leads brought out to one end of the former. The secondary, consisting of about 40 turns of No. 26 s.s.c., can then be put on and the leads joined to the other coil plug. The plug connected to the primary should be placed in the ordinary aerial-coil holder of the set, while flex leads and another plug connect the secondary winding. K.

Mounting Grid Leaks

DIFFERENT valves require different grid leaks, and it is not always convenient to unfasten the panel while experimenting with varying values of leak.

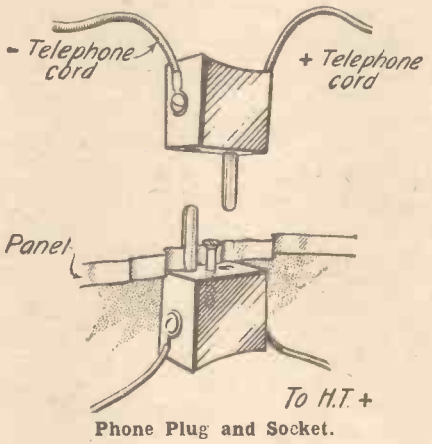


Details of Grid Leak Mounting.

A simple method of changing the grid leak from the front of the panel is shown in the diagram, and may be employed without detracting from the neat appearance of the receiver. An ebonite tube 1½ in. long by about ⅜ in. in diameter is let into the panel to guide the leak into position, while a small swivelling clip at the front and a fixed clip at the rear serves to make contact with the metal caps. The wiring of the set should, of course, be joined to the bolts holding the metal clips. R.

A Phone Safeguard

TELEPHONES, when connected directly in the plate circuit, tend to become demagnetised unless always correctly inserted in circuit. In order to obviate all possibility of a reverse connection, it is advisable to make some sort of plug (as shown in the sketch) to which the phones may be attached and which will fit into a corresponding socket in the anode



Phone Plug and Socket.

circuit. The type of plug and socket illustrated is absolutely irreversible and is therefore quite suitable.

A countersink screw is used for mounting purposes, so that the plug can be placed behind the panel. W. P. A.

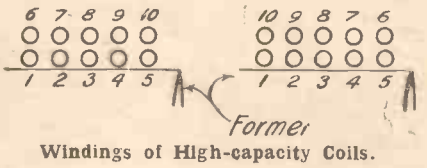
Tellurium Crystals

TELLURIUM is usually found in combination with other metals in the minerals sylvanite, black tellurium and tetradymite. The tellurium crystal is exceedingly brittle, and it is in colour a silvery white. This crystal is generally used in the form of a perikon combination; tellurium and zincite make a good rectifier, also tellurium and bornite may be used. It is advisable to use a dry battery and potentiometer with this combination, but the voltage should be exceedingly small (in the neighbourhood of a third of a volt) or it will be impossible to allow any current to flow. Further good combinations are tellurium galena and tellurium graphite. W.

Capacity in Coils

CAPACITY losses in coils must, at all costs, be avoided. On the short waves, where the current frequency is extraordinarily high, it is specially important to remove all bridging capacities, no matter how minute, that tend to by-pass signals.

In a coil capacity effects take place be-



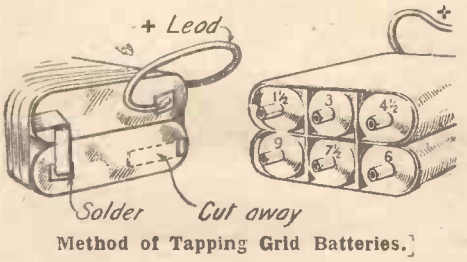
Windings of High-capacity Coils.

tween near-by turns having a large difference of potential, and it is therefore important to wind the coil so that such turns are widely spaced. Thus in the two coils shown (in section) in the diagram capacity losses are likely to be fairly high. That on the right is wound from left to right and then back again, and turn 10 will lie directly over turn 1. The left-hand coil is better, as turn 6 lies over turn 1, and (although considerable) the losses will not be so great. P.

Tapping Grid Batteries

HERE is a simple method of making tappings for a 9-volt grid-bias battery. Take two ordinary pocket-lamp batteries, bind them together with insulating tape and join the positive strip of one to the negative strip of the other.

Cut the other negative strip away and solder a length of flex to the remaining short strip. Now turn the battery upside down and expose the zinc containers by slipping a penknife under the bottom of the battery. Attach valve sockets or other



Method of Tapping Grid Batteries.

similar tapping devices to the bottom of each cell and the battery is complete.

The flex lead from the original positive tag is then connected to L.T. negative in the set and the grid-bias negative plug is placed into the required socket. F. W. N.

BURNT-OUT VALVES!

A Personal Experience of
BOSPHOR PRONZ

FIND me a schoolboy who has never blown an egg, or find me a reputation which has never been slightly blown upon, and I will find you a valve user who has never blown a valve.

I am perfectly well aware, my good sir, that you deny ever having blown one of *your* valves, but that is not quite my point. I said "blown *a* valve," and my experience of wireless men tells me that, even if you have never blown one of your own valves, you most certainly must, at some time or other, have blown a valve belonging to somebody else, which proves my point. Thank you!

Far be it from my intention, however, to thrust unpleasant wireless home truths upon you. Rather is it my purpose to tell you some of my own experiences with burnt-out valves, and to suggest to you certain uses to which a burnt-out valve may be put.

There is no need for sarcasm. I candidly admit myself having burnt out a valve, and one of my own valves too. A most distressing incident it was. I happened to be just on the point of connecting up my high-tension battery to a one-valve set when somebody pushed me and——

A little flash,
A little dash,
And westwards went the valve.

All's Well that Ends Well

As our little chat is on the subject of the burnt-out valve, it would be as well if you had one such valve in front of you. Certainly I will excuse you one moment while you fetch a burnt-out valve from your wireless junk heap. My dear sir, I know that you are perfectly unaware as to how that burnt-out valve found its way on your junk heap. There is no need to apologise.

My wireless neighbours have just the same remarkable propensity for hiding their blown-out valves on my junk heap. Let me tell you of a very curious adventure I had in this connection.

About four ack emma one cold, snowy morning last Christmas holidays there came a fearful blam-blamming on my front-door knocker. I got farther under the bedclothes, but the noise became louder and more imperative. As I became more and more conscious I realised that the knocking was the police constable's CQD; you know the call-sign—tum, tummy, um tum, tum tum.

With great reluctance I got out of bed, put on my foot insulators and my dressing-gown and went downstairs to the front door.

"What is it?" I asked through the letter-box.

"Burgulers, sir," replied the constable.

I undid the door and let the constable in.

"Scullery window wide open, sir," said the constable, as he closed the front door to keep out the snowy blast.

We repaired to the back of the house to investigate and, sure enough, the scullery window was wide open. The cold draught was most searching, so I got behind the constable's bulky form. By the light of the constable's torch we saw footmarks, wet and ominous, on the scullery floor.

"There you are, sir, I told you, sir, burglars, or a burglar, I should say, since there is only one set of footprints," said the arm of the law.

We followed the wet footprints from the scullery to the kitchen and from thence to the hall. Without the slightest difficulty we followed the footprints up the stairs. They were plainly visible on the stair carpet, but we lost them by the time we reached the first landing. Evidently the intruder's boots had dried as he worked his way quietly and slowly up the stairs.

"Shouldn't wonder if he isn't in the house, sir," remarked the constable. "Better waken the butler and the men-servants, sir."

Having neither butler nor men-servants, I did the best I could. I wakened up the two boys and the terrier pup, which happened to be sleeping that night on the spare bed. We went over the house in procession, the constable leading and the dog following last so that he could get an occasional lick at the boys' bare legs. No burglar was unearthed, and we looked everywhere except in the cellar, and even there the constable called down the cellar steps to ask if anybody was there and he got no answer.

"Seems as if he has vanished," said the policeman. "Have a good look round in daylight, sir, and see if anything is missing. I'll call in during the evening, sir."

The next morning I looked all over the house in daylight, but not a thing was missing. As a last resource I went to my junk heap, which happens to be in one of the attics at the top of the house. Right on the top of my junk heap there lay two blown-out valves which I had never seen before. When the constable called in the evening I told him what I had found, and, being a wireless enthusiast himself, he understood and nothing more was said of the matter.

That is just one experience I have had with burnt-out valves. What I cannot understand is why people do not put their burnt-out valves to some useful purpose. It is possible to make a beautiful little water fountain with a blown valve. All you have to do is to place the valve upside down in a dish, basin, or other receptacle full of water and nip the pip off under water with a pair of valve pippers. Water will then enter the valve with a most beautiful fountain effect.

The best thing I can suggest to do with a blown valve is to make use of its explosive properties on some fitting occasion. Did you know that a valve would explode? Try the experiment of dropping a valve from the top of your house to the ground floor. I think the resulting noise will please you.

Of the most fitting occasions on which to explode a valve, I think the best is when the braggart of your wireless circle is relating for the hundredth time how he picked up fifty American stations one night on one dull-emitter. Explode your burnt-out valve at the right moment and you will not hear that story again.

RADIATION RESISTANCE

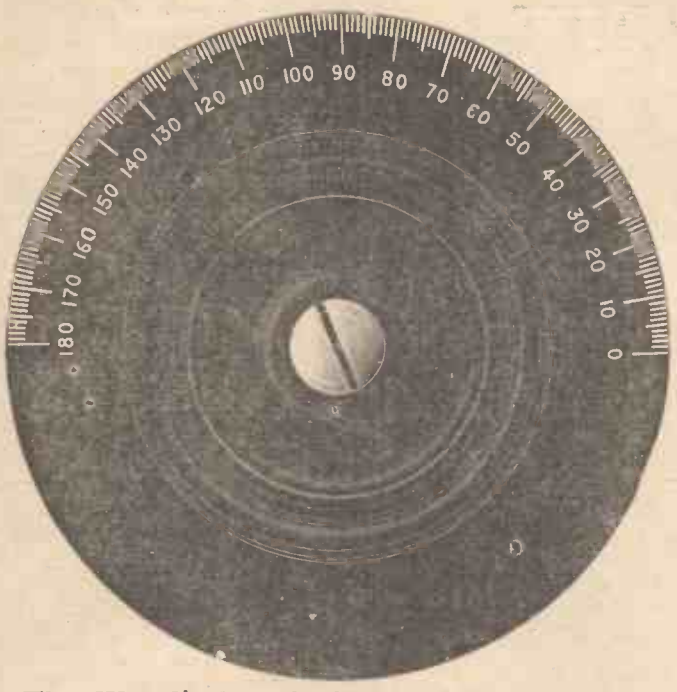
THE effective resistance of an aerial is made up partly of ohmic resistance which leads to waste in the form of heat, and partly to a more or less fictitious factor called "radiation" resistance, which gives a measure of the power lost in radiation. This applies to all aerials alike, but plays a particularly important part in the design of transmitting aerials where large powers are handled.

The ohmic resistance lies partly in the wire network forming the elevated aerial and partly in the high-frequency resistance of the earth system, including the ground plates or wires and the nature of the surrounding soil.

Radiation resistance, on the other hand, depends solely upon the geometrical form of the aerial as a whole, including the relative spread of the wires and their effective height above the ground. These factors govern the actual distribution of the aerial current or "form factor," as it is called, which, in turn, determines the "grip" of the oscillatory currents upon the ether, and the proportion of the total aerial energy radiated as ether waves. In reception the form factor of the aerial is the measure of its efficiency in absorbing energy from the ether.

H.

Considerable activity at present reigns in Russia with a view to the rapid development of wireless communications. Contracts have been placed by the Russian Posts and Telegraphs Departments for the installation of a high-power station in Petropavlovsk on the Kamshatka peninsula of eastern Siberia. This station will be of such a power that a minimum radius of roughly 3,000 kilometres will be obtained.



The World's best SLOW MOTION DRIVE
For the World's most popular condenser.

ENGINEERING
"ORMOND"
COMPANY LTD.
Registered *Trade Mark.*

BALL BEARING FRICTION DRIVE SLOW MOTION DIAL

Price **10/-** *each*

IDEAL RATIO 55-1.

SPECIALLY DESIGNED FOR THE MILLION
ORMOND LOW LOSS CONDENSERS ALREADY IN USE

THREE SELF-ADJUSTING BALL BEARINGS GUARANTEE
TOTAL ABSENCE OF BACKLASH—*PERMANENTLY*

RATIO High enough for finest tuning, low enough for easy searching. Direct drive also for rough setting

Beautiful finish. Absolutely silent action and superlatively smooth

FIXES AS SIMPLY AS STANDARD KNOB AND DIAL

ESSENTIAL FOR PORTABLE SETS

ORMOND ENGINEERING Co. LTD.

199-205 Pentonville Road, King's Cross, LONDON, N.1.

Telephone: Clerkenwell 9344-5-6. *Telegrams: "Ormondengi, Kincross."*

FACTORY: WHISKIN STREET, CLERKENWELL, E.C.1.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

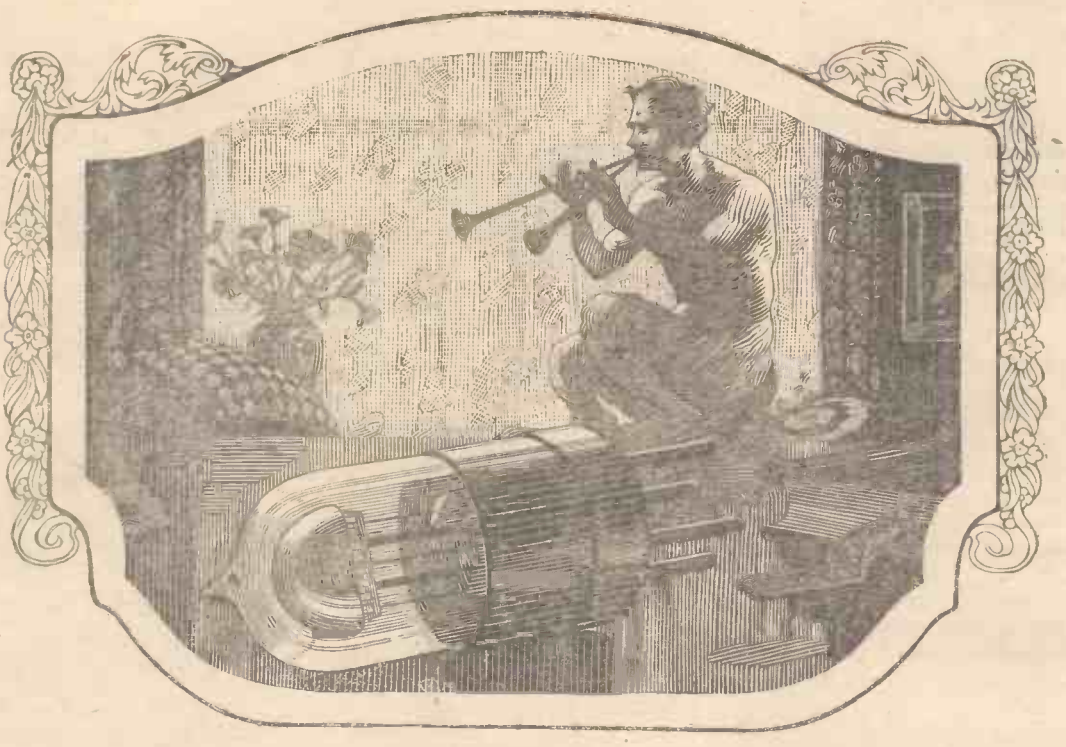
"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS CABINET, solid oak, extraordinary bargain. Photo and price. Edwards, Ingham Street, South Shields. [25

PATENTS and Trade Marks obtained.—H. T. P. Gee, Patent Agent Member R.S.G.B. A.M.I.R.E. 51/52, Chancery Lane, London, W.C.2. Phone Holborn, 1525.

PATENTS.—Trade Marks. Advice Handbook free.—B. T. King, Reed Patent Agent, 146a Queen Victoria Street, London.

VALVES, 3s. 6d.; 60-volt Batteries, 7s. 6d. All post free. Send list.—Five, Riverside, Ringwood, Hants. [19



The Dull Emitter which defies old age

LISZT'S beautiful Rhapsody Hongroise—full of dramatic fire and brilliantly contrasted passages—was being broadcast. Away in the Studio, the artiste's fingers tripped lightly over the ivory keys. At home, the family sat enthralled—captivated by the richness and emotion of the masterpiece which won for its composer a niche in the Hall of Fame.

And then suddenly . . . dead silence. A valve in the Receiving Set had burnt out.

What causes a valve to burn out prematurely? Excessive heat—nothing else—is the devastating influence. All metals when heated expand—when cool, they contract. A valve filament constantly expands or contracts as the current is turned on or off. The higher the temperature, in fact, the greater the expansion. Such treatment, in course of time, produces brittleness and inevitably renders the filament very susceptible to fracture.

This was the problem Cossor set out to solve—and so successfully unriddled—by the invention of the triple-coated filament used only in the Wuncell Dull Emitter Valve.

Whereas in most dull emitters, low current consumption has been obtained by the use of extremely fine filaments operating at temperatures as high as 2000°, the Wuncell ensures economy by entirely different methods. Its special filament is *triple-coated* to ensure a prolific electron stream at only 800°—practically the temperature of the embers of a dying match.

Further, its filament is practically as stout as that used in any bright emitter. Because of this, and the fact that its working temperature is so much lower than hitherto thought possible, heat has little or no effect upon it.

As a result the Wuncell has already won a great reputation throughout this country and abroad among broadcast listeners as the one dull emitter "which really defies old age."

Types and Prices:

*W.1. For Detector and L.F. use. 1·8 Volts. Consumption: ·3 amps.	14/-
*W.2. (With red top) for H.F. use. 1·8 Volts. Consumption ·3 amps.	14/-
W.3. The Loud Speaker Valve. 1·8 Volts. Consumption ·5 amps.	18/6
*Also in special base with resistance to suit 2, 4- or 6-volt Accumulator	16/-

Cossor Valves

Issued by A. C. Cossor, Ltd., Highbury Grove, London, N.5

Gilbert Ad. 4973.

On Your Wavelength!

The Wavelength Scheme

THE scheme for wavelength allotment recently drawn up at Geneva is distinctly interesting. The most important point in it is the suggestion that each country should be allotted at least one exclusive wavelength upon which no other country will be allowed to poach. More than one exclusive wavelength may be given to countries with large populations; under the present proposals Britain would have six. The exclusive wavelengths are intended for the use of what we may call standard stations, that is, those rated at from 1 kilowatt upwards. For low-power stations and relays "common" wavelengths will be assigned. It has been found in practice that two low-power stations separated by a considerable distance from one another can transmit upon exactly the same wavelength without causing mutual interference.

If the scheme comes into being, and if its provisions are loyally carried out by all stations, it may provide a complete solution of that most pressing problem, the overcrowding of the broadcast band. But it will be absolutely necessary for every station to adhere strictly to its allotted wavelength, and therein is to be found a stumbling-block that may possibly upset everything. At the present time comparatively few stations possess—or, at any rate, use—really accurate wavemeters. Quite 80 per cent. of the European broadcast transmissions at the present time are slightly off their stated wavelengths.

Crystal Control

In some cases the wandering away from the official wavelength that occurs is done deliberately with a view to avoiding heterodyne interference; but very frequently it is due to the fact that the wavemeter in use at the station is inaccurate. It might seem at first sight unimportant whether the wavelength of a station were half a metre or so above or below what it ought to be, but such a tiny difference would be sufficient to produce chaos upon common wavelengths used by two or more relay stations.

A solution of the wavemeter difficulty may be found in the adoption of crystal-control. Most readers will know something of what is known as the piezo-electric effect. Certain types of crystal undergo a slight alteration in shape when a current is passed through them in a definite direction. Under the influence of an oscillating current of one frequency, and one only, a given piece of crystal oscillates itself. A crystal can be made to control the wavelength of a transmitting station, and when this is done accuracy, not merely to a metre but to a fraction of a centimetre in the wavelength, can be guaranteed. If crystal-control were adopted by all broadcasting stations, calibrated crystals might be issued to each by the International Bureau, in which case all wavelengths would become automatically fixed and exact. Meantime, what seems to be wanting is a system of watching the ether similar to that which obtains in Canada and the United States. On the other side of the Atlantic each area has its official observer, who tunes in daily every station under his jurisdiction and measures its wavelength. If any of them shows the smallest signs of wandering it is pulled up at once.

A Reduction?

If the new scheme is universally adopted, what will happen to the existing stations in this country? As I understand them, the proposals refer to the broadcast band only, so that Daventry is not affected. But we have at the present time nine main stations with wavelengths between 353 and 495 metres. If Britain is to receive six "exclusive," it looks as if three of these would have to go. In this case the power of the others would probably be considerably increased, and it might be necessary to change the positions of some of them in order to obtain a more even distribution of the broadcasting service.

If the common wavelength system for small stations was found to work satisfactorily, there might be an extension of the relays. In any case, wireless folk need not fear that they will suffer in any way should the new scheme be adopted. The boot is actually on the other leg, for under these proposals they have nothing to lose and everything to gain. The crystal man may expect more powerful signals than he receives at present, whilst the valve-user may look forward to a time when it will be possible to pick up at will a number of stations and to tune them in free from interference.

Cave-man Methods

Some curious information comes the way of the B.B.C. from time to time. Recently they have learnt that otherwise staid and respectable wireless people in several places have come literally to blows over the howling question. Such has been the heat engendered by the misdeeds of those who keep their sets in oscillation that aerials have been cut down or short-circuited, whilst black eyes have been freely given and received. Howling certainly does make one feel like taking violent measures at times, and I can sympathise in a way with the fellow who sallies forth at dead of night with a hatchet and fells the mast of the local ham-handed Henry; but you must be quite certain that you have caught your hare before you proceed to skin him! In more than one of the cases reported perfectly inoffensive people have suffered from the attacks of those who were driven desperate by oscillation. The most curious instance that I have ever heard of is that of the man who so detested the squeaks and chirps of the condenser wranglers that he swore a mighty oath to tune in 2 L O once and for all and never to touch the controls again. Two years ago he did this, but the quality of his reception never satisfied him. For two long years he endured it, and then called in an expert friend, who listened for a moment and said: "Why, the set's oscillating." And for four-and-twenty months on end this poor fellow, whose soul was filled with the highest ideals, had been emitting a long-drawn-out howl though he knew it not!

Queer Points

Lawyers in America are, it seems, a little puzzled just now over the legal aspects of wireless. A week or two ago there was a raid on a night club of some kind, and on the following day the announcer at one station startled his hearers by telling them that an eminent public man, whose name he gave, had been among the guests discovered on the premises. Actually he was not within miles of the place, and now he wants to bring a suit for libel against the annouucer. Unfortunately such a contingency as a libel by wireless was not foreseen by those who drew up the existing laws, and it appears that the injured man has no case at all. Congress is shortly to look into the matter, for unless something is done it will be possible for any owner of a broadcasting station—and there are heaps of private stations in the States—to fill the ether with scandalous statements about his enemies without incurring any penalties for so doing. Another little problem that is puzzling American lawyers is that which concerns transmissions to and from foreign countries which pass in their journeys over the United States. Can the U.S.A. or any other country prevent others from transmitting across it? The only solution, so far as one can see, is for the objecting country to enclose itself entirely in a screen designed upon the lines of a gigantic meat safe!

Nothing New in Wireless!

A friend of mine, who is an amateur transmitter and also the secretary of a local radio society, was recently staggered to receive from a broadcast listener a complaint to the effect that his transmissions

On Your Wavelength! (continued)

were interfering with broadcast reception and could also be heard on wavelengths as high as 2,000 metres! Needless to say, he was very troubled, and sent a polite note to the effect that he could not understand how he could cause such interference and would be glad if his correspondent would inform him by what means his wavelength was measured. In reply, his correspondent, in a forceful letter, informed him that there could be no doubt but what he was interfering as stated and "that the figures were plain enough for all to see." My friend, whose curiosity was now quite aroused, decided to pay a visit and see the "figures" for himself. He found a very crusty gentlemen, who testily rated him for his misconduct. After the storm had passed, my friend, who had been eyeing a disreputable crystal set with some misgivings, asked to see the "figures" referred to. The dear old boy, without hesitation, grabbed his telephones and triumphantly pointed to a row of figures stamped on the back. "There you are," he said, pointing with a finger trembling with rage, "2,000 wavelengths!" My friend gazed in silence and quietly walked away, whilst the old gentleman must have heard a voice choked with laughter gasping, "How many ohms to a metre?"

Unlicensed Amateurs

I am told on good authority that there is a large number of amateurs working transmitting sets without a licence, and that these do so owing to the fact that the conditions under which licences are issued are far too onerous for the average man to observe. It is, of course, the easiest thing in the world for anybody to set up a valve transmitter of sorts, and it is to be deplored that the Postmaster-General cannot keep a check on these unlicensed transmitters, who bring disrepute upon the genuine experimenter by transmitting during hours which are observed by the latter as being "taboo," that is, during broadcast hours. Many of these people also use the call-sign of a licensed station, so that the rightful owner of the call-sign not only has the mortification of hearing his sign used without authority, but has often to answer charges made by the Post Office of transmitting on unauthorised wavelengths or causing interference to broadcast listeners. If any readers are able to locate these offenders they would be performing a service for the amateur movement generally if they communicated with the Post Office, stating the exact location of the alleged offender.

Eliminate the Grid-bias Battery

I suppose that all my readers use a grid-bias battery in order to apply a suitable negative potential to the grids of their low-frequency amplifying valves. Such a battery will last a considerable time, but it affords another bulky article, which may well be done without if the following method is adopted. First move up the negative lead of the high-tension battery to 6 or 12 volts. Take the grid-bias lead and plug it into the socket which is marked 6, 12 or zero volts behind the low-tension negative lead. You have now applied that value of grid bias to the grid of the valve and it will be negative. The disadvantage of this method is that the grid-bias value is not variable in small quantities, such as 1½ volts, but perhaps some enterprising firm will produce high-tension batteries in due course, the negative end of which is tapped off in units of 1½ volts so as to be suitable for use in this manner. If, however, the experimenter is desirous of making a portable set with a minimum of weight and in which grid bias is used, the method indicated affords a ready means of attaining the desired end.

Why Not Anode Rectification?

Those amateurs who are troubled with abnormal current consumption in multi-valve sets will be able to reap great benefit in this respect by the use of anode rectification. Two methods present themselves: Firstly, a potentiometer having a resistance of 300 to 400 ohms may be placed across the low-tension battery and the centre tap of the selector switch taken from this to the grid of the detector via the tuning coil. It is sometimes advisable to bridge the potentiometer with a fixed condenser having a capacity of not less than .003 microfarad. The other method is to apply negative grid bias to the grid of the valve by means of a grid-bias battery and to feed this to the grid of the valve in the same manner. A fixed condenser should be used in this case also. Sufficient grid bias is applied to reduce the anode current flow from the high-tension battery to zero when no signals are being received.

These methods not only extend the life of the high-tension battery to a considerable extent, but also have other desirable effects. A gain in purity is often experienced, and it will be found generally that the tuning is made much sharper if the method is employed. Both of these qualities are generally sought after by amateurs, and it is a wonder that they are not used more often in place of the old method of cumulative grid rectification, with grid leak and leaky condenser usually employed.

Continental Relays

After the undoubted success which attended the relaying of the speeches of the League of Nations at Geneva, it is hoped that the B.B.C. will follow this up by sending representatives over to Paris, Brussels and Berlin, with a view to tapping the broadcast possibilities of those gay cities. As a firm *entente* exists among broadcasting companies, there should be no difficulty in arranging for the pooling of information as to the whereabouts of suitable material. In Paris and Berlin there are some remarkably fine dance bands. These bands play up to the small hours of the morning, and could be put on London and Daventry as a follow to our own bands. Such an arrangement would provoke interesting comparisons and would further add to the repertoire of popular dance tunes.

Besides this type of material, there is the intimate form of cabaret, for which Paris is famous, and judging by the success which attended such broadcasts in London, this particular type of entertainment is popular with the English listener. A further touch of piquancy might be added by persuading some French actress, known to the English public, to describe, during a dance tune, any outstanding dresses which happened to pass before her.

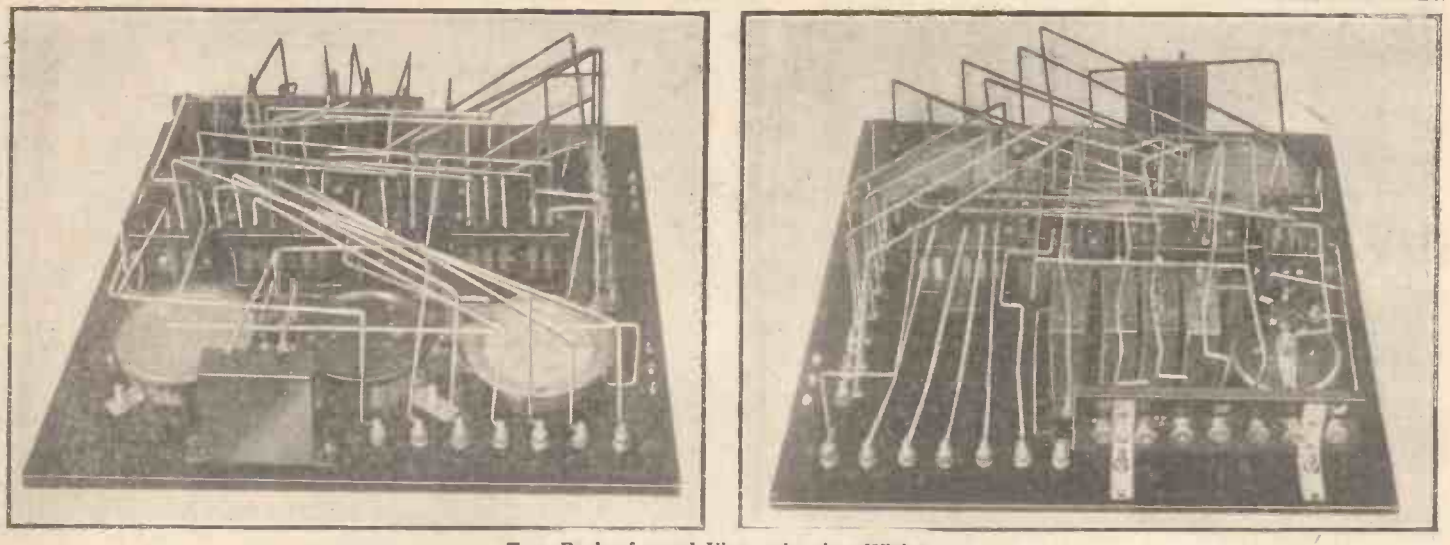
For all such broadcasts it would appear that the land-line would be used by the B.B.C. I do not feel this will be an unqualified success, and am looking forward to the day when the B.B.C. erect on French soil their own "beam" wireless station. By these means the material in question would be "shot" across the Channel on a low wavelength free of interference and then radiated from London and Daventry. I do not know, but I feel that sooner or later this will be the procedure.

Opera by Degrees

It becomes amusing to watch the gradual growth of broadcasting in connection with grand opera. Some few years ago the officials at Savoy Hill, or rather Marconi House, succeeded in obtaining permission to broadcast an excerpt from one of the operas during the Covent Garden season. The next step was an excellent season of B.B.C. orchestral concerts, held at the Opera House, and conducted by conductors from the Continent. Then followed a long silence, broken at length by the B.B.C. presentation of a concert version of Rimsky-Korsakov's *The Sacred City of Kitesh and the Maiden Fevronia.*

The final step, namely, the presentation of grand opera by the B.B.C., has yet to come. It is to be deplored that various schemes for the promotion of opera in England are running parallel. Could not common ground be found and all schemes be united on the financial stability of British broadcasting.

The question of grand opera in England is a thorny one, but when one visualises an eight-million-pound broadcast surplus—it becomes evident that the one authority in whose hands lies the destiny of grand opera in England is the British Broadcasting Commission. THERMION.



Two Back-of-panel Views showing Wiring.

A NOVEL BATTERY PANEL

An Instrument of Particular Interest to the Experimenter

THE instrument about to be described is of particular interest to keen experimenters who desire to try out new or modified receiving sets. Those who have occasion to connect up two or three different sets in an evening will have found what a deal of time is spent in changing over the leads from the batteries. The writer has found, too, that mistakes can be easily made, resulting in misleading results or even damage to apparatus. It was to avoid these risks of failure that this panel was designed. It is hinged to a frame mounted on the wall so as to give ready access to the reverse side.

The low-tension accumulator and the high-tension battery, with four positive tappings, are both permanently connected to terminals behind the panel. On the face there are three sets of output terminals to correspond with these connections, and switches are arranged so that the batteries can be connected to each of the three sets of output terminals at will. In addition this battery panel is provided with amperemeters always in circuit with the low- and high-tension batteries so as to show the respective currents taken off. There is also a fuse in the high-tension circuit. A master rheostat is provided which controls the low-tension voltage, and a voltmeter operated by a press button is arranged to indicate the exact potential applied.

As previously stated, the panel is fitted with three sets of seven output terminals (see Fig. 1). The ideal switch for such an arrangement would, therefore, be supplied by a seven-pole three-throw switch. Such a switch, however, is not readily obtainable, so double-throw switches have been used. There are two pairs of these of two and five poles each on the panel. Disregarding for the moment the testing instruments, the seven input leads go to the central positions of the first pair of switches (Fig. 2). One position of these switches gives the No. 1 output, and the other position throws over so as to connect the batteries to the central positions of the second pair of switches. The second pair in one position gives No. 2 output, and in the other position No. 3 output; that is, when the first pair of switches are over to the positions marked 2 and 3.

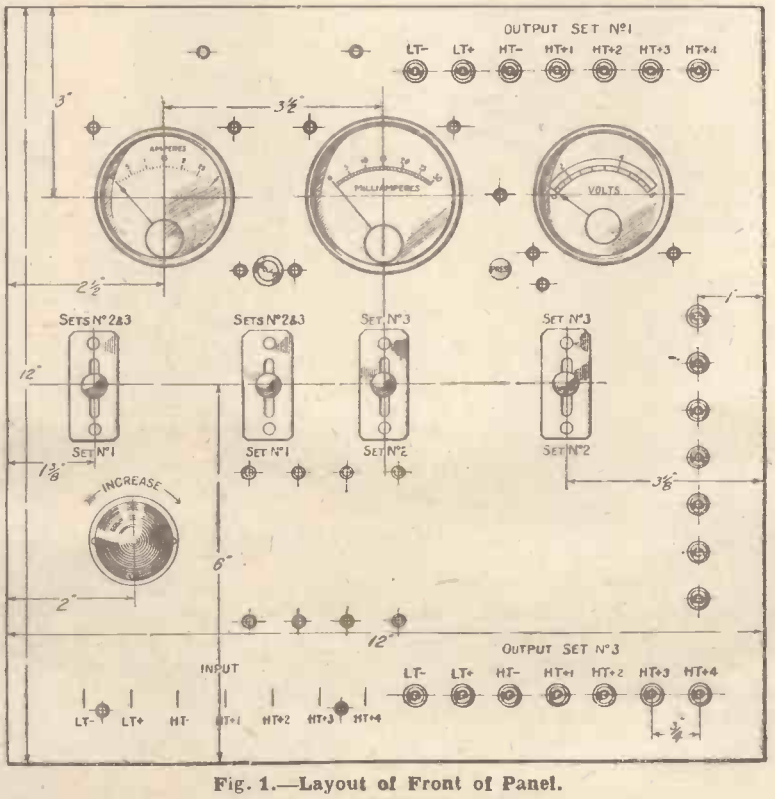
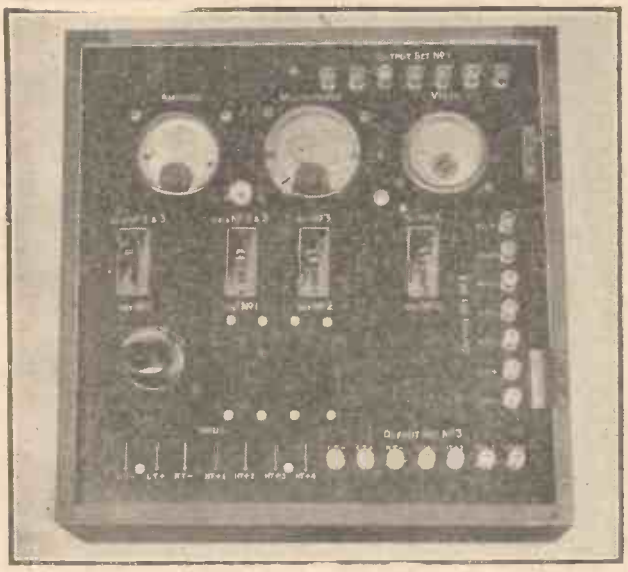


Fig. 1.—Layout of Front of Panel.

The master rheostat is in the low-tension minus connection from the input terminal to its central position on the first pair of switches, as is also the ammeter. The voltmeter bridges the low-tension plus terminals when the button switch is pressed down.

The fuse and the milliammeter are both in the high-tension minus connection. The fuse consists of a pocket-lamp bulb and socket. This simple device most effectively protects the high-tension battery from damage due to accidental short-circuits. Also should the high-tension inadvertently get across the filaments the pocket-lamp bulb fuses at once and saves the valves. The fuse is shunted by a 1-microfarad condenser. There is also a 1-microfarad condenser between the high-



The Complete Battery Panel.

tension minus and each high-tension plus connection.

The photographs of the reverse of the panel give the impression of somewhat complicated wiring connections. In actual fact, however, these connections are quite simple, being all practically side by side. The connections appear in their true simple form in the wiring diagram Fig. 2.

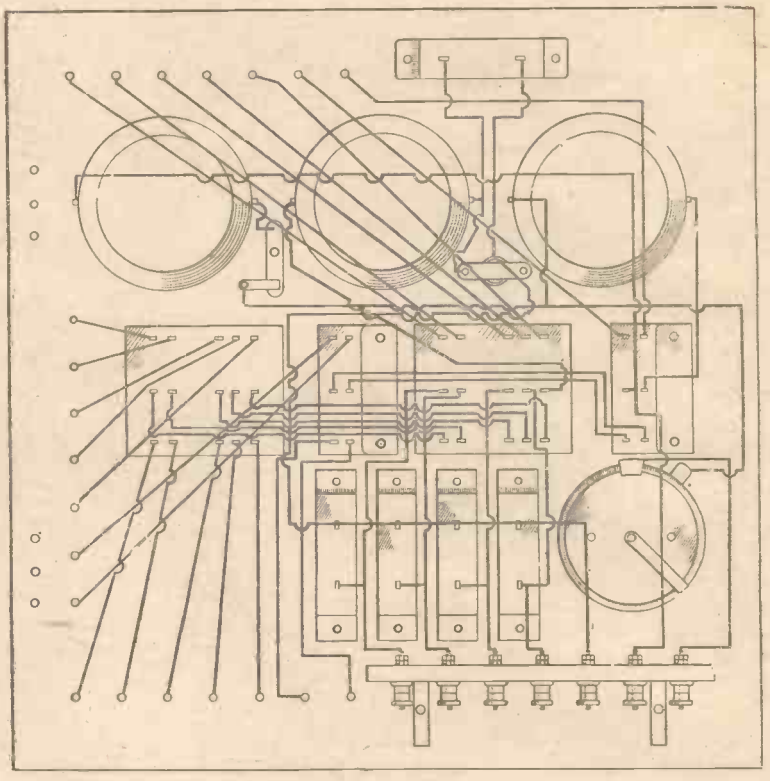


Fig. 2 (right).—Diagram of Connections.

The third photograph shows the layout of the front of the panel and the manner in which it is hinged to its frame so that the back may be accessible. D. G. O. H.

FILAMENT SUPPLY FROM A.C. MAINS

THE filament supply for a valve set can be taken directly from a step-down transformer coupled to alternating-current house mains provided steps are taken to cut out the A.C. hum. One method of doing this is to connect the lower end of the aerial inductance, not directly to the filament but to a potentiometer winding shunted across the secondary of the supply transformer, the potentiometer slider then being adjusted by trial to a point of average equipotential.

The same problem has been solved in America by the use of a specially-designed valve containing two filaments. One is merely a heating wire or resistance, and may take either the full or stepped-down voltage from the mains. As the wire heats up it raises the temperature of a second filament which is wound around but insulated from the first. This second filament is the electron-emitter proper and supplies the internal space current.

A somewhat similar arrangement has recently been proposed by a French inventor. Here the object is not to dispense entirely with the filament accumulator, but to reduce the load upon it, and therefore the necessity for frequent recharging. As before, there are two filaments, one a dummy or heating element.

Alternating current supplied by a step-down transformer from the mains supplies the first filament with sufficient current to raise the temperature of the second to a point just below that at which it emits electrons. The additional current necessary to bring the latter into full operation is then drawn from a storage battery.

B. A. R.

REMOTE CONTROL

THE TANTALUM RECTIFIER

ALTHOUGH tantalum has only recently come into popular favour with valve owners as a rectifier for alternating current, its use for this purpose has been known for many years. Curiously enough its efficiency depends to a large extent upon the presence of certain impurities such as ferrous sulphate in the dilute sulphuric acid electrolyte.

In the ordinary way the rectified current delivered by a tantalum-lead combination in pure sulphuric acid solution may be reckoned as 1 ampere per square inch of tantalum. By adding about 1 part in 10 of saturated ferrous sulphate solution to the electrolyte, the normal output is more than doubled, so that a piece of tantalum 1 in. by 2 in. will pass from 4 to 5 amperes of rectified current—quite sufficient to charge a 60 A.H. accumulator.

The precise effect of the addition of ferrous sulphate is not clearly understood, but it is probably due to what the chemists call catalytic action. When used for charging a 6-volt accumulator the alternating voltage from the house mains should be stepped down to between 20 and 30 volts.

M. A. L.

A new broadcasting station, with an aerial of 400 ft. and a maximum power of 10 kilowatts, has been opened at Pennant Hill, Australia. Reports from British listeners who receive the station's transmissions will be welcomed by the B.B.C.

"A.W." TESTS OF APPARATUS

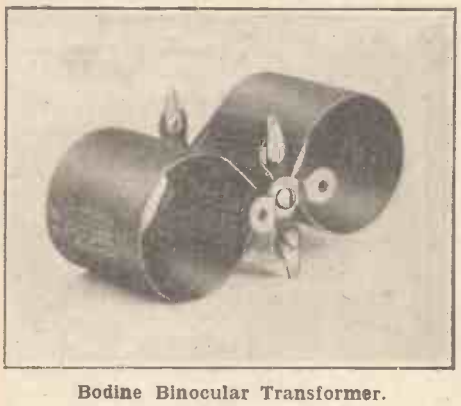
Conducted in the "Amateur Wireless" Research and Test Department

Bodine Transformers

THE Bodine twin-eight binocular transformer is a special type of H.F. coupler, the primary and secondary of which are wound in a unique manner. As its name implies, the component resembles more or less a pair of binoculars. It is claimed that the coil is fieldless, although such a term is rather misleading; in this particular case the field of the coil is confined within limits and will not affect external apparatus.

Each winding of the coil takes the form of a large ∞, and is secured at a central support, the ends of the windings being brought out to soldering lugs mounted at each end of the central support.

These coils can be supplied individually or in matched sets of three. They may be obtained from the Rothermel Radio Corporation of Great Britain, Ltd., of 24 and 26, Maddox Street, Regent Street, London, W.1.



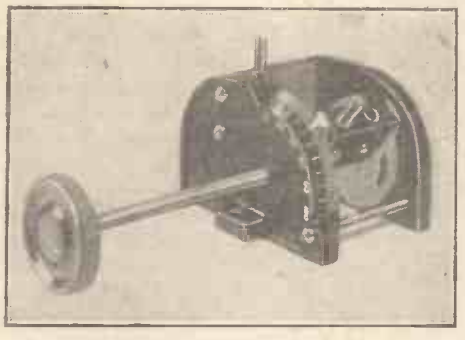
Bodine Binocular Transformer.

On test with a five-valve receiver using three tuned H.F. stages, incorporating these coils, results obtained were exceptionally good. Selectivity was very high and very little tendency to instability was noticed.

Polar Coil Holder

FROM The Radio Communication Co., Ltd., of 34 and 35, Norfolk Street, Strand, London, W.C.2, we have received samples of two- and three-way coil holders, the former being illustrated in the accompanying photograph. As in the older type, the well-known cam-vernier slow-motion mechanism is still retained, the new model having certain refinements which add to its efficiency. Both end-plates of the component consist of moulded bakelite, from each of which small drilled lugs, moulded integrally with the end-plates, provide a means of attaching the coil holder to a baseboard or panel.

To the moving socket is attached a small metal pointer which, when the control knob is rotated, travels over the circumference of a scale engraved on the rounded corner of one of the end-plates.



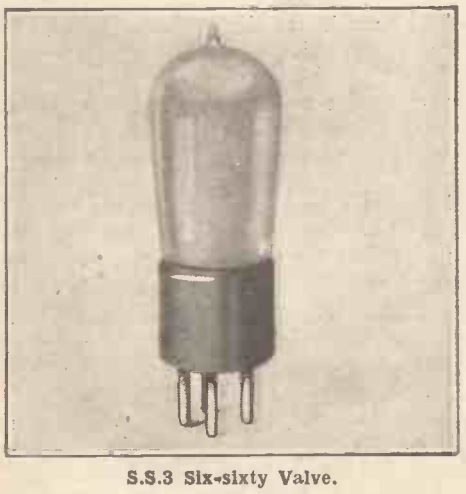
Polar Coil Holder.

By means of the cam-vernier device a slow-motion effect is obtained through about 5 degrees on any part of the scale.

On test the insulating properties of the component were found to be very high, and the motion imparted by the knob is particularly smooth. We can recommend this coil holder as being thoroughly efficient and reliable.

S.S.3 Six-sixty Valves

WE have completed tests on another type of the Six-sixty valves manufactured by The Electron Co., Ltd., of Triumph House, 189, Regent St., London, W1. This is the S.S.3 valve, which is made in two types, the S.S.3 L.F. and S.S.3 H.F., the former being marked with a green disc and the latter with a red disc. The filament voltage of both S.S.3 types is 3, at which pressure the filament passes .06 ampere. Each type has a total emission of 8 milliamperes.



S.S.3 Six-sixty Valve.

The S.S.3 H.F. (red disc) has a plate impedance of 60,000 ohms and an average amplification factor of 17, the plate voltage being from 50 to 125 volts. For a valve of the .06-ampere type this valve has given excellent results both as an H.F. amplifier and as a detector. Owing to the low filament current consumption dry cells may be used to heat the filament.

For low-frequency amplification the S.S.3 L.F. is strongly recommended. This valve has an amplification factor of 7, which remains fairly constant over a wide working range. The impedance is 15,500 ohms, and the plate voltage recommended lies between 50 to 100 volts. As a detector having a transformer of fairly high ratio in the plate circuit, the S.S.3 L.F. gives a very good performance.

G.E.C. Valve Base

NOT the least important detail in a valve is the construction of the base, and in that shown in the photograph there are incorporated several small improvements which are worthy of note. A minimum amount of insulating material is used, and a small projection is formed on the side to indicate the plate pin. The real merit of this G.E.C. valve base, however, is to be found in the construction of the actual pin connections.

G.E.C. Valve Base.

The amount of metal used is very small, as the pins are each formed by four large springs. At their tips are small holes, through which the wires from the electrodes are inserted and sealed up with a small blob of solder, thus securing the wires to the pins. The untidy blob of solder at the top of the pin, by means of which the electrode connections are usually made, is eliminated, thus reducing inter-electrode capacity. On test the insulation resistance between adjacent pins was found to be infinite. These bases will, in future, be used on all valves manufactured by the General Electric Co., of Magnet House, Kingsway, W.C.

A ONE-DIAL

NON-RADIATING ::

THE writer decided to build a set that would give full loud-speaker results from the local and high-power stations with a minimum of distortion, and at the same time one that could easily be operated by the youngest member of the family without causing annoyance to other listeners in the district.

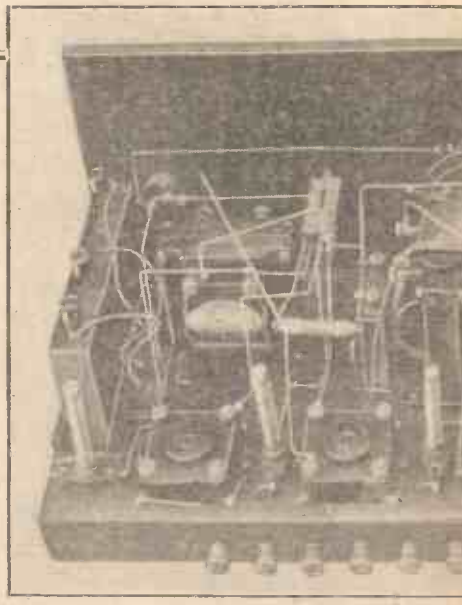
The set had to be used on a small, badly-shielded indoor aerial, and as no reaction was to be incorporated, and owing to the screening effect of the steelwork usually found in modern flats, it was necessary to use two stages of low-frequency amplification in order to bring the local station up to full strength. Also as 5XX came in rather weakly, it was decided to add a stage of resistance-coupled high-frequency amplification, which, although making very little difference on the lower wavelengths, brought the high-power station in at full strength.

dance, and in order to do this choke-coupling has been used. Although this type of coupling does not give quite the same amplification as transformer coupling, the quality is better, and when used after a valve such as the DEQ, with an amplification factor of 20, very little volume is lost.

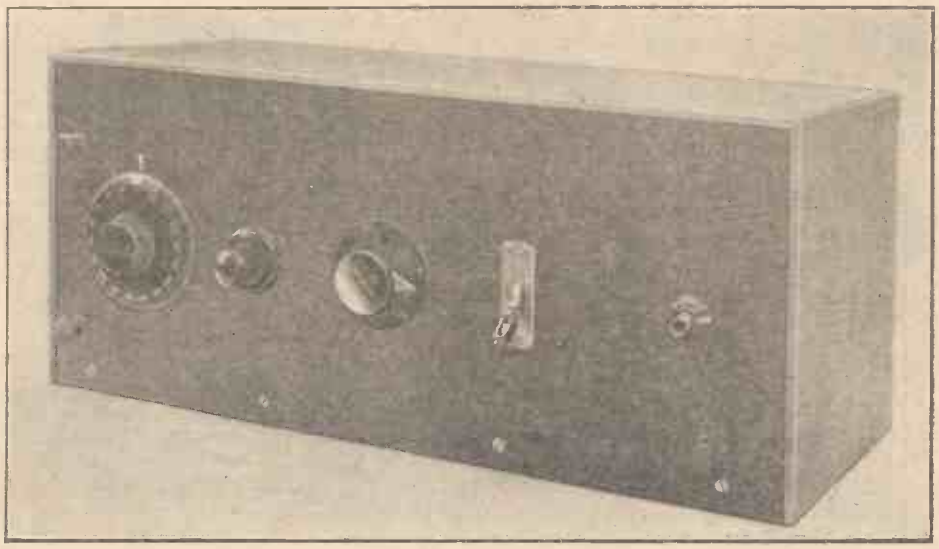
The last stage is transformer-coupled. A switch is incorporated for cutting down the number of valves to three. Now the reason why one usually desires to cut down the number of valves is because they are being overloaded, and if we cut out the last valve, which is a power valve, we do not help things much, that the third valve will still be overloaded owing to the much smaller voltage swing allowable compared to the power valve.

This can be overcome by cutting out this valve and passing the fluctuating output of the detector straight to the last valve; but if this is done in the ordinary way it will mean that the detector valve will now have the same anode voltage as the third valve had and the last valve will have the grid bias of 1½ volts, the former being too great and the latter too small. This may be easily overcome by using a Dewar switch, which will change all of these to the correct values.

The circuit is shown in Fig. 1 (page 602),



Back-of-panel View of Receiver sh



The Complete Receiver.

Quality being the first consideration, anode rectification was employed, but as a variable grid leak and potentiometer are incorporated this may be changed to grid-leak rectification if desired.

The valves used are V1 DE8 H.F., V2 DEQ, V3 DE5B, and V4, a power valve DE5A. Now as the DEQ valve has a very high impedance it is necessary to load this with a circuit of equally high impe-

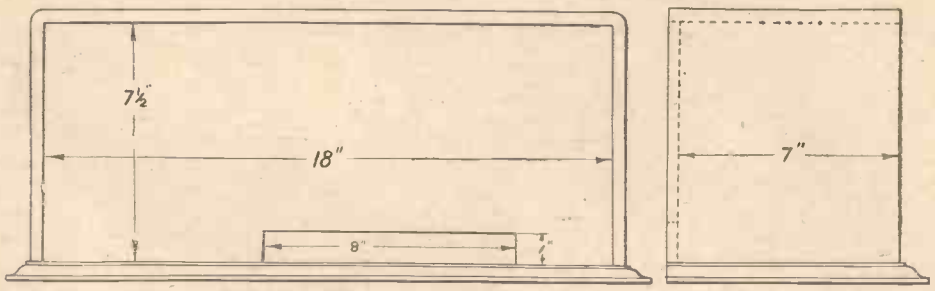
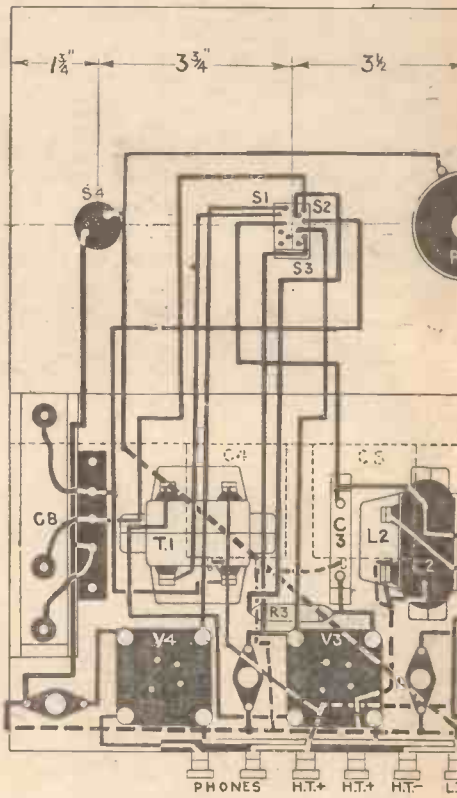
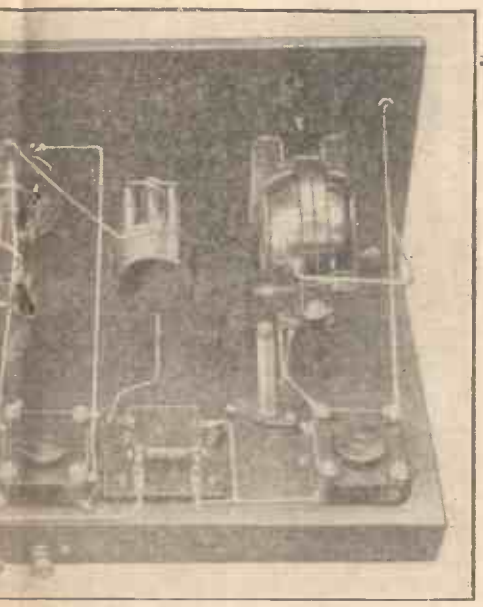


Fig. 2.—Constructional Details of Cabinet.



FOUR-VALVER

SIMPLE :: EFFICIENT



owing Arrangement of Components.

and as will be seen both the local and high-power stations may be tuned in by rotating one dial by using a special Marconi variometer L1, which incorporates a special switching device, so that for the first 180 degrees the windings are in parallel and for the second 180 degrees they are in series. This gives a continuously variable tuning control from 250-1,650 metres. The switches S1, 2 and 3 are shown separately for clearness, but are really controlled by one lever.

No reaction is used, because reaction, however carefully manipulated, invariably introduces distortion.

Good results are only possible if a high quality loud-speaker is used and good components are employed.

The values of various components are shown on the circuit diagram Fig. 1. To some the value of the anode resistance may appear high, but, as has been discovered recently in Germany, this improves reception, providing that the stray capacities are kept to a minimum and the grid leak has a high value, for the whole circuit is voltage operated. Theoretically we could increase these resistances to five times the internal resistance of the valve.

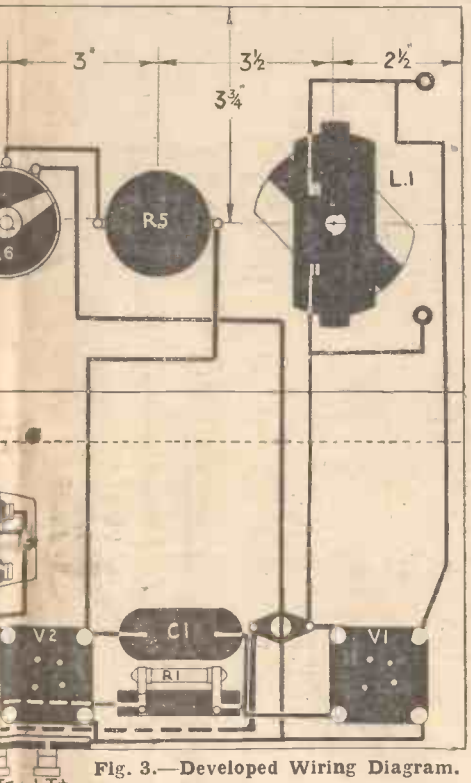


Fig. 3.—Developed Wiring Diagram.

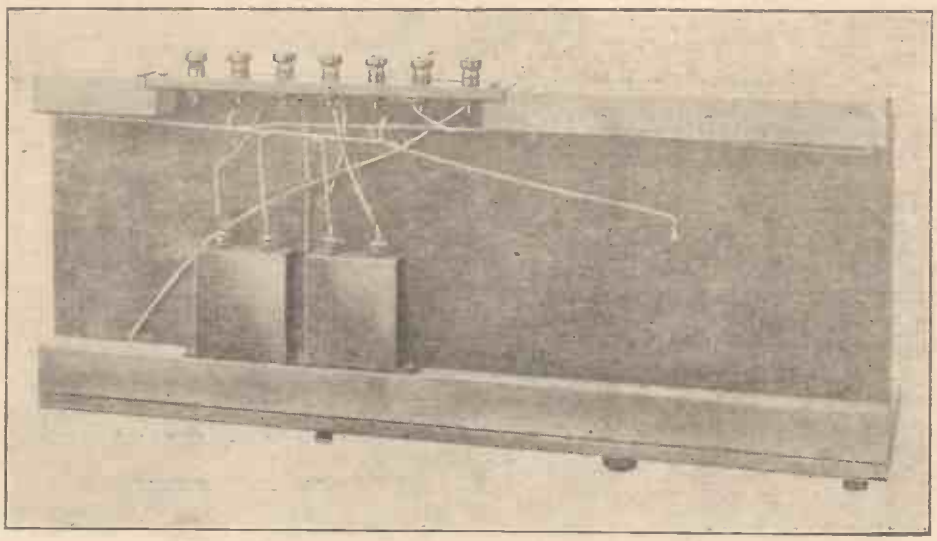
One cabinet of the dimensions shown in Fig. 2; one plywood panel 7½ in. by 18 in.; one plywood baseboard 7 in. by 18 in.; 3 ft. 1 in. by 1 in. batten; one ebonite strip for terminals 7 in. by 1 in. by ¼ in.; nine Belling-Lee terminals; two ebonite bushes; two 1-microfarad Mansbridge condensers; one .25-microfarad Mansbridge condenser; two .0003-microfarad Edison Bell condensers; two .5-megohm grid leaks (Graham Farish); one Igranic variable grid leak; one Ericsson potentiometer; four fixed resistances and holders to suit valves used (Burndept); four valve holders (Benjamin); two Ferranti transformers AF3; one filament on-and-off switch; one 12-point Dewar switch; one Marconiphone variometer; one 9-volt grid-bias battery.

The Panel

The panel is of plywood, as all the portions of the components which are mounted thereon are at earth potential except the aerial terminal, and this is bushed with ebonite. The reason plywood has been used in place of the more usual ebonite is because it is less expensive.

The baseboard is of similar material; a 1-in. by 1-in. batten runs along the front and back, the panel being screwed to the latter.

The panel and baseboard should be shellacked or french polished before use, after



View of Under Side of Baseboard showing Condensers.

Construction

To build the set the following parts are required:

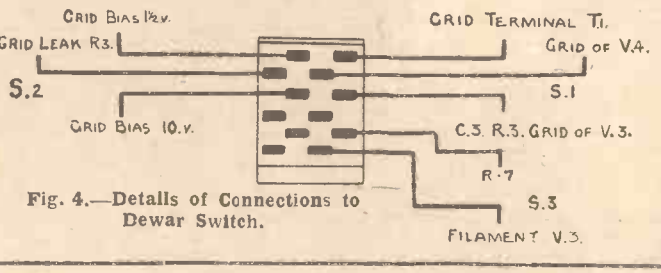


Fig. 4.—Details of Connections to Dewar Switch.

which the panel may be drilled and the components fixed in the positions shown in Fig. 3. In order to reduce the number of wires showing, some of them are carried along beneath the baseboard, and are shown dotted in the wiring diagram Fig. 3. These wires should be insulated.

The only portion of the wiring that may be found at all difficult is that of the Dewar switch, and an enlarged drawing has been shown of this to facilitate connections (Fig. 4).

The choke L2 is a Ferranti transformer with the windings joined in series, and care should be taken that their mutual inductances help each other—that is, the terminal marked "Plate" is joined to the anode of the detector valve, the terminal marked "H.T.+" joined to the "Grid" terminal, and the "Grid bias" terminal connected to H.T.+ of the set. The two 1-microfarad condensers (these being the two H.T.+ terminals) are mounted on one of the battens which run beneath the baseboard.

The wiring having been completed the set may be tried. V1, V3 and V4 may have an anode voltage of 120 volts and V2 about 25-35 volts. V3 will require a grid bias of 1½ volts, and V4 may have anything up to 20 volts on the grid.

For anode rectification the grid of V2 should be minus and for the more sensitive grid-leak rectification it will require to be plus. Of course, the valves mentioned need not necessarily be used, but if a large volume is required they are those recommended. If it is decided to use these valves then the constructor should not try to run them off the ordinary H.T. battery, because the total anode current will be about 15 milliamperes, which means that an ordinary battery would last about three weeks. It is therefore very necessary that either a large-capacity battery be used or else an H.T. accumulator.

If a small indoor aerial is used it may be found that the variometer will not tune up to 5XX, in which case it will be necessary to connect a small condenser of about .0002 microfarad across the aerial and earth terminals. A. R. T.

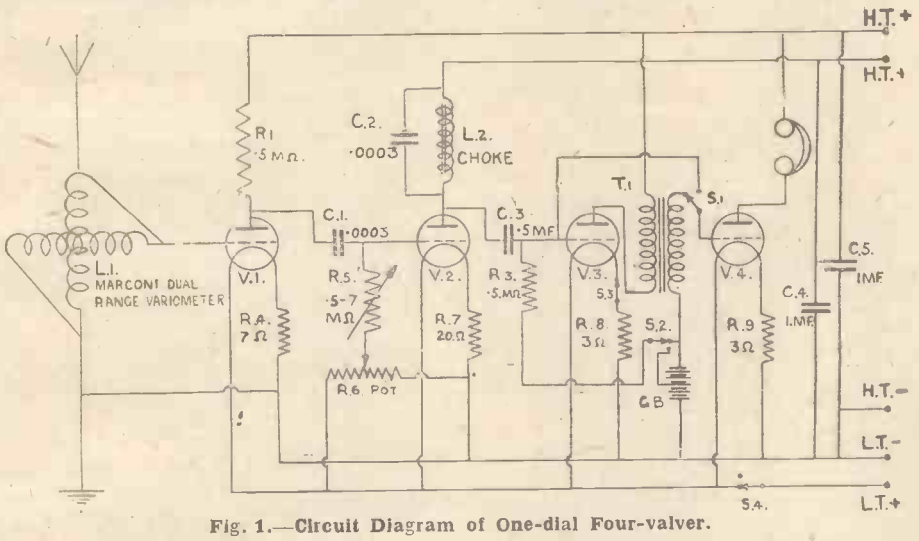


Fig. 1.—Circuit Diagram of One-dial Four-valver.

On April 29 the Glasgow station orchestra and Albert Sammons (violinist) are giving a public concert in the largest hall in the city. The concert will be popular in character.

The Walthamstow Band contest, in which seventeen bands are competing on Saturday, May 1, will take place in Lloyd's Park, and parts of the programme are to be relayed through 2LO and 5XX.

LIGHT-SENSITIVE CELLS

The Comparative Values of the Two Types

SOME interesting points relating to selenium cells were discussed by Professor Fournier d'Albe at a recent lecture before the Oxford University Radio Society. The selenium cell is bound to vie with the photo-electric cell in future systems of wireless photo-telegraphy and television. Professor d'Albe showed that he could work a relay with the current passing through a selenium cell when the latter received a flash of light lasting only a thousandth of a second. On the other hand, Professor Korn was obliged to abandon the use of selenium as long ago as 1908 in his system of transmitting photographs because it did not respond with sufficient rapidity to the changes in density of a slowly revolving photographic film!

Some years ago the writer was invited to assist a French engineer who had made some remarkably good talking cinematograph films with the aid of selenium. Now we know that with a highly-pitched voice the wave frequency may run into many thousands a second. In making photographic records of the voice the currents from the microphone were passed through a delicate galvanometer, which threw a spot of light more or less upon the selenium cell, and these exceedingly rapid fluctuations were evidently responded to with sufficient speed by the cell, because the inventor was able to reproduce the voice with remarkable accuracy.

The writer cannot help feeling, with Dr. Fournier d'Albe, that the last of selenium has not yet been heard, and that when we understand better how to employ it we may discover that its efficiency can be increased enormously. Professor Lindemann, whilst admiring the work of Dr. Fournier d'Albe, said that he had not been persuaded yet that selenium was better than the photo-electric cell. Experiments have shown that the latter will respond to a change of light in a millionth of a second, but against this must be placed the disadvantage that the current it produces is exceedingly minute, and requires great amplification before it can be used for radio transmission.

A New Idea

An interesting new discovery, made some time back by Dr. Fournier d'Albe, was that by using intermittent light of many different musical frequencies it is possible to transmit each one simultaneously by means of the same selenium cell. A large number of musical frequencies, each one corresponding to a "tone unit" of a photograph or image, could be transmitted by wireless, and analysed by a set of resonators in some form of receiving apparatus.

This is only another of the many directions in which the minds of inventors are running in the numerous attempts being made for the solution of the problem of television. T. THORNE BAKER.

In view of the fact that transmissions from Königswusterhausen are so well received in foreign countries, the German Reichspost has decided that the high-power station will from time to time relay special programmes from other German stations when it is not taking those given out by the Berlin studio.

The Moscow (Komintern) station (1,450 metres) now broadcasts a news bulletin in Esperanto every Sunday morning between 09.25 and 09.30 B.S.T.

A POWERFUL REFLEX CIRCUIT

Some Further Notes on the "Coast-to-coast Three-valver."

By C. A. CLEGHORN

THE article entitled "A Powerful Reflex Circuit," which appeared in Nos. 178 and 179, aroused a large amount of interest. In this article some further explanations, and also suggestions for interesting and effective variations in the circuit, are given.

A point which seems to have puzzled inquirers is the object of having three resistances. Regarding these, the additional resistance was introduced for the reason that when I originally designed this circuit there were very few suitable non-inductive wire-wound anode resistances on the market, and the one which I had by me happened to be the Polar resistance-capacity unit, comprising a wire-wound resistance, a condenser and a grid leak. This, although an excellent and compact little unit, had a total resistance of 40,000 ohms only, and such a low resistance (although good results could be obtained with it) was too low to get the best results. I therefore wound non-inductively an additional resistance in order to increase the sum total, as described in No. 178. The correct resistance is about 80,000 ohms if 100 volts H.T. is available.

As regards R1, the resistance next to the anode, I must state that I quite realise that the expert readers of "A.W." will (quite reasonably) be inclined to look askance at the method of taking the lead to the following grid condenser from the top of this resistance R1, as at first sight this appears to be contrary to all theory. Nevertheless, it will be found that this results in increasing considerably the power and effectiveness of the circuit, if the resistance (R1) is wound to the correct amount and in the correct manner.

It should be noted that this part of the total resistance is wound inductively and acts partly as a resistance and partly as a semi-aperiodic inductance. One effect of its use is to introduce a certain amount of reaction which counteracts some of the damping in the circuit just where such action is required. The correct number of turns is best found by experiment, as it will probably vary slightly with the characteristics of different valves and for the wavelengths principally required. The instructions given in the previous article should be followed; the 200 turns specified wound inductively on a 3-in. solenoid former will probably be found to be about correct, but a tapped resistance, as recommended at the end of the article in No. 179, will enable the experimenter to test for best results. The Marco wire can be obtained from the London Electric Stores, 9, St. Martin's Street, W.C.

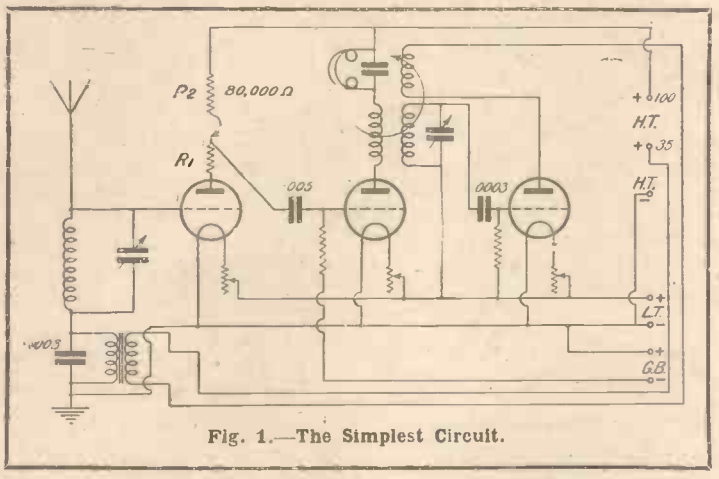


Fig. 1.—The Simplest Circuit.

The use of the resistance R1 may, however, if preferred, be dispensed with altogether, and the circuit in its simplest form is then shown by Fig. 3. If this is done, however, more reaction will have to be employed, and the results will not be quite so good, except for wavelengths of over 1,000, when it is of no advantage.

If another tuned circuit is not objected to, very excellent results may be obtained by using a tuned circuit next to the anode in place of the resistance R1 and taking the lead from the top of the circuit as shown in Fig. 2. This will be found to give very powerful results and excellent selectivity. Taking this lead from the top of the tuned circuit instead of the bottom appears to be contrary to theory, but if experimenters will try this method they will find results extremely good.

Although this introduces a third tuning control, it will be found that after a little practice it does not render searching for distant stations much more difficult than is the case with the two-control circuit. The tuned-anode circuit used as described acts as quite an efficient selector circuit, the tuning being very sharp, a very slight touch of the vernier to one side or the other being sufficient to obliterate a signal. For this reason it is absolutely essential that a condenser permitting really sharp tuning should be used in this position.

The tuning of this condenser (C2) does not vary appreciably with the reaction used, and a good plan when operating is to find by experiment the setting of this

(*Concluded at foot of second column of page* 610)

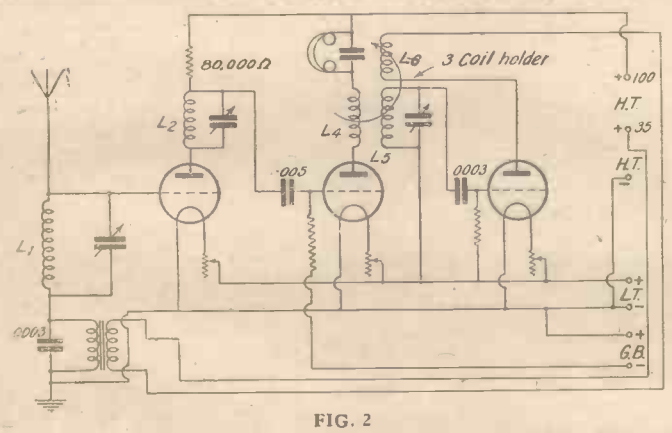


FIG. 2

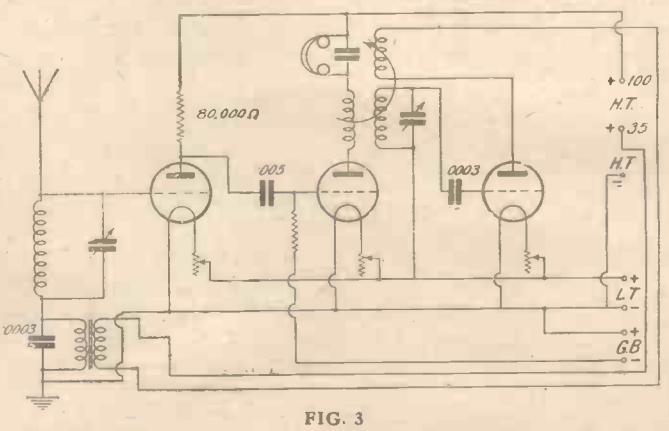
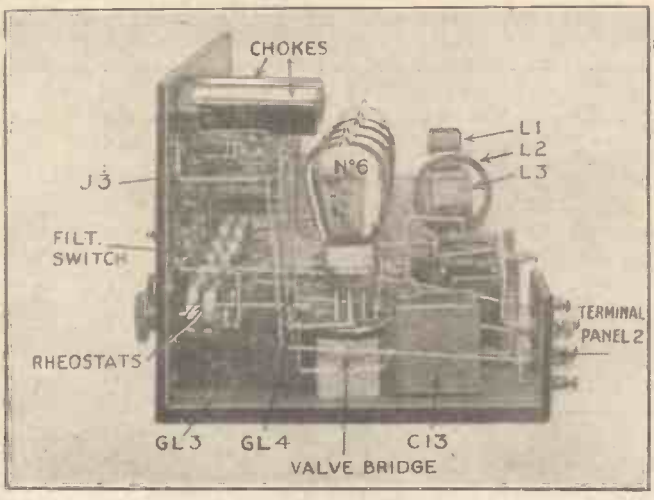


FIG. 3

Figs. 2 and 3.—Two Modifications of the Circuit.

THE "CONCERT SIX"

The second and concluding article on the construction of a loud-speaker set for all stations



End View of Receiver Out of Case.

WE are now ready to begin the wiring, a job which should not be hurried. It is much better to do it very carefully, tackling only a small amount of it at one sitting. Before you start plan it out in your mind's eye or, better still, on paper, making use of the photographs to help you. I have used the right-angle method in which leads, with very few exceptions, are kept parallel with the long or short edges of the panel or with the short edges of the baseboard. This system has a great deal to recommend it, since where wires cross they do so at right angles. If, however, you prefer the more direct method, in which leads are taken by the shortest available path from point to point, there is no reason why it should not be used. Do not yet mount on the baseboard the two terminal panels—they can come later, and connections to them are easily made at a subsequent stage.

Begin by wiring up the filament circuits. The first step is to connect together with a wire the filament sockets of the valves which are nearest the rear edge of the panel. This will be the positive low-tension busbar. Connect it also to one end of the windings of the potentiometer. Next join up the rheostats and the other winding of the potentiometer with the low-tension negative busbar, as seen in Fig. 2 (p. 566, No. 201). From the unoccupied connection of each rheostat take a lead to the filament negative leg of the corresponding valve.

Next wire up the A.T.I. and A.T.C., the slider of the potentiometer, the grid of V1 and the condenser C6. Connect the plate of this valve also to the plug of the second valve holder. From the socket of this holder take a lead running under the valve bridge to the moving plates of A2. Run a lead from the second contact of C4 to the grid of V2, and one from the contact of the leak extension to the slider of the potentiometer. The wiring of the second valve is precisely the same except that the grid leak GL2 is connected to the positive low-tension busbar. In both cases the variable resistances must be wired as shown across the leads running to the variable condensers A2 and C3. The connection between the rectifier V3 and the first note magnifier V4, being through the transformer, is clear and straightforward. Fig. 6 shows the two kinds of jack required for the low-frequency valves. The first kind, which is used for J1 and J2, is the double-closed-circuit which has four contacts. In the position shown in the drawing the lower spring arm 1 is connected to the leaf 3, since their contact points spring together. The upper spring arm 2 and the leaf 4 are similarly in contact, hence if we connect the plate of V4 to 1, the second high-tension positive busbar to 2, and the choke to 3 and 4; the current will pass to the plate of the valve through the choke when the plug is in position. On inserting the plug the arms 1 and 2 are forced apart, the former making contact with the point of the plug and the latter with its body. One of the loud-speaker terminals being connected to the point of the plug and the other to the body the only path for current from the battery to the plate is now through the windings of the loud-speaker, and the choke is cut out altogether.

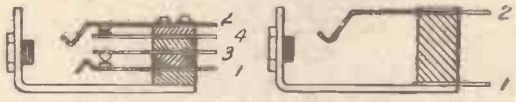
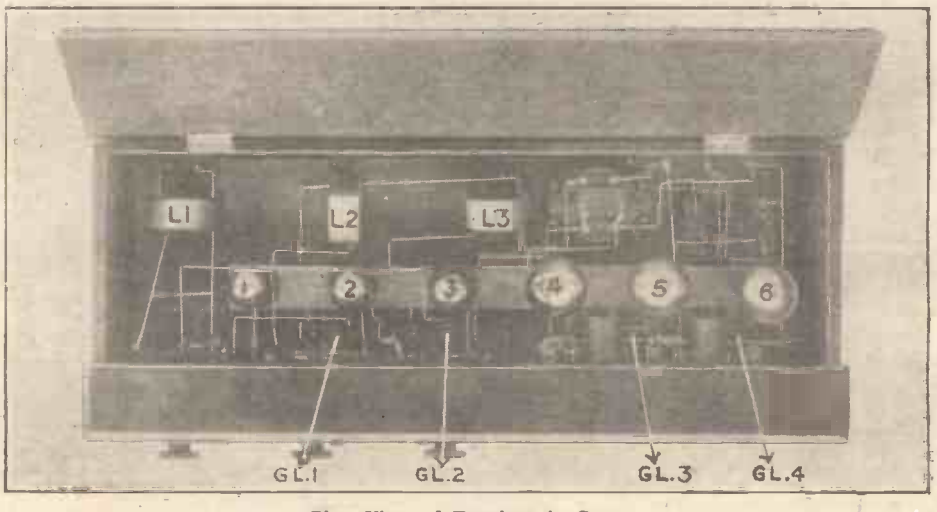


Fig. 6.—The Two Kinds of Jack Employed.

The single open jack used for J3 must be turned upside down when it is mounted upon the set in order that current may always flow in the same direction through the windings of the loud-speaker. An examination of the jack and plug will show why this is done.

The last step is to fix in place the terminal panels, the first of which, 2 in. square, supports the aerial and earth terminals, whilst the second, which measures 3 in. by in., takes the eight terminals for H.T. +1, H.T. + 2, H.T. −, L.T. +, L.T. −, G.B. +, G.B. − 1, G.B. − 2. When the necessary connections from these to the proper points in the set and to the condensers A12 and C13 have been made the set is ready for use. In an early issue of AMATEUR WIRELESS I shall describe how the set is operated so as to obtain efficiency combined with perfect stability. The photographs on this page will be of assistance when considering the operation of the set.

J. H. R.



Plan View of Receiver in Case.

The new Kaschau (Czecho - Slovakia) broadcasting station is now daily transmitting an evening concert between 20.00 and 21.00 B.S.T. on 2,020 metres. The call is given out in Czech. The entertainments are organised by the local radio clubs with the help of the Slovakian authorities. Other Czecho-Slovakia broadcasting stations are at Prague and Brunn.

"AMATEUR WIRELESS"

GREAT HOLIDAY BALLOT COMPETITION

FIRST PRIZE £100 SECOND PRIZE £50

and Twenty other Prizes of £5 each

WHICH IS YOUR FAVOURITE EAST COAST HOLIDAY RESORT?

Perhaps it is SCARBOROUGH, or FELIXSTOWE, or SKEGNESS. WHATEVER IT IS, BY SELECTING YOUR SIX FAVOURITES, according to what you think will be the most popular vote, YOU STAND A CHANCE OF WINNING £100, or one of the other 21 Prizes. THIS COMPETITION IS SIMPLICITY ITSELF. BELOW YOU WILL FIND A LIST OF 20 of the most popular RESORTS—ALL ON THE LONDON AND NORTH EASTERN RAILWAY, which, as you know, runs from King's Cross to Lossiemouth and from Manchester to Grimsby. ALL YOU HAVE TO DO IS TO STATE, IN THE SPACE PROVIDED BELOW, which you think will prove to be the most popular among all the competitors. FOR INSTANCE, if you think SCARBOROUGH will be at the top, put that FIRST, or if you think FELIXSTOWE, put that FIRST, or if you think SKEGNESS, put that FIRST, and so on in order. YOU MAY ONLY SELECT SIX PLACES—NOT MORE—AND ONLY THE PLACES NAMED BELOW MAY BE USED.

LIST OF TWENTY RESORTS.

SCARBOROUGH.	WHITBY.	YORK.	REDCAR.	DUNBAR.
BRIDLINGTON.	YARMOUTH.	CROMER.	CLEETHORPES.	NORTH BERWICK.
WHITLEY BAY.	LOWESTOFT.	CLACTON.	HARROGATE.	EDINBURGH.
NORFOLK BROADS.	FELIXSTOWE.	SKEGNESS.	SALTBURN.	ABERDEEN.

Before deciding on your favourite six East Coast Holiday Resorts, read below what distinguished residents say about them:—

SCARBOROUGH. By Councillor G. Whitfield, His Worship the Mayor.
"There are entertainments to suit every taste, and it is the Children's Paradise. Scarborough, as the 'Queen of Watering Places,' still 'reigns supreme.'"

YORK. By Coun. W. Wright, The Lord Mayor.
"York is unique. It is surrounded by mediæval walls with ancient Bars and Towers. Its Minster is the largest and most beautiful in the Kingdom. It is *the* centre for excursions to the Coast, Moors, Rivers, Abbeys and Castles of Yorkshire."

YARMOUTH. By Councillor A. W. Yallop, His Worship the Mayor.
"Yarmouth's health-giving breezes and invigorating air are unsurpassed. It provides all that is best in amusements, has the most up-to-date attractions, and its golden sands make it the ideal resort."

REDCAR. By Alderman W. Wardman, His Worship the Mayor.
"Redcar possesses the finest stretch of beach to be seen in the United Kingdom. These sands are unparalleled, and at low water there is a width of sand three-quarters of a mile."

WHITBY. By F. W. Horne, Esq., Proprietor of *The Whitby Gazette.*
"You can spend a fortnight at Whitby, have the beach, bathing, tennis, etc., in the morning, visit a different beauty spot every afternoon, and come back to music and entertainments in the evening."

FELIXSTOWE. By H. F. Douthwaite, Esq., Chairman of the District Council.
"Felixstowe is Peter Pan's own playground. For the tired—rest and recuperation; for the virile—games galore. Merry entertainers, bright music, clean air, sparkling seas and golden sunny days."

SKEGNESS. By Councillor F. Cooper, Hon. Sec. Skegness Advancement Assoc.
"The bracing air of Skegness acts as a tonic. There are miles of golden sands for the kiddies. If it is for life and health, will you not find it where innumerable others have done?"

NORFOLK BROADS. By H. Blake, Esq.
"A Norfolk Broads holiday is 'better than the seaside,' because it is 'the holiday that is different,' being free from the usual irksome routine. 'For health and rest, the Broads are best.'"

EDINBURGH. By Sir W. L. Sleigh, the Lord Provost of Edinburgh.
"Edinburgh is the most beautiful city in the world. Its picturesque charms appeal to all lovers of nature; its romance and history to all students. With its bright sunshine and bracing climate, it forms the ideal holiday resort."

NORTH BERWICK. By A. D. Wallace, Esq., Town Clerk.
"North Berwick is the world's golfing centre. It has 9 first-class golf courses within 6 miles; tennis courts; finest safety swimming pool in the country; safe, sandy beach; picturesque sea-board."

HARROGATE. By F. J. C. Broome, Esq., Publicity Manager to the Harrogate Corpn.
"Harrogate offers the money-and-time-saving proposition of a 'cure' and a holiday combined. 'The Mecca of the Ailing, the Playground of the Robust,' expresses Harrogate in a few words."

CROMER. By Commander Locker-Lampson, M.P.
"Cromer has the record for sunshine of any seaside resort in England, and its sands, its sea, and its surroundings are as charming as anywhere in the United Kingdom."

LOWESTOFT. By Councillor W. Smith, His Worship the Mayor.
"Lowestoft is the first town in the British Isles to greet the rising sun, and it is the most invigorating resort on the English coast. Its inhabitants welcome visitors."

BRIDLINGTON. By W. A. Storr, Esq., His Worship the Mayor.
"Bridlington is one of the most delightful and popular health resorts on the East Coast. With its glorious sands, aptly described as 'The 'Children's Paradise,' its facilities for sports, it offers unrivalled attractions."

WHITLEY BAY. By Arthur Barker, Esq., Clerk to the Whitley Urban District Council.
"Whitley Bay is well known as Northumbria's happy holiday centre-by-the-sea. For bracing air and facilities for every form of outdoor recreation and indoor amusement, it would be hard to beat."

CLACTON. By Councillor W. Fenton-Jones, J.P., Chairman of the District Council.
"Clacton-on-Sea faces South, and combines a tonic air with warmth and abundant sunshine. It is a garden city by the sea which provides every facility for a healthy and pleasant holiday."

CLEETHORPES. By W. J. Womersley, Esq., M.P., J.P.
"Cleethorpes provides bracing air with facilities for golf, tennis, bowls, boating, fishing, and it possesses Britain's largest bathing pool. The sands are safe for children."

SALTBURN. By Sam H. Rapp, Esq.
"Saltburn sands are the finest in Europe, firm and clean. The town is surrounded on three sides with beautiful glens and sylvan woods. Special facilities for the moors and neighbouring resorts."

ABERDEEN. By Councillor Doeg, Convener of Public Health and Advertising Committees.
"For a bracing holiday there is no place in the British Isles can surpass Aberdeen, 'The Silver City by the Sea,' with its fresh air from the North Sea and the Grampian Mountains."

DUNBAR. By J. B. Brook, Esq., Town Clerk.
"Dunbar is a main-line seaside resort with a most bracing climate, and ample facilities for holiday recreation and amusement. The affection visitors acquire for Dunbar brings them back year after year."

ALL ENTRIES MUST BE POSTED TO Cassell & Co., Ltd., "HOLIDAY BALLOT COMPETITION," La Belle Sauvage, London, E.C.4, NOT LATER THAN MAY 12th, 1926, and the result will be published in the JUNE 19 ISSUE of this paper.

No Entrance Fee—Free to All. Simply Fill Up This Coupon

COUPON

The following are, in my opinion, the SIX most popular Resorts on the East Coast.

1 ..... 4 .....

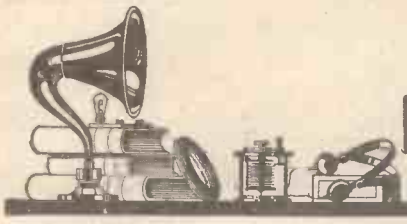
2 ..... 5 .....

3 ..... 6 .....

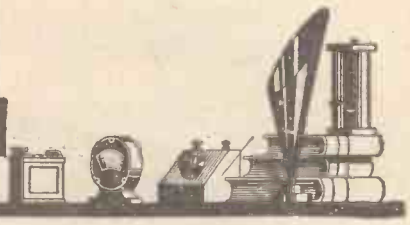
Name.....

Address.....

A.W.1. .....



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 616).

Efficiency of Frame Aerials

Q.—*For a given size of frame aerial which is the most efficient method of construction, the solenoid or the flat pancake-type of winding?—K. N. (Leeds).*

A.—The efficiency of a frame aerial depends upon the average size of the turns. In the case of a solenoid winding the average size is the same as the size of one turn, but in the flat winding the average size of the turns is considerably less than the size of the largest turn. Thus, for a given length of side, the solenoid winding is the more efficient.—J. F. J.

Lightning and Indoor Aerials

Q.—*I have erected an indoor aerial just below the roof of the house. Will there be any great danger of the house being struck by lightning due to the presence of the aerial? Shall I decrease any such danger by lowering the position of the aerial?—D. V. (Salisbury).*

A.—The extra danger of a house being struck by lightning owing to an indoor aerial having been erected is quite negligible. You are not advised to lower the position of the aerial, as this would decrease signal strength without any compensating reduction of the danger from lightning. You can provide means for connecting the aerial directly to earth when the set is in use; but although this would reduce any little danger that might exist, it must be remembered that the lightning would have to pass through the roof before it could reach the aerial and be conducted to earth.—J. F. J.

Loading Loose-coupler

Q.—*I have a set which employs the old-fashioned type of loose-coupler. It is designed for operation on wavelengths between 300 and 500 metres only and works well. I now wish to receive Daventry and have tried loading both aerial and secondary circuits with all sizes of coils, but with no results. Can you suggest what is wrong?—H. R. S. (Eastbourne).*

A.—When you load up the two circuits the coupling between them is considerably reduced owing to the fact that only a portion of the total inductance of each is included in the coupled coils. Both loading coils should be coupled together in a two-way holder and when you succeed in receiving Daventry, you should try the effect of reversing the connections to one of the coils to make sure that the coupling is in the same sense as that between the loose-coupler coils.—B.

Oscillation

Q.—*Why is it that any set oscillates more easily when the aerial condenser is connected in series with the aerial than when this condenser is connected across the tuning coil?—B. C. (Leicester).*

A.—There are several reasons for this, but it will only be necessary to state two of the more important. First, connecting the condenser in series with the aerial reduces the total capacity of the aerial and also the damping of the circuit. A reduction in the damping, of course, means that less energy will have to be transferred back through the reaction coupling in order to cause oscillation. Secondly, with the condenser in series a larger aerial coil should be used to give a certain tuning range than would be the case were the condenser in parallel with the coil. This larger aerial coil will mean that the reaction coupling will be closer (if reaction is applied to the aerial circuit) with a given distance between the aerial and reaction coils.—R. W.

Best Three-valve Circuit

Q.—*Which is the best way of using three valves; as two H.F. stages and detector, as H.F., detector and L.F. or as detector and two L.F. stages?—E. C. (York).*

A.—Everything depends upon the purpose for which the set is to be used. When distance is the only object the first-mentioned arrangement may be recommended, though it must not be expected to give loud-speaker results even on a near-by station. When loud-speaker results are required from one or two stations only, and situated not very far away, the last-mentioned circuit will give the most powerful signals. For good all-round results, including both fair range and loud-speaker reproduction from several stations, the H.F., detector and L.F. circuit is far and away the best.—J. F. J.

OUR WEEKLY NOTE

MICROPHONIC VALVES

A peculiar trouble is often experienced by people using three- or four-valve loud-speaker sets, when certain types of dull-emitter valves are employed. What happens is this. When first switched on the set works as it should for a little while and then a faint "booming" sound begins to issue from the loud-speaker. The sound constantly increases in intensity until it soon develops into a noise which completely obliterates even the strongest signals.

The cause may seem baffling at first when tests have shown that it is not due to H.F. oscillation or interaction between the L.F. transformers. The real trouble is that the valves are microphonic. The sound-waves emanating from the loud-speaker cause the valves to vibrate and this, by causing the relative positions of filaments, grids and plates, to alter very slightly, produces variations of the anode current which are superimposed on those due to the signals. As these extra impulses finally reach the loud-speaker and are passed by it, through the air, back to the valves, it will be seen how the sound builds up in just the same way as does ordinary H.F. oscillation.

The cure, of course, is to fit one of the many excellent makes of anti-microphonic valve holders now on the market.

THE BUREAU.

Insulators in Stay-wires

Q.—*What is the advantage of breaking the stay-wires of an aerial mast and inserting insulators every few feet?—H. L. (Rugeley).*

A.—This need only be done when the stays consist of metal rope. If each of the stays consisted of one continuous length of wire, serious losses of signal strength might occur owing to absorption of some of the energy in the aerial by the stays. By breaking up the stays into short lengths of wire, in the manner mentioned, it is ensured that the natural wavelength of each piece of wire is considerably shorter than that to which the aerial is tuned, therefore making the transference of any considerable amount of energy unlikely.—B.

Natural Wavelength

Q.—*Is the natural wavelength of a T aerial the same as that of an inverted L aerial with the same length of horizontal portion and down-lead?—P. L. (Dunstable).*

A.—The natural wavelength of a T aerial is approximately the same as that of an L aerial with the same down-lead but of only half the horizontal length. This is assuming that the down-lead of the T aerial is taken (as it always should be) from the exact centre of the horizontal portion. Although when we compare these two latter aerials the capacity of the T may be greater than that of the L, its inductance is less, as the two arms are, in effect, in parallel with each other.—J. F. J.

H.T. Condensers

Q.—*When separate H.T. tappings are used for each of the valves of a receiver, is it necessary to connect a large condenser between each H.F. positive tapping and H.T. negative, or is one condenser sufficient? If the former, can smaller condensers be used than would be the case were only one H.T. positive tapping used?—T. M. A. (Uxbridge).*

A.—While it is not actually essential to use a condenser across the H.T. battery in most cases, it is certainly advisable to do so. However, when several H.T. positive tappings are used, there would be little gain in placing a condenser between one of them only and H.T. negative. As many condensers should be used as there are H.T. positive tappings. The size of the H.T. condenser is not at all critical. At the same time, it is better not to make any reduction in the size of each condenser because more than one is used. Any value between .06 and 2 or more microfarads is suitable.—R. W.

Exhausted H.T. Battery

Q.—*How can I tell when it is time to renew the H.T. battery?—I. R. (Dorset).*

A.—As long as reception is satisfactory there is, of course, no need to worry. If the strength of reception seems to be falling off and there is increasing difficulty in making the set oscillate, the H.T. battery may be to blame. Other causes could, of course, produce the same symptoms. If the H.T. battery is becoming exhausted it will be noticed that signals are fairly strong when first the set is switched on, but that they soon decrease in strength. To make sure disconnect the H.T. battery for a few minutes, leaving the valves alight. If, upon connecting up the H.T. battery again, reception is again good, you may be pretty certain where the fault lies. When the battery begins to run down crackling noises, not traceable to any other component, will generally make their appearance.—J. F. J.

Connecting Switch

Q.—*I wish to fit a switch to enable the last valve of "Britain's Most Popular Two-valver" to be cut out at will. What will be the simplest arrangement?—S. H. (Coventry).*

A.—A switch of the S.P.D.T. type may be used for the purpose. The lead which at present goes from one side of the reaction coil to I.P. should be removed and this side of the reaction coil connected to the centre switch contact. One of the side switch contacts should be joined to I.P. and the other switch contact to the plate of the last valve. A D.P.D.T. switch would be necessary to cut off the second valve at the same time.—B.

RADIOGRAMS

RADIO BELGIGUE has applied to the Belgian authorities for authority to broadcast its programmes on 508 metres, as the 262-metre wave appears to be a very unfavourable one, and it is thought that by the use of the higher wavelength it would be possible to overcome the many blind spots in Belgium.

The Danish Government proposes to equip its various railway ferries with wireless apparatus.

The power of the Zurich broadcasting station will shortly be increased to 5 kilowatts.

The Japanese Government has now definitely approved the establishment of a broadcasting service, and eight transmitting stations, working on wavelengths between 200 and 400 metres, with a power of 1 to 1½ kilowatts, will be installed at Sendai, Aomori, Sapparo, Niigata, Kanazawa, Hiroshima, Hakato and Kumamoto. Broadcasting stations are already in operation at Nagoya (365 metres), Osaka (385 metres), and Tokio (375 metres).

Transmissions from the Nijni Novgorod (Russia) laboratory, on a wavelength of 35 metres, have been received in Australia during daylight hours.

The Berlin broadcasting station now proposes to organise a special weekly programme for the blind, and to this end they supply the various institutions and hospitals with a programme printed on the Braille system.

Dr. Popoff, the Russian scientist, has recently completed an invention which, according to his statement, enables the wireless transmission of moving films.

Two interesting relay "stunts" were recently effected by German stations. On Easter Monday the Berlin studio installed microphones at various points of the Karlshorst steeplechase racecourse, and by this means listeners received the sounds of an exciting finish at the winning post. At the conclusion of each race the announcer gave out the results, and intervals were filled in by a musical programme from the orchestra. At Frankfort-on-Main on Saturday, April 3, the station relayed incidents from a Rugby football match.

It is stated that over 1,000 schools take the educational broadcast transmissions from the London and Daventry stations.

A condensed version of Verdi's opera *La Traviata* will be given from the London studio on Friday, April 16.

St. George's Day, Friday, April 23, will be devoted to a special programme announced by Mr. Basil Dean, with whom will be associated Miss Lilian Baylis.

The small experimental wireless telephony transmitter installed at the Ecole des Arts et Manufactures de Paris, of which the call-sign is 8 D K, is now working regularly between midnight and 1 a.m. nightly on a wavelength of 44 metres.

The various clubs which are responsible for the running of the Radio Toulouse station have now decided to increase its power to 15 kilowatts, and to develop the daily programme so as to make the transmissions continuous from 9 a.m. until 11 p.m., with an occasional extension until 2 a.m. the next morning. It has now been decided to relay light operas from the Toulouse Variety Theatre at regular intervals. As the French Postes et Télégraphes have refused to place a land-line at the disposal of this station the performances are picked up by wireless link from a small transmitter in the city of Toulouse and rebroadcast on a higher wavelength.

During Easter the Glasgow Radio Circle was instrumental in providing 700 gifts for patients in children's hospitals. The presents took the form of Easter eggs, each containing a toy.

With a power of only 12 watts, 2 V X (Aberdeen) has been in two-way morse communication with 6 Q A (Maranhao, Brazil), a distance of 4,000 miles. The 2 V X signals, on 45 metres, were reported of good strength and clarity. The Brazilian replied with 50 watts on 36 metres. 6 W G (Glasgow) has been reported R7 at Funchal, Madeira, 1,800 miles distant.

The Swedish Posts and Telegraphs department is now erecting a further relay station at Ostersund. Its power will be about 500 watts.

One of last year's outside broadcasts, "Beating Retreat," a feature of garrison life at Dover, will again be heard by listeners on May 26.

A shortened version of Offenbach's burlesque *Bluebeard* is to be included in the London programme on April 21. This will be its first broadcast performance.

The Prince is to speak at a meeting of the National Savings Movement at the Albert Hall on May 14, and his address is to be broadcast.

The Liverpool City Police Band will be heard again from that station on April 28.

Mr. Stenson Cooke, secretary of the Automobile Association, will resume his chats on motoring matters on April 29.

The General Electric Company at Schenectady is effecting a series of tests on various low wavelengths. Almost every evening, with the exception of Wednesdays and Sundays, 2 X K and 2 X A F broadcast the W G Y programme on respectively 65.5 and 32.79 metres. The frequencies of both transmitters are maintained by crystal-quartz control. The signals on 32.79 metres were recently rebroadcast by the Johannesburg station and were received by local amateurs at loud-speaker strength.

In the Argentine Republic the opening of two new broadcasting stations has aroused considerable enthusiasm, and Buenos Aires has been "bitten" by the broadcast fever. Wireless components, which in other countries are being sold at quite moderate prices, sell in South America at extremely high prices.

The Radio Toulouse broadcasting station is shortly to be fitted with a high-power transmitter.

In view of the satisfaction given by the installation of wireless apparatus on express trains between Hamburg and Berlin since March 1 last, two further trains have been similarly equipped.

In plans for a broadcast series depicting the development of Glasgow and the Clyde, it is hoped to include transmissions dealing with the various important industries, such as shipbuilding, engineering and coal-mining. Among the novelties proposed is a broadcast of the launching of a ship.

Although the United States Department of Commerce (on the recommendation of the National Radio Conference which took place last autumn) has discontinued to issue broadcast licences, applications to the number of 428 have been received from firms who desire to erect transmitters. Eight of these emanate from New York and include one filed by a theatrical company.

The Archbishop of Canterbury will broadcast from Church House, Westminster, on April 22.

The broadcast from Hilversum on April 19, which will be relayed to British listeners by the B.B.C., will include songs by a vocalist from the Vienna Opera House as well as instrumental solos by well-known Dutch artistes.

Test transmissions are at present being made by the Basle station in Switzerland. No fixed power is used, and the wavelength varies in the neighbourhood of 400 metres.

In Glasgow the proposal to broadcast town council meetings has once again been turned down, but the B.B.C. intend to persevere. Meantime arrangements are on foot for a big series of transmissions dealing with municipal activities, with the primary object of arousing listeners to their responsibilities as citizens

Exide

THE LONG-LIFE BATTERY

The New H-T Battery TYPE WJ

9d PER VOLT

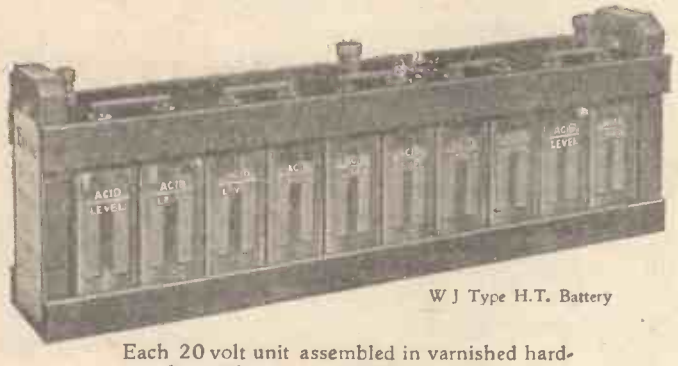
"ATMOSPHERICS" ELIMINATED

Only by using Accumulator high tension can you realise the purity of reception attained by cutting out the noises, due to partly run down dry batteries.

The silent background given by Exide H.T. batteries is almost uncanny, giving a freedom from the distortion due to "dry battery atmospherics," that is a revelation and a delight.

Accumulator H.T. means music instead of noise and every word distinct.

The W J type has a capacity of 2,500 mili-ampere hours, needs recharging only every six months and will last a lifetime.



W J Type H.T. Battery

Each 20 volt unit assembled in varnished hardwood container.
Internal resistance negligible.
Voltage practically constant.
A third terminal gives 10 volt tappings.
Supplied ready charged, it can be used immediately on addition of "Accumulator" acid.

PRICE—

20-volt battery - 15/-
(without acid)

9d. per volt

Any required voltage can be obtained by coupling, in series, the appropriate number of 20-volt units.

Order from your usual dealer at once to ensure early delivery

Advertisement of THE CHLORIDE ELECTRICAL STORAGE CO. LTD., Clifton Junction, nr. Manchester

Maurice Cole.

NEXT WEEK AT 2LO

By "THE LISTENER"

In the programmes

THE novelty of visits of various other provincial musical directors to 2LO has "caught on," as one might say, and on Sunday next a very great pianist will be heard in the person of Herbert A. Carruthers, an exponent of Beethoven's works. He is the musical director of the Glasgow station.

On Sunday, however, he conducts a Handel programme, his scheme including one of the Concerti Grossi, the "Water Music" (Sir Hamilton Harty's full orchestral version), and some of the favourite arias from operas and oratorios will be sung by Mr. Robert Radford, the great bass of the B.N.O.C., including the "Hailstone Chorus" from *Israel in Egypt* and the ever-popular "Hallelujah Chorus" from *The Messiah*.

An interesting programme of Byzantium music will follow, arranged by Napoleon Lambelet, the Greek tenor, and formerly precentor to the Greek Church in London. He is the father of that charming singer Vivien Lambelet, and will be one of the singers on Sunday evening in conjunction with the Casano Octet.

Chamber music is in the programme of Monday, with the help of the Kutcher String Quartet, which includes Frederick Thurston, the well-known clarinet player. The feature at 10.30 will be the performance of the celebrated song-cycle by Schumann entitled "Poet's Love." The actual words are by Heine, and it is a favourite work of George Parker, who sings it. Mr. Parker will be remembered for his work in *Kismet*.

On Tuesday, April 20, the cowboy will be represented both in song and story, for Frederick Collier, another famous B.N.O.C. star, will sing cowboy songs, while the famous actor James Carewe will give readings from "Arizona Nights," by Stewart Edward White. At 8 o'clock the brilliant young violinist Issay Schlaen will be heard again, contrast being provided at 9.30 by the Brass Quartet of the Besses o' the Barn Band.

Wednesday's feature consists of duets by two French pianists, Doucet and Wiener, who come to us, however, via New York.

It is difficult to see why we should be given still further programmes of Handel on Thursday, following so closely on the heavy nature of the Sunday programme, but the first part of a performance of Handel's *Semele* will be relayed from the Bishopsgate Institute, with the assistance of the Harold Brooke Choir.

For the performance of *Semele* some well-known artistes have been obtained in the persons of Elsie Suddaby, Cathcart Lynn, Edward Leer, Clifford Lathlean and W. H. Reed, the principal violinist of the London Symphony and Royal Albert Hall orchestras, will be one of the intrumentalists, together with Gerald Cooper at the harpschicord.

Friday being St. George's Day, it is fitting that the national poet should be commemorated, and who so well fitted to pay that tribute than one who has helped to endear his works as has Lilian Baylis.

The pianist throughout the week is Maurice Cole, the chosen composer being Mendelssohn.

Lilian Baylis.
Lessee and Manageress of the "Old Vic."

A NEW WIRELESS ASSOCIATION

A NEW association, known as the Wireless Association of Great Britain, Ltd., has been formed with the object of providing efficient services for the broadcast listener. This association is modelled on the lines of the Automobile Association, and the council consists of Col. Reginald Halsey, the Earl of Drogheda, the Earl of Northesk, Sir William Noble, Maj. Charles Jarvis, Lieut. L. M. Robinson, and Mr. George Gordon, assisted by a technical committee which consists of Dr. J. A. Fleming, Dr. R. L. Smith-Rose, Capt. P. P. Eckersley, Mr. Norman Lea, and Mr. Frank Phillips.

It is stated that the services rendered by the association will include a personal service conducted by engineers on similar lines to motor patrols. It is the intention to establish these by degrees throughout the country. Also free postal technical service, free insurance, free legal advice and defence, and the free use of a comfortably furnished reading-room in London are among other amenities which it is intended membership shall confer.

Official dealers and repairers are to be appointed throughout the country, and these will display a sign bearing the association's badge.

An attractive badge is also to be issued to every member for attachment to the receiver or loud-speaker. The subscription is one guinea per annum for each valve member and five shillings per annum for a crystal member, both classes being entitled to all the privileges of membership.

Full particulars may be obtained from the secretary at 7, Southampton Street, London, W.C.1.

"A POWERFUL REFLEX CIRCUIT" (*continued from page 603*)

tuned-anode circuit for various stations. When tuning them in, therefore, it is only necessary to set the condenser C2 to the position previously marked for the particular station, and then search for it with the other two condensers.

It is, of course, quite easy to fix up some sort of switching arrangement by which either the semi-aperiodic resistance-inductance shown in Fig. 1 or the tuned-anode circuit as in Fig. 2 may be employed at will. On stations within fifty miles there will probably not be found much difference between the two except as regards selectivity; but if the maximum of power and selectivity is required from the circuit the tuned-anode arrangement shown in Fig. 2 will be found preferable, *the lead to the grid condenser being taken from between the tuned circuit and the resistance as shown.*

As regards valves, most good makes of general-purpose valves are suitable.

I hope that these few additional explanatory notes will assist experimenters who feel interested in fixing up and testing this circuit, and if they will keep an open mind as to its unconventional points and make it up strictly according to the instruction in this and previous articles, I think I can safely assure them that they will obtain excellent results. C. A. C.

W M S G is the call-sign allotted to the new broadcasting station which is being erected by Tex Rickard, the well-known American organiser of boxing matches. It is situated at Madison Square, New York, and will shortly be testing on 212.6 metres. It will be used for broadcasting all important sporting events, but musical programmes will also be given. When matches are being relayed the announcer will describe all incidents over the microphone.

Low-frequency Transformers

SIR,—Your correspondent "J. B." (Manchester) on page 540, No. 200, speaks with the voice of great authority on the subject of L.F. transformers. Unfortunately his statements are not correct. He says that for best results the impedance of the transformer should be infinitely great compared with the valve when the maximum amplification would be obtainable. It is very easy to show that under such conditions *no amplification whatever* would be obtained.

If the impedance of the transformer were infinitely great, that of the valve would be (in comparison) infinitely small. Therefore, when the signals caused the grid of the valve to fluctuate (and the impedance of the valve to vary), there would be no change in the current passing through the transformer primary, as only the impedance of the valve would be affected, and this (as seen above) is an infinitesimal portion of the total impedance of the circuit. If no change in the current through the primary took place there would be no voltages induced in the secondary, and the grid potential of the succeeding valve would not be altered.

For best results it is necessary that a change in the valve impedance should cause as big a change in the current through the transformer primary as possible, and this is obtained when the impedance of the valve and the transformer are the same for any given frequency.

If "J. B." were correct great amplification could be obtained by using resistance wire for the transformer windings, as the bigger the resistance the greater, of course, the impedance. Yet no manufacturer does this.—S. A. J. (London, W.).

Appreciation

SIR,—I have to express my thanks for the suggestions contained in the letter from your Information Bureau, as I have been able to remedy the faults that I experienced with my receiver.

I am a constant reader of your journal, which always seems to cater for the amateur constructor.—W. G. R. (Southfields, S.W.).

Interference from Tramways

SIR,—I have the misfortune to live in a suburb of London in which otherwise splendid reception is marred by chronic interference from the tramway system. I have tried numerous so-called remedies, including the shielding of my set and the erection of my aerial at right-angles to the tramway tracks, but still the interference persists. I understand that the disturbance caused by trams in Germany has been systematically studied, and it has been found that the lighting current and *not* the driving current is chiefly responsible. It was found, for instance, that when the lighting current was increased from .6 ampere to 2.5 amperes the interference practically ceased, owing to the diminished voltage. Another remedy which had some success was to introduce condensers of large capacity in parallel with the lights. The success of this method was most marked where the trams possessed rolling contacts. In Berlin fifty-five trams have been equipped with these condensers to cut down interference.

I do not suppose for a moment that the London tramway companies would bother themselves about a matter so trivial to them, especially in the face of all the criticism they are now experiencing. It is significant, however, how the *successful* German companies study every section of the community.—E. M. R. (Ealing).

CUP TIE RELAY FROM WEMBLEY

ON the occasion of the Cup Tie at Wembley Stadium, arrangements have been made by the Marconiphone Co., Ltd., in conjunction with the *Daily Mail,* to relay from Wembley Stadium a full description of the cup tie played on Saturday, April 24, to Manchester and Bolton.

Microphones will be placed in the Stadium in such positions that they will pick up music from the band, also the cheers from the crowd. An observer, placed in a soundproof cabinet and overlooking the match, will give a running description of the play as it proceeds. A Marconi-Sykes microphone will be placed in the cabinet, so that everything he says will be collected by the amplifiers, as well as all the other well-known sounds of the Stadium during a cup final. The signals will then be taken, amplified and relayed, to Manchester and Bolton over Post Office land-lines. Three lines will be used between London and Manchester, one for amplifier-working known as an operating line, one for ordinary telephone instruments for communication between engineers, and the other line is a spare and used to handle the Bolton circuit direct should line conditions warrant this proceeding.

The Manchester end will really form a sub-station, and will connect with Bolton by two private wires; one pair will be used for operating and the other for communication lines between engineers.

The proceedings will be projected from Marconiphone loud-speakers at each point. In the first place, the noises of the crowd will be relayed. This will be followed up by a relay of the band and finally a description of the match.

The Norddeich coastal station now transmits a weather forecast on 1,800 metres at 04.00 B.S.T. daily.

CHIEF EVENTS OF THE WEEK

SUNDAY, APRIL 18

London	3.30	Handel Programme.
London	9.15	Casano Octet.
Birmingham	3.30	Sterndale Bennett Programme.
Bournemouth	3.30	Byrd-Purcell-Arne Programme.
Manchester	3.30	The Band of H.M. Royal Air Force.

MONDAY

London	8.0	The Kutcher String Quartet.
Daventry	8.25	Concert relayed from Hilversum, Holland.
Aberdeen	8.35	*The Glass Panel.*
Birmingham	8.0	The Bubbles Concert Party.
Birmingham	9.0	Light Items.
Bournemouth	8.15	Winter Gardens Night.
Cardiff	7.55	Welsh Melodies and Musicians.
Glasgow	8.0	A Scene: *Cyrano de Bergerac.*
Manchester	8.0	Edward German Concert.
Newcastle	10.30	A Mystery Half-Hour.

TUESDAY

London	8.0	Cowboy Songs and Stories.
London	9.5	The London Radio Dance Band.
Aberdeen	8.0	Chamber Music.
Birmingham	8.0	Band Concert.
Bournemouth	9.30	Song Cycle, "The Little Sunbonnet."
Manchester	8.0	A Token to Cambria.

WEDNESDAY

London	9.0	The Eastbourne Municipal Orchestra.
Aberdeen	8.0	Half an Hour with Bach
Birmingham	9.0	Dance Music.
Bournemouth	9.30	York Bowen Piano Concerto.
Belfast	8.0	British Composers.
Edinburgh	8.0	All Scottish Programme.
Glasgow	8.0	Popular Concert.

THURSDAY

London	9.0	An Hour of Humour: Arranged and Introduced by Willie Rouse.
Aberdeen	8.0	Old Favourites in Music and Song.
Birmingham	8.0	Grand Opera.
Cardiff	7.55	*The Pagoda of Flowers.*
Manchester	8.30	Jest and Jollity.

FRIDAY

London	8.0	Special Programme in Commemoration of Shakespeare and St. George.
Belfast	8.0	St. George's Day Programme: Band of the 1st Battalion Durham Light Infantry.
Manchester	8.0	"This Precious Stone Set in a Silver Sea."
Nottingham	8.0	Concert.

SATURDAY

London	8.0	Regimental Reminiscences.
London	9.0	Jack Hylton's Band.
Aberdeen	8.20	The Bubbles Concert Party.
Birmingham	8.0	Popular Programme.
Bournemouth	8.0	A Merry-Go-Round.
Cardiff	8.0	Fun and Fancy.
Manchester	8.0	Song and Story.
Newcastle	9.15	Dance Music.

Commencing in the middle of April, the feature night at Glasgow will be Thursday, and the programme will be relayed to Scottish relay stations. The change is being made to accommodate the relay stations, whose local programmes are given on Wednesday, which, up till now, has also been Glasgow's feature night.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. DAY asked the Postmaster-General if he was aware that amateur wireless experimenters were able to listen to the official two-way telephony tests recently carried out between the Rugby high-power Post Office station and America, and what steps were being taken to safeguard the secrecy of these Transatlantic conversations.

Sir W. Mitchell-Thomson said that he was aware of the fact to which the hon. member drew attention. The steps to be taken to secure secrecy for Transatlantic telephone conversation were at present being investigated.

Reception at 1,000 miles on a power of 6 watts seems now well within the range of possibility. With that power 6 W G (Glasgow) has been reported R 5 at Onate, near Bilbao, a distance of some 950 miles.

The Sorö broadcasting station alternately relays the Copenhagen programmes on 1,150 and 1,500 metres, the latter being a temporary experimental wavelength.

A fund is being inaugurated in Edinburgh to provide phones for patients in local hospitals.

TRADE NOTES AND CATALOGUES

A WIRELESS service between Radio House, Wilson Street, E.C.2, and Moscow has been started by Marconi's Wireless Telegraph Co., Ltd. Private and commercial telegrams will be accepted at any Marconi office for wireless transmission to Moscow or any part of Russia, facilities having been arranged for the rapid distribution of such messages throughout the country.

A coloured showcard illustrating various MH components has been issued by L. McMichael, Ltd., of Wexham Road, Slough.

An interesting folder describing and illustrating Marconiphone amplifiers has been received from the Marconiphone Co., Ltd., of 210, Tottenham Court Road, W.1.

The five new Handley-Page air liners delivered to Imperial Airways, Ltd., will be equipped with standard-type Marconi A.D.6 wireless installations for telephonic and telegraphic communication. This wireless apparatus is the standard fitting for all Imperial Airways passenger machines, and enables the pilots to keep in constant communication with the ground stations throughout their flights.

A leaflet describing the Benjamin Clear Tone valve holder has been issued by the Benjamin Electric Co., Ltd., of Brantwood Works, Tariff Road, N.17.

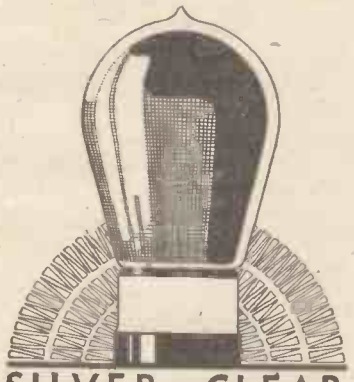
IMPROVING THE EARTH

IN order to obtain an efficient earth connection of low resistance it is necessary to keep the soil very damp in the neighbourhood of the earth plate. In order to keep the resistance of the soil down to as low a value as possible a gallon or so of copper sulphate solution should be poured on the ground after loosening the soil in the immediate neighbourhood of the connection. About 2 lb. of the sulphate should be added to every gallon of water. Copper sulphate is obtainable from the British Sulphate of Copper Association, Ltd., of Victoria Station House, Victoria Street, S.W.1.

"Overhauling the Lawn Mower" is the subject of a seasonable article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in the same number are: "Accumulators: Their Action, Care and Maintenance," "A Simple Summer-house," "Re-enamelling a Motor-cycle," "A Low-loss Crystal Detector," "Restoring a Rocking-chair with Box-spring Seat," "An Oilstone Tip," "The Season's Overhaul of the Small Car," "The Reflecting Telescope and How to Use It," "Pattern for Model Engine Bed," "A Light-weight Tent for Camping."

The Prague broadcasting station is effecting tests on 800 metres.

CAN YOU FORECAST THE CUP FINAL RESULT?



Bright Emitters.	Dull Emitters.	D.E. Power Valves.
F1 L.F. and Detector.	FER1 L.F. and Detector.	PER1 Transformer-Coupled Amplifiers.
F2 H.F. Amplifier.	FER2 H.F. Amplifier.	PER2 Resistance-Coupled Amplifiers.
5·5 volts, 0·4 amps. **4/6**	4 volts, 0·1 amps. **8/-**	6 volts, 0·2 amps. **12/-**
Dull Emitters.	**Dull Emitters.**	**D.E. Power Valves.**
FER1 L.F. and Detector.	LER1 L.F. and Detector.	PER1 Transformer-Coupled Amplifiers.
FER2 H.F. Amplifier.	LER2 H.F. Amplifier.	PER 2 Resistance-Coupled Amplifiers.
6 volts, 0·1 amps. **9/-**	2 volts, 0·2 amps. **8/-**	4 volts, 0·2 amps. **11/-**

POSTAGE, 1 Valve, 4d.; 2 or 3 Valves, 6d.; 4, 5, or 6 Valves, 9d.

A SPORTING COMPETITION

A SUPERB FELLOWS TABLE GRAND ELECTRIC GRAMOPHONE will be presented free of all cost and carriage paid to the winner of this simple competition. Send in your coupon at once. If you have not electric light in your house, you can choose Fellows' goods to the value of the Gramophone if you win.

WHAT YOU HAVE TO DO:

1. Fill in the coupon below ordering one or more of the Louden Valves mentioned above.
2. Fill in on the coupon (a) Your forecast of the team which will win the Cup Final at Wembley on April 24, and (b) Your forecast of the number of people who will attend the match.
3. Tear off the coupon and post to us together with remittance.
4. You may send in any number of coupons, but each must contain an order and remittance for at least one Louden Valve.
5. The Prize will be awarded to the entrant who having forecast correctly the winning team gives the closest estimate of the official attendance. The Directors' decision shall in all cases be binding and final, and no correspondence can be entered into.
6. ALL COUPONS MUST REACH US NOT LATER THAN FIRST POST ON THURSDAY, APRIL 22.

Send for our 44-page Illustrated Catalogue No. 11 free.

Louden Valves

To THE FELLOWS MAGNETO CO., LTD., CUMBERLAND AVENUE, PARK ROYAL, N.W.10.

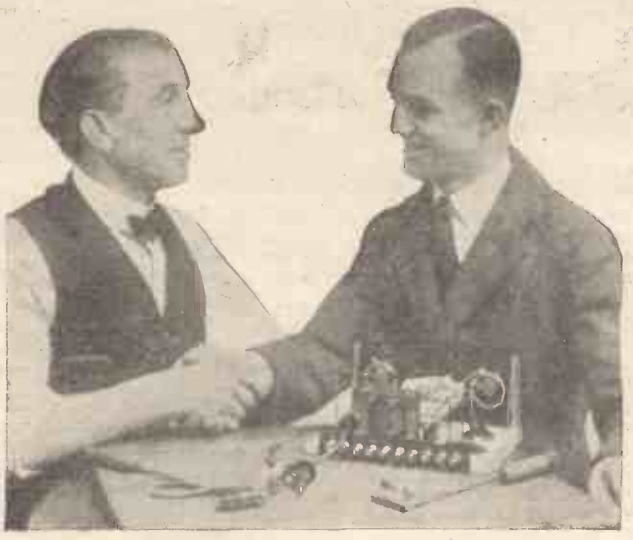
I enclose remittance value.....for....Louden Valve(s) Type....
I forecast that the team to win the Cup will be.....
I forecast that the official Attendance will be.....
I agree to abide by the Directors' decision on all matters.

NAME .....

ADDRESS .....

.....

A.W. 17/4/26. E.P.S.82.



"...Yes, that's the best set I've made— *thanks to*

GLAZITE

BRITISH MADE REGD.

COLOURED CONNECTING WIRE"

Red, Yellow, Green, White, Blue & Black

10 ft. Coils 1/2 *Per Coil* 1/18 S.W.G.

2 ft. lengths *Per Packet of 4 Assorted Colours* **1/-** 1/16 S.W.G.

Obtainable from all dealers

Write for free booklet to

The **LONDON ELECTRIC WIRE CO. and SMITHS LTD.**

(Makers of Electric Wire for over forty years)

Playhouse Yard, Golden Lane, London, E.C.1

This mark LEW *guarantees quality*

JUDD

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 308 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 324.5 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 323.5 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 304 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily (exc. Sun.), 7.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 535 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed.. Fri.), 20.10.

BELGIUM.

Brussels, 262 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service; 17.30-21.30, same as Copenhagen; 20.00 (Wed., Thurs.), lec., con., news, orch.

Hjoerring, 1,250 m. (1.5 kw.).*

Odense, 810 m. (200 w.).*

Sorö,* 1,150 m. (1½ kw.). Also occasionally relays 5XX from 23.00 B.S.T.

* Relay Copenhagen.

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 20.10, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 260 m. (500 w.).

***Bordeaux**, 410 m.

* Relays of PTT Paris.

Montpellier, 238 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 308 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.00, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (nightly). Relayed on 1,300 m. by Köenigswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news; 21.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (230 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 06.55, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Münster, 411 m. (2½ kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Aalesund, 515 m.

Bergen, 358 m. (1½ kw.). Testing.

POLAND.

Warsaw, 380 m. (700 w.). Daily: con., 18.00-20.00.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 13.30 and 18.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 11.00, 12.00, lec.; 14.00, 20.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 19.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30, con.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Joenkoeping (SMZD), 265 m.; Karlsborg, 1,250 m.; Karlstadt (SMXC), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 218 m.; Sundsvall (SASD), 540 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 340 m.; Helsingborg, testing.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle, about 400 m. Testing.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 23.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 16.30-23.00, con. (almost daily).

Madrid (EAJ4), 340 m. (1 kw.). 15.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). 16.00-20.00, news, lec., con. (Sun.); 17.00-22.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 18.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 18.00, news, weather, con. Close down 20.00 or 21.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 21.00-23.00, con. (daily).

Cadiz (EAJ3), 360 m. (350 w.). 18.00-20.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 23.00.

Cartagena (EAJ15), 335 m. 18.00-21.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 20.00, con., news, weather. Close down 22.00.

Seville (EAJ17), 300 m. 18.00-21.00, con. (daily).

Printed and Published in England by Cassell & Company, Limited, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, Central News Agency Limited, Saturday, April 17, 1926.

A SUPER-HET FOR THE NOVICE

THE LODGE "N" CIRCUIT

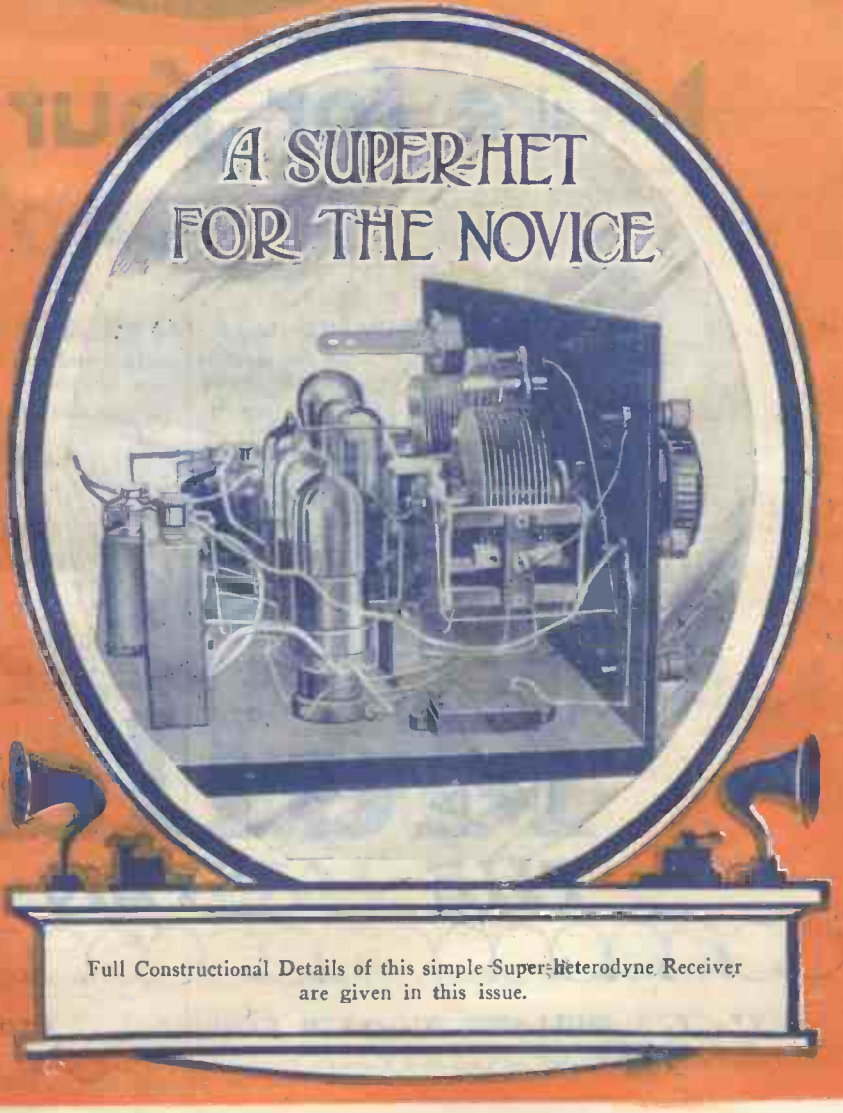
Amateur Wireless And Electrics

Vol. VIII. No. 203 SATURDAY, APRIL 24, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.



Full Constructional Details of this simple Super-Heterodyne Receiver are given in this issue.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. VIII. No. 203 — APRIL 24, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

SILENCING THE LOCAL STATION

A DIFFICULTY that besets most of us when we wish to range far afield with the wireless receiving set is that the local station refuses to be silenced, but insists upon making its voice heard over a large number of degrees of our condenser-dial settings. This means that all other stations whose wavelengths lie within bands of varying width on either side of that of the local station are blotted out and cannot be tuned in. The extent of the blotting-out depends largely upon the degree of proximity of the receiving aerial to that of the transmitting station and upon the output of the latter. Thus if you live anywhere near London, the most powerful of our home medium-wave stations, you may find that his signals are to be heard over quite a large proportion of the whole broadcast band.

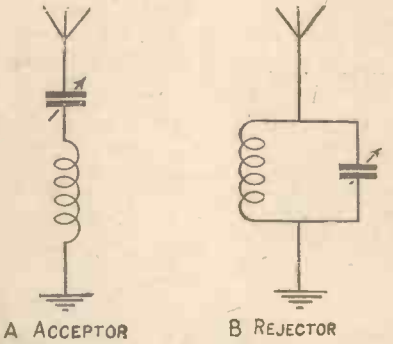


Fig. 1.—Examples of Tuned Circuits.

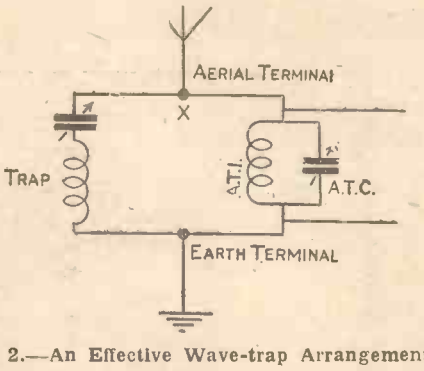


Fig. 2.—An Effective Wave-trap Arrangement.

Shock Excitation

The blotting-out effect appears to be caused partly by shock excitation of the aerial by the powerful local transmission, partly by lack of selectivity in the circuits of the receiving set, and partly by what is known as the "pick-up" effect. We can lessen the effects of shock excitation to some extent by reducing the size of the aerial; with a high single wire whose "roof" is quite short the extent of the blotting-out effect will be smaller than with a long aerial containing two or more wires.

Selectivity we can improve considerably by using coils whose resistance is small, by keeping leads within the set short and by fitting well-designed variable condensers. But even if we do all these things it is likely that the local station will still be with us, occupying an unconscionable large band of wavelengths.

In theory we can add to the selectivity of our receiving sets by increasing the number of tuned circuits; in practice we often find that a multi-valve set with two stages of high-frequency amplification is no more selective than the single-valver, and often it is less so. There is nothing wrong with the theory, except that it takes no account of the pick-up effect, which means quite simply that the coils and the wiring of the receiving set act as direct collectors of powerful oscillations.

One often hears the proud constructor boast that his receiving set is wonderfully sensitive. To prove his point, he will remove the aerial and earth leads, and will then proceed to tune in the local station. Actually he is demonstrating to you, though he knows it not, that he cannot tune *out* this station simply because the coils and the wiring of his receiver

are capable of picking it up by themselves whether the aerial is in use or not.

You can reduce the pick-up effect by using efficient coils with small magnetic fields and by keeping leads, not only inside the set but also *outside* it, as short as possible. Do not forget that long leads to the loud-speaker, the low-tension battery or the high-tension battery may act as collectors of oscillations. You can eliminate this altogether by surrounding your coils with metal screens, though unless you use either specially wound small-field coils or enormously large screening boxes you will introduce eddy-current losses which will more than counterbalance the gains due to screening.

Wave-traps

With the average receiving set the best way of getting rid of the local station is to employ a wave-trap of some kind. The extent to which the trap will help depends upon its own efficiency and upon that of the receiving set. The principle of the wave-trap is quite simple. In wireless reception we use two kinds of tuned circuit, which are seen in Fig. 1. That marked A is known as the series acceptor. When this circuit is brought into resonance with a particular frequency, it accepts that frequency; that is to say, it offers small hindrance to its passage, though it opposes the passage of frequencies above or below it. The selectivity of this circuit depends mainly upon the amount of resistance that it contains. If there were no resistance at all the resonant frequency would find a perfectly free path, whilst those on either side of it would be barred.

The rejector circuit seen at B has precisely the opposite quality. When brought to resonance it offers great opposition to the frequency to which it is tuned, but passes those above and below it. Here again the resistance is an all-important factor. The lower the resistance of the circuit, the more absolute will be its rejection of the resonant frequency and the easier will be the path offered to unwanted frequencies.

In Fig. 2 is seen a tuning arrangement in which use is made of the properties of

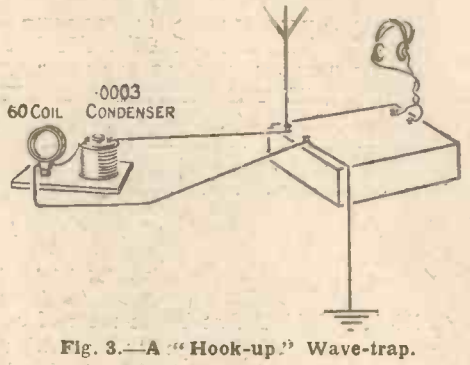


Fig. 3.—A "Hook-up" Wave-trap.

the two kinds of tuned circuit. The aerial tuning inductance and the aerial tuning condenser form a rejector circuit which resists the passage of the resonant frequency and causes considerable potentials to be set up by it across the coil. The trap, which consists of an acceptor circuit, can be tuned to resonance with an undesired signal that is causing interference. When this is done the acceptor circuit acts as a kind of drain. On reaching the point X in Fig. 2, unwanted oscillations find two paths to earth awaiting them. The easiest, which they take, is that through the trap, and they pass away without affecting the rejector circuit by means of which the receiving set itself is tuned.

If any reader is troubled with blotting-out from his local station, or finds it impossible to separate completely two more distant transmissions, one of which he wishes to receive, I would recommend him to try a wave-trap upon these lines. It can be tested out in hook-up form in the way shown in Fig. 3. A .0003-microfarad condenser and a No. 60 coil are wired in series. They are then connected across the aerial and earth terminals of the receiving set as shown in the drawing. If you have not components of the sizes mentioned, a No. 50 coil and a .0005-microfarad condenser will do quite well.

Using the Wave-trap

Take care to place the wave-trap coil so that there is no magnetic coupling between it and the A.T.I., and use a well-designed coil of low resistance. The method of cutting out the local station is quite simple. Set the trap condenser at zero and then tune in the local station as strongly as possible. Now turn the dial of the trap condenser so as slowly to increase the capacity in the drain circuit.

As resonance is approached, the local station's signals will begin to fall off in strength, and a point will be found at which they are either silenced altogether or are quite weak. If you turn beyond this point they will come in again. When the best setting of the wave-trap (that is, that at which the local station is at its faintest) has been found, searching for other stations may begin. If you cannot altogether silence the local station, you will find at any rate that the wave-trap considerably reduces the waveband over which he is audible. By using a low-loss coil in the trap and by employing some form of aperiodic aerial in the receiving set the blotting-out effect may be reduced to very small proportions even at short range.

I have found this type of wave-trap very effective. In my locality 2 L O comes in so powerfully that even with a short aerial, with good inductances and with pick-up effects reduced to a minimum, his transmissions are audible over a band 40 metres wide when a receiving set containing two tuned high-frequency stages is in use. With the help of the wave-trap there is little difficulty in tuning in either Cardiff (353 metres) or Prague (368 metres). Further, one can separate Dublin from Hamburg, though the difference between their wavelengths officially is only 2½ metres. The trap, in fact, enables dozens of stations to be tuned in clearly which without it would never be heard at all.

J. H. R.

"John Henry" feeds the pigeons in St. Paul's Churchyard.

Complaint is made with regard to some B.B.C. stations in the provinces that, on switching over to London after the completion of the local programme, modulation becomes very poor.

THE "PORTOSET"

A really portable receiver constructed on a novel principle

The "Portoset" Receiver.

FOR some considerable time the writer has been experimenting with a view to determining a satisfactory radio set for portable purposes.

Circuits of the super-regenerative class, whilst bringing in the stations with great volume, are noisy and unstable. The super-heterodyne is, of course, highly efficient, but it requires more valves than one usually wishes to employ. The set about to be described does, however, meet the case admirably, for it is entirely self-contained and combines efficiency with real portability.

When using a frame or loop aerial directly connected to a rectifying valve, it is usually necessary to employ reaction in order to strengthen the relatively weak signal impulses picked up by the frame.

The Circuit

A reference to the circuit diagram (Fig. 1) shows how this is done. A frame aerial L is shown connected between the plate and grid of the rectifying valve V1, and a tap T is taken from a point on the frame to the positive leg of the filament. This connection divides the frame into two parts, one of which is connected between grid and filament, and the other between plate and filament. To many this is known as the Hartley circuit, in which the whole inductance is tuned by the condenser C, whilst the degree of reaction is controlled by the condenser C1, which also, in conjunction with the grid condenser C2, effectively insulates the grid from the H.T. voltage, supplying the plate of V1.

It is highly important in a circuit of this description, where maximum energy must be utilised, that the path of the high-frequency oscillations be confined to the valve and frame circuit. They must not be permitted to pass along the plate circuit, which includes the primary of the transformer TR. Consequently a radio-frequency choke is usually necessary, but if a suitable type of L.F. transformer is employed, such a choke may be dispensed with. In the set described a B.T.H. 4-1 ratio transformer is employed, it being found after comparative tests to embody the essential characteristics. The incoming signals, having been amplified by reaction, are rectified by V1, and then passed to V2 by the transformer for magnification at audio-frequency.

Components

A complete list of components required is given below, with the respective letter references in the circuit diagram (Fig. 1). C = frame aerial tuning condenser, .0005 microfarad variable (vernier adjustment). C1 = reaction control condenser, one fixed and one moving plate. C2 = grid condenser, .00025 microfarad, fixed. R = grid leak, 2 to 5 megohms. R1 = filament resistance, 7 ohms, variable. V1 = valve, .06 type. V2 = valve, .06 type. 2 = anti-microphonic valve holders. 9 = sockets and twelve plugs. TR = transformer, ratio 4-1 (B.T.H.).

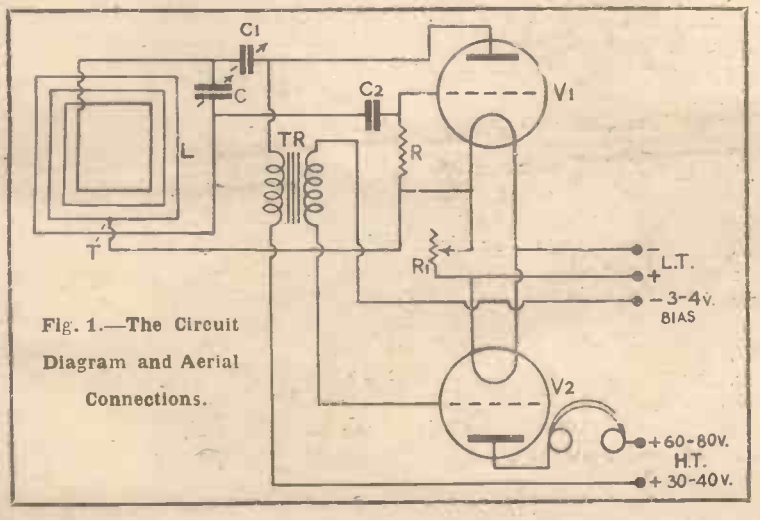


Fig. 1.—The Circuit Diagram and Aerial Connections.

The Case

This is shown in the photograph, and has interior measurements of 14 in. by 9½ in. by 4 in., and it is a type made for footballers to carry their shoes, etc. It is very strongly made, and is admirably suited to the purpose. The total weight of the outfit, complete with batteries and phones, is 15 lb.

The Frame Aerial

In order to obtain best results on both normal and high-power stations there are two frame aerials, one for use on 300-500 metres and another for use on 1,600 metres. They are both wound on separate frames, and fit inside the lid of the case.

A reference to Fig. 2 will give the dimensions for the frames, which should be wound as follows:

For 300-500 metres, 18 turns of .02-in. d.s.c. copper wire, tapped and spaced as per Fig. 3.

For 1,600 metres, 60 turns of .02-in. d.s.c. copper wire, tapped and spaced as per Fig. 4.

The Panel

The panel is of ebonite and measures 9½ in. by 7 in., while the baseboard of wood measures 6½ in. by 4 in. The disposition of the components will readily be seen from Fig. 5. A small flash-lamp battery is used for grid bias, and is clipped to the panel just behind the transformer.

Plug connectors are used in place of the ordinary screw terminals. A wooden partition divides the case into two parts, one part containing the panel and the other the batteries.

Operation

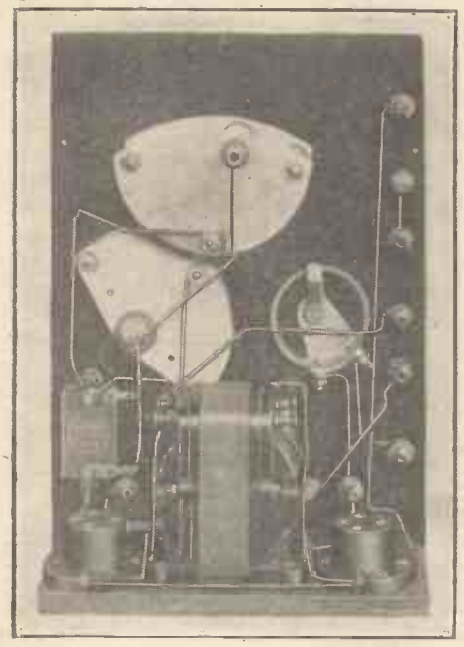
To use the set, adjust the filament resistance so that the correct voltage is applied to the filaments.

When searching for a station move the tuning condenser C1 a degree at a time from the maximum value, and increase the value of the reaction condenser so that self-oscillation just does not occur. It will be found that the reaction adjustment is quite smooth and that there is no "backlash," providing that the correct filament voltage and plate voltage on

the rectifying valve are used, but as there are variations with valves it is advisable to vary the plate voltage above and below the value given to find the best working conditions.

Range

Under normal conditions the local main station should be intelligently received on phones up to a distance of 30 miles, and Daventry will operate phones up to 70-80 miles. It is interesting to record that 2 L O has been received, on successive days, 90 miles away, and it will therefore be agreed that this is some index of the efficiency of the receiver. H. W. G.



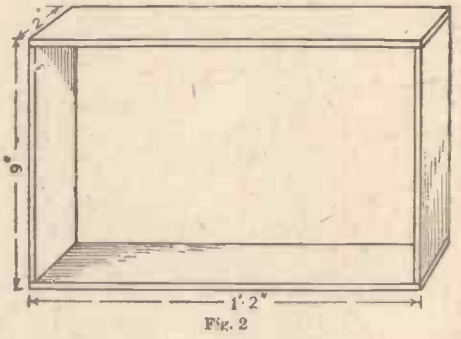


Fig. 2

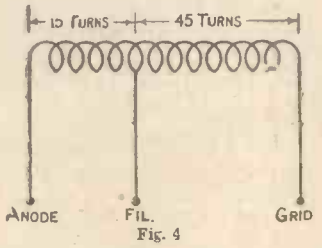


Fig. 4

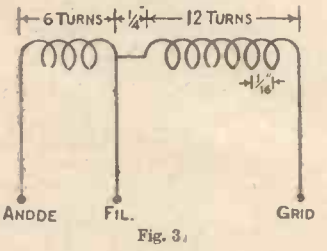


Fig. 3.

Photo (left).—View of Under Side of Panel.

Fig. 2.—Details of Frame.

Fig. 3.—Winding for 300-500 Metres.

Fig. 4.—Winding for 1,600 Metres.

THE "KNACK" OF TUNING—AND HOW TO ACQUIRE IT

TO tune a receiving set properly is not at all easy and the knack takes a long time to acquire. The array of knobs and dials is rather bewildering to the novice, and many inexperienced owners are apt to blame their sets for what is really their own fault.

Tuning should be carried out on regular and methodical lines if the best results are to be obtained. Of course a different procedure must be followed in the case of each type of receiver. For instance, the tuning of a simple crystal set is extremely easy; one knob controls the variometer or tuning condenser, and the operator has only to turn this one knob slowly and carefully for the signals to come in.

Control of Reaction

A valve set requires more attention. There is the reaction coil to be adjusted. Many two-valve sets have at least three different tuning controls—the aerial condenser, the anode condenser and the reaction coupling. All these dials must be properly adjusted, and there is only one way of doing this successfully. First adjust the reaction coupling until the set is on the verge of oscillation, then turn the two other dials simultaneously, advancing one a little at a time while the other is slowly rotated. When a station has been picked up, adjust these dials so that the greatest volume is obtained. Then return to the reaction knob and set this so that comfortable strength is obtained without any distortion or loudness. Of course from the point of view of purity of tone the less reaction the better. These remarks also apply to large sets which have the same three controls for aerial, anode and reaction.

The Super-het

The powerful neutrodyne and super-heterodyne receivers which are now becoming so popular are more difficult to operate. In the case of the former, the neutralising condensers must be so adjusted that all tendency to oscillate is prevented before the set is used; this is quite beyond the powers of a beginner and should be left to the experienced amateur.

The super-heterodyne at first sight appears quite easy to operate. There are only three tuning controls—loop, oscillator and potentiometer. The potentiometer can be adjusted so that the set is just off the oscillating point and then left alone. But the other two tuning dials are not by any means so "innocent" as they look; the tuning is ultra-critical, and dozens of stations may be passed over if the dial is turned too quickly. Both dials must be correctly adjusted before signals can be heard; the same station will come in on two settings of the oscillator condenser. The owner will learn by experience which of these two settings gives the better results.

The super-het, however, can be operated by the most inexperienced amateur if he cares to work carefully and systematically and is sufficiently patient. After a month or two of "knob tuning" he will become quite expert and will be able to pick up the most distant stations. G. J. M.

The new United States naval aeroplane carriers *Saratoga* and *Lexington* have been equipped with five microphones and 265 loud-speakers. By this public address system of communication, orders can be instantly issued to all members of the crew if necessary.

MORE ABOUT THE "N" CIRCUIT

How the new Lodge Non-radiating Receiver works

THE standard type of valve set may be said to fall below modern requirements in two important particulars. In the first place, its efficiency as regards range is largely offset by its failure to achieve the necessary high standard of selectivity. There is little practical advantage in being able to reach far out into the ether unless one can at the same time select and reproduce any particular transmission without overlap.

In the second place, the use of valve reaction, combined with unskilful handling of the tuning controls, often converts what should be a quiescent receiving aerial into a miniature transmitter radiating superfluous energy for miles around. Those listeners who have to endure a noisy background of howls and cat-calls caused by the persistent mishandling of adjacent valve sets will certainly agree that this is a pernicious form of nuisance, and one that is unfortunately steadily on the increase.

It is only natural, therefore, that the wireless public should be keenly interested in any development that promises to effect an improvement in both these directions, more particularly when it comes from the hands of so eminent an authority as Sir Oliver Lodge.

In the early days of wireless, Sir Oliver was the first to discover the principle of electric tuning, thus making it possible to radiate signals upon a definite wavelength. This discovery laid the foundation of selectivity, by enabling a receiver to distinguish between messages sent on different wavelengths.

In his latest contribution to wireless reception, Sir Oliver provides a remedy for that particular abuse of tuning known as "condenser swinging." There are, of course, other well-known methods of stabilising a receiving set so that it cannot energise the aerial, such as the balanced high-frequency amplifiers, but the Lodge eliminator, or N-circuit, attacks the problem in a characteristic fashion. In describing his invention, Sir Oliver lays particular stress upon the fact that it is intended primarily to prevent any kind of local disturbance. No matter how unskilfully the controls may be handled, the action of the N circuit prevents any re-radiation from the receiving aerial to which the set is connected. Incidentally, as the N circuit operates solely by resonance, it serves also as a filter to reject undesired signals, and so increases the discriminating or selective action of the set as a whole.

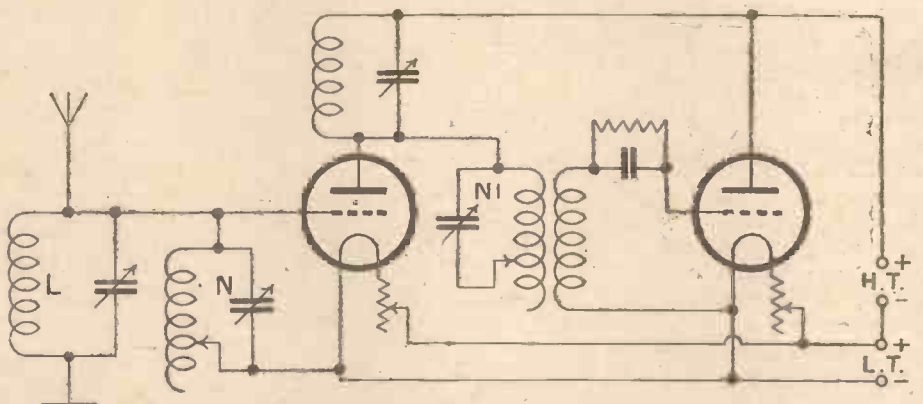


Fig. 1.—The "N" Circuit Applied to Tuned-anode and Detector Combination.

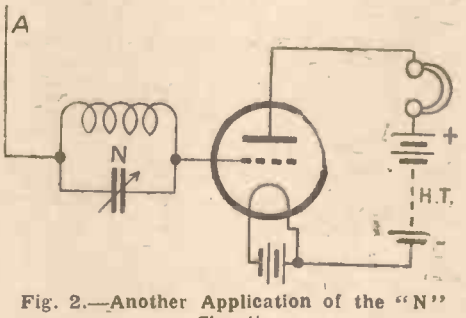


Fig. 2.—Another Application of the "N" Circuit.

In any open oscillator, such as an aerial, there are obviously alternating end-potentials at its capacity terminals, but there is also a varying potential everywhere (except deep in the earth connection), and these side potentials, if tapped off, are sufficient to stimulate into vigorous oscillation a really-responsive tuned circuit consisting of low-resistance inductance and concentrated capacity. The potential oscillations of definite frequency built up in the N circuit are then transferred to the grid of an amplifying valve. In this way accurate selection is secured, combined with clear and strong articulation, without using reaction.

The N circuit is shown in Fig. 1 as applied to a tuned-anode amplifier and detector combination. It will be noticed that there is only a one-point connection from the aerial to the N circuit, and that the latter is connected across the grid and filament. The usual connection between the filament and aerial is omitted. A similar N circuit is shown coupling the H.F. amplifier to the detector valve. The single-point connection between the aerial and N circuit is sufficient to energise the latter and so build up oscillations of considerable amplitude by resonance, just as the swing of a balance wheel rapidly increases under the application of minute but accurately-timed impulses. The enhanced oscillations built up in the N circuit are applied across the grid and fila

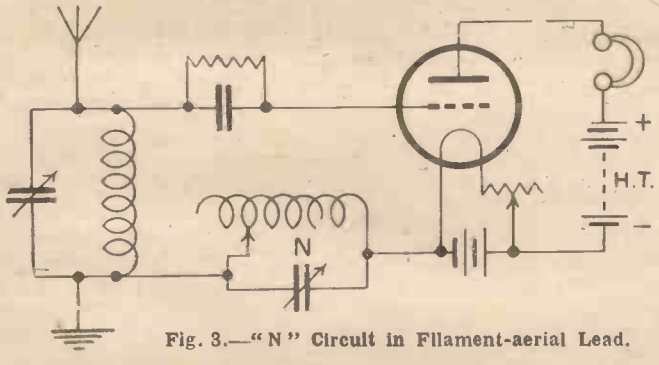


Fig. 3.—"N" Circuit in Filament-aerial Lead.

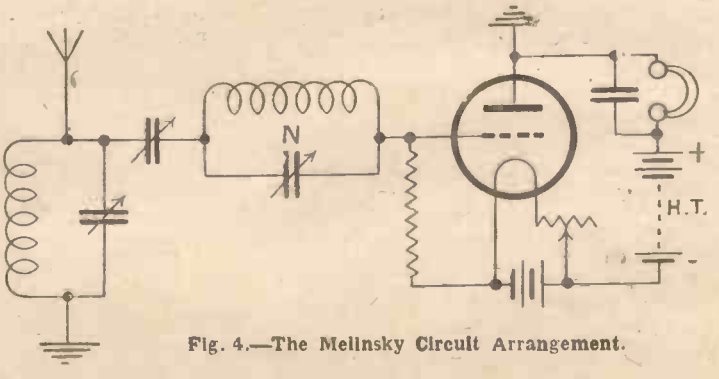


Fig. 4.—The Melinsky Circuit Arrangement.

ment of the first valve and give rise to amplified plate currents in the ordinary way.

Isolated Aerial

There must be no ordinary magnetic or electrostatic coupling between the secondary and N circuits, otherwise the main object of the arrangement is lost. It is essential that the aerial should be completely isolated from the currents flowing in the plate circuit of the valve amplifier.

The circuit shown provides what is in effect a one-way coupling between the aerial and the grid of the valve. The N circuit is impulsed by *potential* rather than *current* oscillations from the aerial, so that the actual energy-transfer is very small indeed, although the voltages built up by resonance in the loop N are sufficient to create a pronounced effect in the plate circuit. In this connection it must be borne in mind that the valve is essentially a voltage-operated device.

Because of the high resistance of the shunt path across the grid and filament electrodes inside the tube there is practically no diversion of energy in this direction from the N circuit, and consequently no damping effect on the latter. Virtually only electrostatic potential is tapped off from the N oscillator. Similarly, because of the small energy content of the loop circuit, it exercises no appreciable damping on the aerial, so that the system as a whole can be made extremely selective.

In the ordinary back-coupled receiver self-oscillation is caused by direct coupling between the plate and grid coils of the valve. As previously explained, there is no direct magnetic or electrostatic coupling between the N circuit and either the aerial or plate coils, so that no transfer of energy is possible in this way.

Self-oscillation

Self-oscillation is also frequently set up in the ordinary type of tuned-anode amplifier by electrostatic coupling between the internal electrodes of the valve. In the circuit shown in Fig. 1, owing to the one-point connection to the aerial, there is no available path by which any appreciable amount of energy can be conveyed from the plate circuit back to the aerial. Any back-coupling effect across the valve electrodes is localised in the N circuit, which is not linked magnetically with the aerial inductance, and which, as previously stated, does not take a heavy energy-content.

As previously stated, the potential variations tapped off from the aerial by the N circuit are quite sufficient to give a pronounced effect when applied across the grid and filament of a sensitive voltage-operated valve. The N circuit cannot, however, transmit sufficient energy in the reverse direction to energise the aerial to the point of re-radiation. It functions, in fact, as a one-way path, linking the aerial to the valve for reception only, but isolating the aerial from the amplifier so far as back-feed is concerned.

The N circuit may also be utilised as shown in Fig. 2, the aerial A being quite untuned and serving merely as a collector to feed impulses with the tuned loop N.

In Fig. 3 the N circuit is inserted in the filament lead to the aerial as shown. As before, the circuit is tuned to the frequency of the signals to be received. Sir Oliver points out that this arrangement must not be confused with the well-known use of so-called rejector circuits, which are tuned to the frequency of signals it is desired to exclude from the receiving set.

A Modification

Fig. 4 shows a circuit arrangement due to Mr. M. M. Melinsky, who is at present working in collaboration with Sir Oliver Lodge. In addition to utilising a resonant coupling-circuit of the N type, it will be noticed that the anode of the valve is earthed, whilst the L.T. battery is left "floating." Whilst the particulars given above illustrate the general principles underlying the use of the N circuit, it is understood that the distinguished inventor is still engaged in perfecting certain details and that further developments may be expected in due course. B. A. R.

For the first time on a Good Friday a studio service was held at a Scottish station. This was at Glasgow, where Rev. Provost Lethbridge, of St. Mary's Cathedral, conducted.

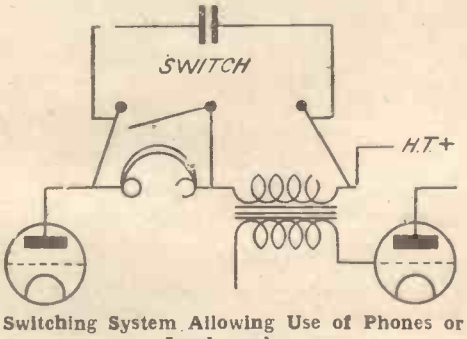
Angers (Radio Anjou) transmits daily on a wavelength of 275 metres. At 20.30 B.S.T. a programme, including a new bulletin, lecture and a short concert is given.

PHONES OR LOUD-SPEAKER AT WILL

Details of a Novel Switching System

IN multi-valve sets it is often desirable to provide for the use of phones, either directly after the detector or between the first and second L.F. valves, and usually this is done by means of a D.P.D.T. switch. The following method is simpler and avoids breaking the anode circuit, an objectionable practice when the filaments are switched on.

Insert the phones in the circuit between the primary of the intervalve transformer and the plate of the valve to which it is connected, and provide a S.P.D.T. switch so arranged that the switch arm is connected to the circuit between the transformer primary and the phones, whilst the other terminals of the switch are connected, the one on the plate side of the phones and the other on the + H.T. side of the primary of the transformer. The arrangement is shown in the sketch. Then in one position it will short-circuit the phones, and in the other it will short-circuit the primary of the transformer. In the middle position the phones can be used whilst the transformer is in action for the succeeding valve, which may be operating the loud-speaker, and will not materially reduce the signal strength of the latter.



Switching System Allowing Use of Phones or Loud-speaker.

A single by-pass condenser across both the transformer and phones will serve for both. Other advantages are that the phones can be inserted or removed without breaking the circuit, and by suitable arrangement of the wires from the switch terminals the switch arm can be arranged to point to the phone terminals when the phones are in use, and to the loud-speaker terminals in the other position.

This switching system can also be successfully used for two loud-speakers in series; for example, to test one against the other, or to use both at once (a great advantage when one suits the higher and the other the lower audible register), or for tuning purposes at the set when the second loud-speaker is in another room.

A. H. B.

Mr. Lloyd George will broadcast from London on April 27 instead of April 7, as previously stated.

The new Kaschau (Czecho Slovakia) broadcasting station is now daily transmitting an evening concert between 20.00 and 21.00 B.S.T. on 2,020 metres. The call is given out in Czech. The entertainments are organised by the local radio clubs with the help of the Slovakian authorities.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

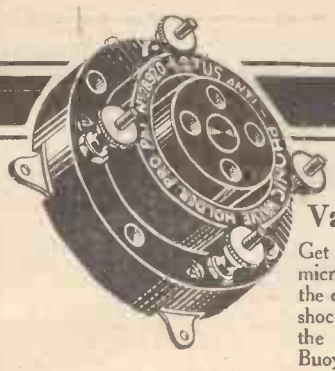
As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

CONTENTS



Get Rid of Valve Trouble

Get rid of these disturbing microphonic noises—prevent the danger of breakage from shock. Ask your dealer for the new improved Lotus Buoyancy Valve Holder, which absorbs shock and protects your valves.

Valve sockets and springs are locked together by a mechanical process, making a definite and permanent connection. Bakelite mouldings, nickel silver springs and phosphor bronze valve sockets, nickel-plated.

Without Terminals 2/3

With Terminals 2/6

LOTUS

BUOYANCY

VALVE HOLDER

ANTI-MICROPHONIC

Garnett, Whiteley & Co., Ltd.,
Lotus Works, Broadgreen Rd., Liverpool.
Makers of the famous Lotus Vernier Coil Holder.

100,000 RUGS GIVEN AWAY

This Phenomenal Offer is made to readers of "Amateur Wireless" 24/4/26. On receipt of P.O. for 12/6 we will forward direct from our looms to your address one of our "Prudential" Brusselette Real SEAMLESS WOVEN BORDERED (Guaranteed Genuine Bargains).

12/6

CARPETS

Carriage 1/- Extra.

Suitable for Drawing-room, Dining-room, Bedroom, etc., handsomely bordered in thirty Turkey patterns and fashionable self shades of Crimson, Greens, Blues, and Art Colourings, to suit all requirements, and LARGE ENOUGH TO COVER ANY ORDINARY SIZED ROOM. These Carpets with FREE RUGS will be sent out as Sample Carpets, showing you the identical quality we supply. They are made of material equal to wool, and being a speciality of our own, can only be obtained direct from our looms, thus saving the purchaser all middle profits. Over 400,000 sold during the past 12 months. Money willingly refunded if not approved. Thousands of Repeat Orders and Unsolicited Testimonials received. With every carpet we shall absolutely give away a handsome Rug to match.

Remarkable Testimonials.
5, Forth Avenue, Garden Village, Levenshulme.
May 11.

Mr. W. L. Stanton writes—"Send me one of your Prudential Brusselette Carpets and Rug. I was interested to see that one of your customers stated she had a carpet from you 19 years ago that was not worn out. You can also state that I have now in my bedroom one in fairly good condition which I bought at your place well over twenty years ago."

12/6

Repeat Orders received from the Royal Palace, Stockholm.

GALAXY ILLUSTRATED BARGAIN CATALOGUE of Carpets, Hearthrugs, Embroidered Linen and Cotton Bedspreads, Quilts, Table Linens, Bedsteads, Linoleums, Blankets, Curtains, Copper Kerbs, Fire Brasses, Cutlery, Tapestry Covers, &c., Post Free, if when writing you mention "Amateur Wireless" 24/4/26. *Established over half a century.*

F. HODGSON & SONS, (Dept. A.W.) Mnfs., Importers & Merchants, **Woodsley Rd., Leeds**

COMPENSATED SQUARE LAW EFFECT

LOW LOSS

NO BACK LASH

LOW LOSS SQUARE LAW SLOW MOTION

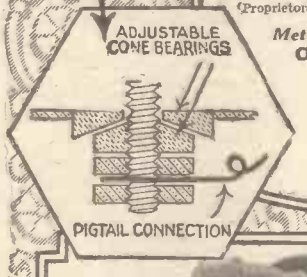
THE "Cosmos" Condenser is a slow motion condenser with absolutely no back lash either when new or after use. This desirable feature is accomplished by the use of a spring belt held in tension, which permits coarse tuning with the large knob, and a 10·1 slow motion with the small knob.

Cone bearings allow for adjustment and the slow motion bracket can be mounted for *remote control* as shown in the lower illustrations.

The Condenser for Fine Tuning.

METRO-VICK SUPPLIES, LTD.
(Proprietors: Metropolitan-Vickers, Elec. Co., Ltd.)

***Metro-Vick House,* 145 Charing Cross Road, LONDON, W.C.2.**



PRICES:

Slow Motion	·00025 mfd.		14/9
,, ,,	·0005	,,	15/6
Ordinary ,,	·00025	,,	12/- R
,,	·0005	,,	13/- P39

COSMOS

On Your Wavelength!

Good Work

THE B.B.C. is to be congratulated on its enterprise in attempting to relay American transmissions at this time of the year. Already dance music from one of the Schenectady hotels has been successfully rebroadcast in this country, and we are promised regular weekly relay programmes from the U.S.A.—conditions, of course, permitting. The company is wise in making use of the short-wave transmissions for several reasons. Signals on the normal broadcast belt between 300 and 500 metres have failed to travel successfully across the Atlantic to this country for some months—even the great Boundbrook station with its 50-kilowatt rating has hardly been heard at all. And even when ether conditions are favourable for the long-distance passage of wireless waves on the broadcast belt there is as often as not no small amount of interference from atmospherics and from spark signals. The short-wave stations KDKA and WGY have been heard over here all through the autumn and winter that are just past; apparently they are not affected by the adverse influence—sunspots, the aurora, or whatever it was—that prevented those on the longer waves from reaching us.

Short-wave Oddities

But though the short waves seem able to to stay the course when the longer ones cannot, they have some peculiar traits all of their very own. Anyone who has listened frequently to KDKA's or WGY's short-wave transmissions must have been rather puzzled at times by the queer kind of distortion that is apt to occur. Sometimes they will come in extremely well; sometimes again villainous distortion mars both speech and music. Another peculiarity is that there seems to be a breed of atmospheric which is confined to the short waves. Often when crashes and scrapings are bad on the broadcast band you will find that the belt between 100 and, say, 50 metres is quite free from their baleful effects. But occasionally the shorter wavelengths are badly affected by atmospherics, whilst the longer ones are pretty well clear of them. Short-wave signals have sometimes the strange trick of skipping altogether a region of varying width around the aerial that transmits them; thus it may be that nothing at all is heard within 50 miles or more of a short-wave station, though signals come in strongly at distances of 2,000 or 4,000 miles.

Any reader who has not so far attempted short-wave DX reception has missed a good deal. It is by no means difficult to make up a set that will bring in the U.S.A. stations using these wavelengths with a fair amount of certainty—instructions for so doing have appeared more than once in AMATEUR WIRELESS. One thing about short-wave reception is that you need not sit up until the small hours in order to tune in American stations. KDKA can often be heard quite early in the evening.

Bravo, South Africa!

A fine feat of two-way long-distance working is reported from Durban, where there are many enthusiastic devotees of wireless. Whilst searching the ether to find someone to converse with Mr. W. H. Heywood received a reply from U6HM, which is the call sign of Mr. Clair Foster's station situated at Carnival, California. In a few moments these two amateurs at opposite sides of the world were hard at it, each receiving clear and easily readable signals from the other. Since then they have communicated with one another on several occasions. Mr. Heywood's transmitter uses a power of only 10 watts. He had previously been able to establish communication with amateurs in India, Cochin-China, Australia, and Palestine. His usual wavelength is 35½ metres. This is a splendid record, and both Mr. Heywood and South Africa deserve the warmest congratulations. Despite atmospheric difficulties—South Africans say that *we* don't know what atmospherics are!—reception over very long distances is frequently accomplished in the Union. Both the Capetown and the Johannesburg broadcasting stations are regularly received in Durban; a glance at the map will give you an idea of the distance. The Durban station, rated at only 500 watts, has been heard on a four-valver in Nairobi, 1,500 miles or so away.

Simultaneous Transmissions

If the relaying of WGY and other American short-wave stations continues to prove successful it is probable that experiments will be undertaken with a view to making the high-power station a regular link between the crystal-man's receiving set and broadcasting stations on the far side of the Herring Pond. At present relaying can be done only by interrupting the regular programme or by giving the retransmissions very late at night after its conclusion. It is proposed to try at Daventry shortly the experiment of transmitting simultaneously on two different wavelengths. One of these will be devoted to the regular programme, whilst on the other relaying of Continental or American stations will be done. If this scheme matures, and there seems to be no reason why it should not do so, the "crystalliser" will be able to tune in either the home programme or items from foreign stations just as he feels inclined. Several of the American stations now give simultaneous transmissions upon two or more wavelengths, and the system is found to work most satisfactorily over there.

A Novel Device

Passing the other day through a small secluded square in a North of England town I noticed something that, to me at all events, was quite new in the way of aerials. Between two houses on opposite sides of the square were suspended parallel wires separated by spreaders. Nothing very new about that? Wait a moment. Midway along each wire was an insulator, and from the ends a lead-in was taken to the two houses. When you come to think of it it is a particularly neat idea. Each house has its own perfectly good aerial, yet neither needs a mast of any kind. The same scheme could be worked between any pair of houses whose gardens back on to one another. The only drawback that I can think of is that if the other fellow howled you would get the full benefit of it!

I hear that in other places the "communal" aerial mast is used. One pole is erected at a point more or less equidistant from a number of dwellings, and the free ends of all their aerials are attached to it.

Why Not Use a Valve Voltmeter?

One often hears amateurs making comparisons of signal strength, and more often than not they are at a loss for a manner in which to express themselves. Testing by ear on very weak signals is deceiving, and the majority of listeners are totally unable to discriminate between fine gradations of signal strength. The use of a valve voltmeter will obviate all these difficulties, and it is not a difficult matter to rig up a suitable instrument which can easily be switched in or out of circuit at will. The two essentials are a sensitive galvanometer shunted with a number of fixed resistances which may be wound on a piece of mica and tapped so as to provide a ready means of varying the sensitivity of the instrument, and a valve which has a very good straight-line characteristic curve. The QX type of valve is particularly suitable in this respect, although an ordinary R-type of valve will do. The circuit used is exactly the same as an ordinary straight detector valve circuit (without tuning coils), and the galvanometer is inserted in the plate circuit of the valve, sufficient grid bias being applied to the grid of the valve to reduce the plate current to zero. When signals arrive on the grid of the valve the plate current rises from zero according to the intensity of the signals. Such an arrangement is very

On Your Wavelength! (continued)

handy for testing the efficiency of circuits, and it is very convenient to incorporate it in one box with a coupling transformer. This is, of course, a low-frequency transformer. The primary of the transformer is connected in the plate circuit of the last valve of a multi-valve set or in the crystal circuit of a crystal receiver. If a really sensitive galvanometer is used you will be astonished at the very fine measurements obtainable with the gear even on very weak signals. The galvanometer may be calibrated in volts by means of applied positive voltages between the grid and filament, since the current change in the plate circuit is very nearly a linear one.

Crystal Experimenters

You have probably experienced that doubtful feeling when testing a number of specimens of crystals or crystal combinations for sensitivity. The valve voltmeter will show quite plainly which is the best sample or circuit, and the use of the instrument in conjunction with a box of crystals will provide quite a number of absorbing experiments for the enthusiastic experimenter. Correspondingly, the effect of making changes in the type, shape and height of aerials may be definitely ascertained and also the results of making different earth connections and the like. The instrument has been neglected by amateurs owing to the fact that its use has not been sufficiently advocated, but I can heartily recommend it to those who are on the look out for something interesting.

Reducing Reaction

Have you noticed that at times you require a far closer coupling of the reaction coil to the tuner than at others? If this is the case it is probable that you have an earth of varying resistance according to the moisture content of the soil. In order to overcome this it is a good plan to take the earth lead direct on to the water-pipe, and if this is not possible the only thing to do is to sink a good earth plate well below the surface of the ground. It is not always advisable to use an earth bedding of coke breeze (as is very often advocated) on account of the chemical action which takes place, especially between *copper* plates and coke.

Another good method of obtaining a constant reaction effect is to use a loose-coupled tuner in place of the old direct aerial reaction method. If this is done, a reaction coil one or two sizes smaller may also be used, added to which you are not so likely to cause interference to your neighbours by means of a re-radiating valve. It is worth the trouble, even if you only gain a clear conscience on this score! Of course, sometimes an erratic reaction effect is caused by a worn-out battery. The remedy in this case is obvious, but I would strongly advise everybody to use their reaction on to a closed circuit wherever possible, for you also often get a smooth control which is not obtainable by any other method.

Watch the Lightning Switch

Many amateurs are puzzled by an unaccountable falling off in signal strength about this time of the year, especially if the set has been installed for any length of time. This may often be traced to the fact that the outdoor earthing switch has become oxidised. It is a good plan to overhaul this switch at least twice a year, cleaning the switch blades and contacts and otherwise making quite sure that a good electrical contact is made between the aerial and set.

Accumulator Troubles

Those amateurs who have been at wireless for a year or so, and have been running a valve set for this period of time, might possibly begin to notice that the accumulator charge does not last for quite such a long time as was its wont. It is possible that this is caused by badly worn valve-filaments taking more current than they used, but, on the other hand, it may be due to the accumulators themselves. Accumulators that have been in use for some time will generally be found to have a heavy deposit on the bottom under the plates, and as time goes on this sediment gradually increases in bulk until the plates of the accumulators are partly shorted, thus considerably curtailing the life of the battery per charge. The remedy is to have the cells cleaned out. When buying an accumulator, see that there is plenty of room between the floor of the cells and the bottom of the plates, so that the cleaning-out process does not have to be done too often.

A Moot Point

At a radio conference held recently in the States it was decided to suggest that after a certain date the use of reaction should be prohibited in all sets sold for broadcast reception. I am wondering whether, supposing that our own Government were to make a regulation to this effect, there would be any great decrease in the amount of interference caused by radiation. I am rather inclined to think that if there were an improvement it would be only a small one. An enormous number of wireless enthusiasts build their own receiving sets, and it would be a difficult if not an impossible matter to keep a check upon them. Heaps of people, again, make a great deal of use of "hook-ups," frequently changing their circuits.

The most important point of all is that a set which is completely innocent of a reaction coil can howl with the best (or worst!) of them if it has one or more stages of high-frequency amplification and no special stabilising device. In such cases you get a feed-back from the plate to the grid owing to the inter-electrode capacity of the valves themselves; in other words, there is capacity reaction.

The majority of the standard receiving sets sold in America are so designed that they will not radiate even when used by completely inexperienced people. This is brought about in many cases by neutralising, and in others by the use of special coupling transformers between the high-frequency valves. The neutrodyne is one of the best circuits in the world for the reception of telephony, but for some reason it has not yet become as popular in this country as it deserves to do. Possibly this is because it is not easy to obtain ready-made coils with central tappings or transformers designed for neutrodyne purposes. Apart from any question of comparison, I think that manufacturers over here would do well to devote more attention to stability in the sets that they turn out, for there are many on the market in this country to-day that can and do radiate badly. Makers of components, again, would probably find that there was a ready market for the special parts needed for the construction of stable receiving sets.

Encouraging Young British Composers

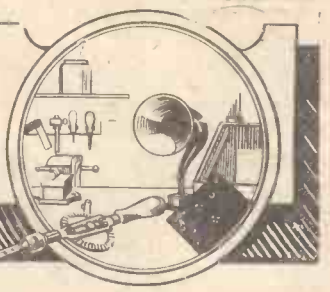
I am delighted to see that the B.B.C. have launched a competition to discover new talent among the struggling band of young British composers. This is a step in the right direction and worthy of our wholehearted support. It is hoped that the conditions will be sufficiently simple and the judging of the work submitted be patiently performed. One of the best points is the condition barring established composers, so that no young enthusiast will feel that her or his work will be prosed over hurriedly for that of a known composer.

Under the circumstances it is not surprising to find that orchestral pieces form the largest field in the competition. This class of work undoubtedly is the severest test of musical skill and the most likely type to produce the composer that the B.B.C. wish to encourage.

Yet all are given a chance, and so sections are devoted to military band music and a song cycle. This enterprise on the part of the B.B.C. gives to the present generation a chance which was denied their parents. It will be interesting to see the quality of the compositions submitted, both from the point of view of skill, but also of national character.

It will be a great achievement were this competition to bring to light a young Briton whose gifts are capable of development to the extent of creating a musician of international calibre. What the B.B.C. may succeed in doing is to discover a British Beethoven or Bach. THERMION.

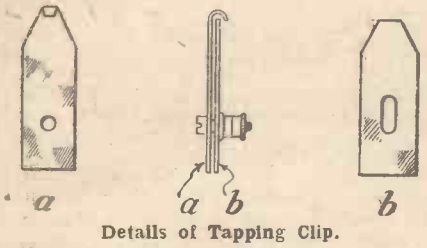
PRACTICAL ODDS AND ENDS



A Tapping Clip

THE diagram shows the details of a simple clip for tapping tuners in which the turns are spaced and wound on an open former.

Two small pieces of sheet brass *a* and *b* are clamped together by means of a



Details of Tapping Clip.

small B.A. screw and nut or terminal head. A hole is bored through *a* to receive the screw, while in *b* a slot is cut so that, when assembled, the piece *b* is pressed down on the wire to be tapped. This holds the wire firmly in the hook at the end of *a* when the parts are clamped together by the nut or terminal head.

E. W.

A Coil Support

LOW-LOSS plug-in coils are generally wound with widely spaced turns and are sometimes literally "wound on air," no former of any description being used.

With constant handling this type of coil is apt to become crushed out of shape, and it is therefore advisable to fit some holder,

A Coil Support.

such as that illustrated in the accompanying diagram, which will assist the insertion or removal of the coil. For the sake of neatness of appearance thin strips of ebonite are used for the side supports but there is, of course, no reason why wood should not be used. Countersink-head screws are used to attach the side supports to the coil socket. These holders will protect the windings from a great deal of damage and, if neatly made, add to the appearance of the coil. K.

Distilled Water

FROM time to time storage batteries must be filled up with small quantities of distilled water to make up for evaporation. Although distilled water is cheap when bought at the chemist's, we can easily distil our own.

The arrangement shown in the photograph is perhaps the simplest distilling apparatus imaginable; the few utensils needed can be "requisitioned" in every kitchen. The most essential item for any distilling apparatus is the boiler. For this any kettle with a well-fitting lid will answer very well. The jet of steam issuing from the spout of the kettle plays on the outside of a thin metal jug, preferably an aluminium one, which has been suspended by three cords. A fourth cord

Simple Method of Distilling Water.

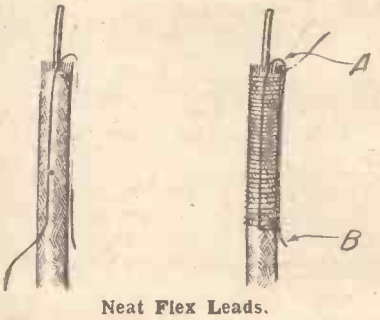
attached to the handle holds the jug in a slightly inclined position.

To condense the steam, the jug is filled with cold water; if the metal wall is very thin (as is usually the case with an aluminium jug), the steam will be changed into distilled water, which will fall off the lower edge of the jug.

These drops of condensed water are caught in a plate standing a few inches below the jug. With such a simple arrangement one ounce of water can be distilled in five minutes. If large quantities are needed, the cooling water in the jug will be found to get fairly warm after about ten or fifteen minutes, and it is advisable to replace it by cold water to maintain the distillation. C. A. O.

Neat Flex Leads

UNTIDY and frayed flexible leads mar the appearance of any receiver. The following method of binding the ends of flex and covered wires will repay the slight trouble involved and make any external connections quite presentable. A 6-in. length of stout thread is all that is required.

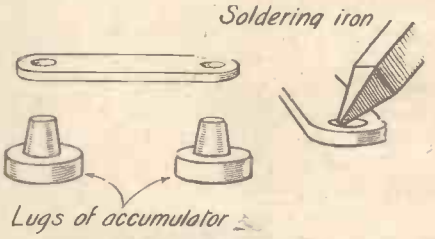


Neat Flex Leads.

Double back an inch of thread at one end and place on the wire as shown. Then wind the longer end of thread tightly on in a close spiral in the direction of the end of the wire, making a binding about ½ in. long. Pass the free end of the thread through the loop (A) and, with a pair of pliers, pull the end (B) until the loop disappears under the windings. Cut off the spare ends, and the result will be a firm, neat binding which will effectually obviate any tendency to fray. H. E. T.

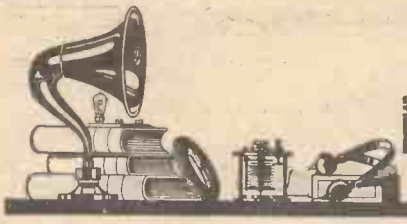
An Accumulator Repair

IF the brass terminals or cell-bridging wires of an accumulator get badly corroded and break off, quite a neat repair can be made at home in the manner shown in the diagram.

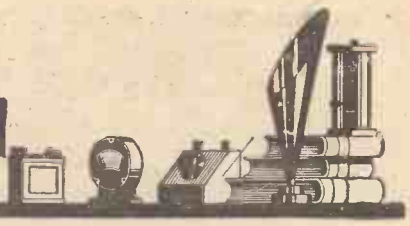


An Accumulator Repair.

The plate lugs are cleaned and filed to remove all the corroded part (special care being taken not to get any filings into the accumulator) and a strip of lead drilled with holes that are a good push fit on the lug ends is pressed into the position required. The lug should project about $\frac{1}{32}$ in. above the top of the plate. A hot soldering-iron rubbed over the projecting end of the lug will then serve to spread the metal, so that the plate is held securely in position. M. R.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 648).

Amplification Factor

Q.—*What is meant by the amplification factor of a valve?—S. A. L.* (*Essex*).

A.—Perhaps the simplest way to explain this is to say that in a valve with an amplification factor of 10 a change in the potential of the grid will cause as big a change in the anode current as would be caused by leaving the grid potential alone and altering the plate potential ten times as much as the grid-voltage alteration.—J. F. J.

Disconnecting Batteries

Q.—*Is there any need to disconnect the H.T. and G.B. batteries when the set is not in use, or is it sufficient to turn out the filaments of valves?—O. N. C.* (*Uxbridge*).

A.—Provided that the insulation of the set is perfect no current can be drawn from either battery when the valve filaments are not alight. Therefore, unless there is reason to suspect the insulation, the H.T. and G.B. batteries may be left permanently connected to the set.—B.

Aerial Wire

Q.—*I understand that it is an advantage to use wire having a large surface area for the aerial. Does this apply only to the aerial itself or to the lead-in also?—F. C.* (*Runcorn*).

A.—By "aerial" in this case the whole of the aerial circuit is meant. This includes the horizontal portion, the down-lead, tuning coil and earth wire. There would be little advantage in using wire with a large surface area for part of the circuit only. Although the tuning coil must be kept down to a reasonable size all the rest of the aerial circuit should consist of wire wth the same surface area and that a large one.—J. F. J.

Converting Accumulator

Q.—*Is there any satisfactory method of converting a 6-volt accumulator into one of 4 volts?—D. S.* (*Leeds*).

A.—Beyond disconnecting or leaving out of circuit one of the cells there is no satisfactory method of doing this. You can, however, disconnect all the cells and use them in pairs alternately. After breaking the connections between them you could use the first and second cells for a certain period, then the first and third cells for about the same length of time, and lastly the second and third cells could be joined in series. If all the cells are to be kept in good condition it is important that each cell should have approximately the same amount of current taken from it before the whole battery is charged again.—J. F. J.

Sulphating

Q.—*What causes accumulator plates to sulphate and how can the trouble be cured?—R. T. P.* (*Rugby*).

A.—Sulphating is usually due to neglect or careless usage. Leaving the battery in a discharged condition for some time or discharging too quickly may produce the effect. Even if fully charged the plates may sulphate if the battery is not used for a considerable period. Alternate charging and discharging at a very slow rate will sometimes effect a cure, if the process has not been allowed to go too far. It is important to continue the treatment untill *all* trace of the sulphating has disappeared. In very bad cases the plates may be removed from the case and scraped, though it is possible for a battery to get into such a state as to be quite incurable.—B.

OUR WEEKLY NOTE

INTERFERENCE BETWEEN AERIALS

If you are just putting up an aerial and your neighbour happens to have one as well, it may seem very convenient if you can persuade him to let you fix your aerial to his mast. Although this may save trouble when erecting the aerial, unfortunately it often leads to much more serious trouble later on when you both wish to use your sets at the same time.

It is well known that when a closely coupled H.F. transformer is used it is sufficient to connect a variable condenser across one of the windings only. Owing to the closeness of the coupling this will serve to tune both windings. In the same way if two aerials are erected close to each other (and nearly parallel) it will often be found that when the tuning of one is altered the tuning of the other is affected. It is very annoying, when enjoying a programme from one station, to be suddenly switched over to another station which you do not want to hear.

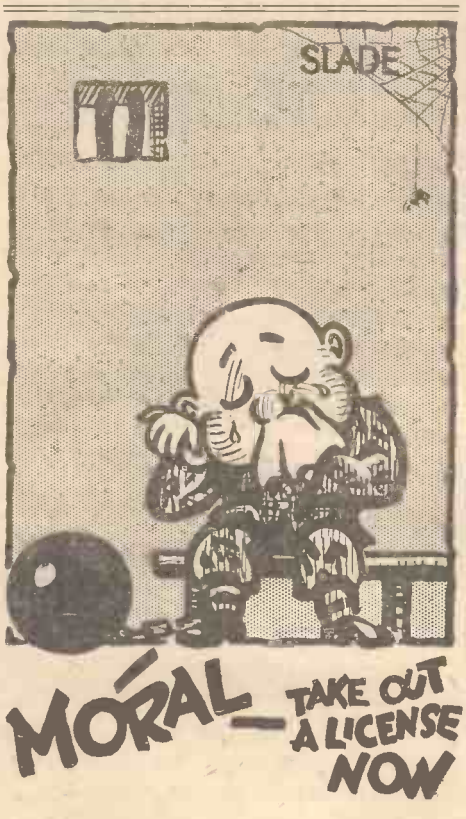
Therefore, when putting up an aerial, take care to erect this as far away from and as nearly at right-angles to any near-by existing aerials as possible.

THE BUREAU

Frothing Accumulators

Q.—*How can I reduce the frothing of an accumulator? I know that it is normal for gas to be evolved, but in my case the frothing appears to be abnormal.—H. L.* (*Buxton*).

A.—This trouble often appears to be due to some defect in the composition of the celluloid case but does not seem to impair the normal working of the accumulator. Strange to say, the trouble can often be cured, or at least reduced, by introducing a small quantity of soap into each of the cells. At any rate it can do no harm to try this. Any kind of soap will do, but the powdered variety seems to act with most effect.—B.



Fault in Crystal Set

Q.—*I have a crystal set tuned by a plug-in coil and variable condenser with which I receive the local station quite well. I find, however, that touching the aerial terminal increases the strength of reception slightly. How can I secure this increase in a normal manner?—R. T.* (*N.5.*)

A.—This effect may be caused by your aerial coil being on the small side. If at present you get best results with the variable condenser set at its maximum capacity you can be sure that this is the case. The set will then be tuned to a slightly lower wavelength than that of the transmitting station and the added capacity of the body assists reception by increasing the wavelength to which the set is tuned. Try a larger aerial coil.—J. F. J.

Resistance Coupling

Q.—*Could you please explain briefly how resistance-capacity amplification works?—W. N.* (*Leicester*).

A.—This coupling consists, of course, of a high resistance in series with the plate of one valve while the grid of the next valve is connected to the plate of the first through a condenser. The second valve is provided with a grid leak. The voltage drop of the H.T. battery is distributed between the anode resistance and the first valve according to their respective resistances. At all times the total drop will be that of the battery, but when signals cause the resistance of the valve to vary a re-distribution of the voltage drop across these two resistances will take place. When the grid of the valve is made more positive the drop across the valve will decrease but that across the anode resistance will increase. When the grid is made more negative the reverse will be the case. Thus, while the side of the anode resistance connected to H.T. positive and the filament of the valve will always remain at the same potential as at first (and will always have the same difference of potential between them), the point where the anode resistance joins the plate of the valve will fluctuate when signals are being received. It is to this point that the coupling condenser is connected and the fluctuations are passed thereby to the grid of the next valve. The grid leak is used merely for the purpose of allowing electrons to escape from the grid of the second valve where they would otherwise accumulate, being unable to pass through the coupling condenser. As part only of the total voltage of the H.T. battery is applied between the plate and filament of the valve this battery must have a considerably higher total voltage than would be the case were transformer coupling used.—R. W.

AN IMPROVED TUNER FOR THE CRYSTAL SET

Details of a Novel Variometer with Interchangeable Rotor

A VARIOMETER of good design is undoubtedly still one of the best components for use as a tuning inductance. The one described in this article is equipped with a rotor which may be instantly changed by the simple means of using a selection of basket coils; the details are shown in the accompanying diagrams. The advantage of this factor in design is easily seen, as it enables the experimenter to employ one variometer which will cover a varied range by reason of the fact that he can alter his field of tuning

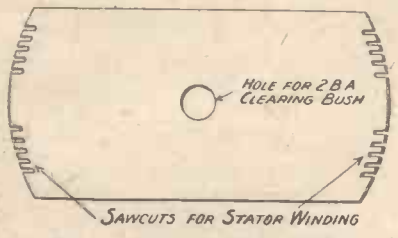


Fig. 2.—Shape of Stator Plates.

by selecting small or large basket coils to act as the rotor.

The general construction is clearly shown in Fig. 1. The dimensions may be made to suit the taste of the constructor, care being taken to see that the distance between the two stator pillars is sufficient to clear the diameter of the largest basket coil which may be used.

The rotor spindle is made of ebonite, each end being tapped to receive a short length of 2 B.A. rod. The screws T3 and T2 are to take the input and output connections of the basket coil, and care should be taken when assembling these into the basket spindle that they make contact with the 2 B.A. rod, as these act as contact points, carrying the current through the output of the stator to the terminal T2, which is the input of the rotor.

The basket coil is easily clamped into

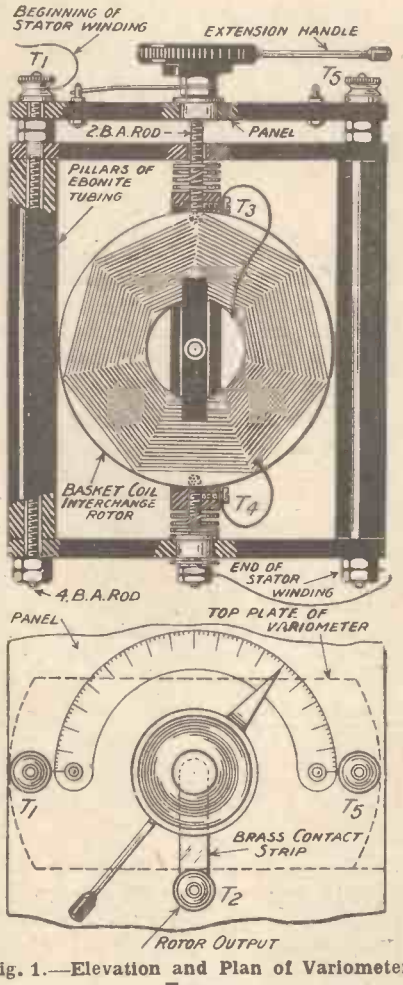


Fig. 1.—Elevation and Plan of Variometer Tuner.

position by means of a small strip of ebonite and a screw and nut, as shown. The brass contact strip is passed from the upper end of the rotor spindle to the terminal T2, as indicated in the plan shown in Fig. 1.

In Fig. 2 the shape of the top and bottom plates of the stator is shown. These are exactly similar with one exception, namely, the top plate has a centre hole drilled to clear 2 B.A. rod, and the bottom plate has a centre hole drilled for a forced fit for a 2 B.A. clearing bush. The saw-cuts are to receive the stator winding. The number of these may be in accordance with the number of turns desired, a total of 10 to 18 of No. 18 wire

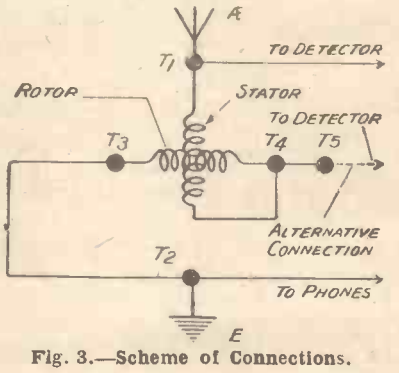


Fig. 3.—Scheme of Connections.

being suggested if the variometer is fairly large. These cuts may, however, be made of sufficient depth to allow for more than one run being taken through each slot, thus giving a larger total number of turns which may, if desired, be taken to tappings.

Connections are made as follows: Secure the input of the stator winding to terminal T1, and the output to the nuts on the bottom plate of the stator. Pass a flexible lead from this point to the nuts, securing the lower portion of the rotor spindle. Screw T4 connects to the input of the rotor, the output being connected to T3, which also connects to T2 via the brass contact strip. The theoretical connections are shown in Fig. 3. The aerial may be connected to either T1 or T5 according to the circuit used, this being a further advantage over the ordinary type of variometer. RADIO.

TWO PANEL HINTS

DESPITE the greatest care, the constructor will occasionally show a hole in the wrong position when marking out a new panel. If the hole has already been indicated with the centre-punch, the best way of dealing with the mistake is to stick a small piece of gummed paper over the mark. When the holes are drilled, the small square of paper will warn the operator that this hole must not be drilled.

After drilling, some amateurs finish off their panels by rubbing them with oil and polishing the surface with sand-paper. All traces of oil must be carefully removed, and this can be easily done with a clean rag, except for the holes. Here a fair amount of oil is retained, and this leaks through on both sides. The simplest way of cleaning the holes is to use a pipe-cleaner. This cleaner should be of the brush type; after pushing it a few times through the holes all traces of oil will be removed. When removing dust and grit from inaccessible corners, a cleaner of this type will be found very useful. C. A. O.

A PHONE TIP

PHONES nowadays are made with such precision and are so reliable that amateurs seldom realise what instruments of exactness modern phones are. The distance between the diaphragm and the permanent magnets, for instance, is very small and the diaphragm under the continuous magnetic strain is apt to become distorted. When trouble of this nature occurs the ear-caps of the phones should be removed and the diaphragms reversed. If the distortion is considerable it may be necessary to use packing rings of paper to correct the clearance. G.

A SUPER-HET FO

A simple long-distance receiver that gives

THE craving for distance is ever with us. Whatever the set the more advanced amateur possesses, he will sooner or later come to the conclusion that everything is not quite as he would like it to be, and he will search around for some other set on which to test his skill and one on which he is able to obtain dependable results. There are only two circuits which I would recommend to the amateur for this purpose: One is the neutralised circuit, which works admirably on the open aerial when once it has been properly balanced, and the other is the one with which we are immediately concerned—the standard super-heterodyne receiver, the circuit of which is shown by Fig. 1 (p. 634), with slight modifications which have been added to make for selectivity and reliability.

A little thought will show that the range of any sensitive receiver is entirely dependent upon (*a*) the efficiency of the detector valve, and (*b*) the design and efficiency of the high-frequency amplifier. Maximum high-frequency amplification is only obtainable on moderately high frequencies, that is, long wavelengths; the shorter the wavelength used the lower the amplification obtainable valve for valve.

The Aerial

There is absolutely no need to use the super-het on an outdoor aerial. If it is working properly its range on a frame aerial is little less than that obtainable on the open aerial, whilst its selectivity and freedom from static interference is considerably enhanced.

With the set illustrated in the photographs remarkable results have been obtained. From the sensitivity point of view it is of interest to relate that over thirty broadcast stations were tuned in during the first three-quarters of an hour it was actually in use. Fifty per cent. of these stations were on the Continent and two American stations came in almost as loud. On the amateur band of wavelengths dozens of amateurs' phone stations came in and also one or two short-wave Continental broadcast stations. Many of the amateur stations were French and were received at good phone strength in London. During active hours it is hardly possible to move the dials more than two degrees without hearing a station.

As regards selectivity, one could hardly wish for anything better. Spark stations are the only ones which really cause trouble, and even this interference is often cut out by a slight orientation of the frame aerial. The set is very sensitive to direction, and in order to hear very distant signals the loop must point almost dead on to the wanted station.

Distance and Volume

A remarkable thing is that all stations so far heard appear to arrive at good phone strength and their nearness does not have any appreciable influence on the volume of sound in the headphones. This may possibly be due to the fact that high-frequency amplifiers often act as rejectors of very strong signals whilst they build up the weak ones. The writer therefore found it necessary to construct an extra choke-coupled low-frequency amplifier in order to work satisfactorily the large loud-speaker shown in the photograph. Even with this additional amplification it will be found necessary to search with the phones and plug in the amplifier after signals have been tuned in, for tuning is extremely critical. Musical quality is extremely good.

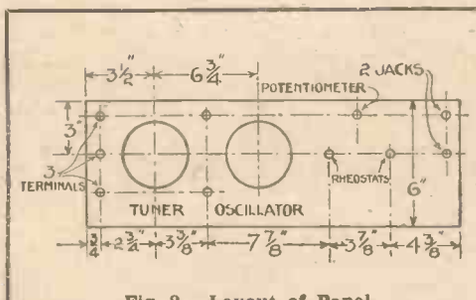


Fig. 2.—Layout of Panel.

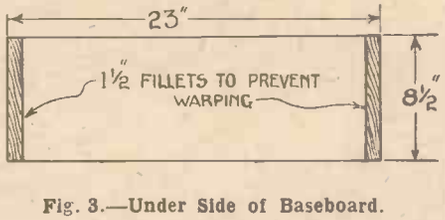
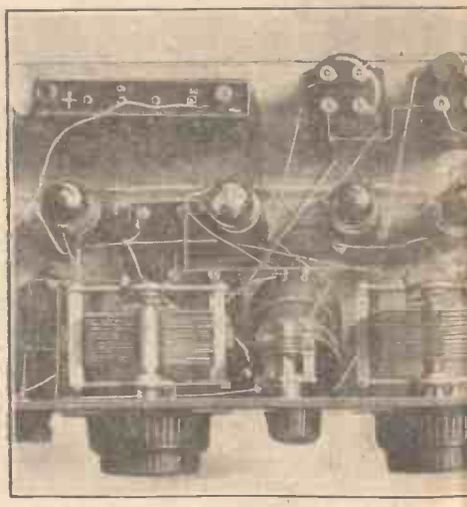


Fig. 3.—Under Side of Baseboard.

Three-quarter View of

Construction of the Set

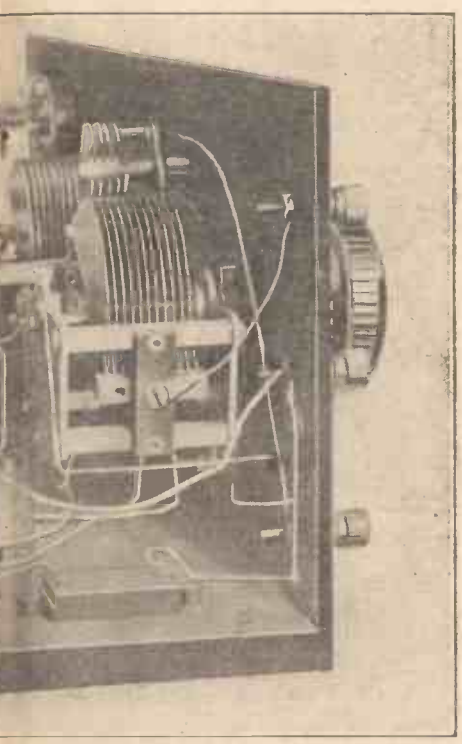
The following components were used in the construction of the set under discussion. Seven Cossor Wuncell valves, four W2 (H.F.) and three W1 (L.F., detector and oscillator); three Remler type-600 intermediate transformers; one Remler type-110 tuned-circuit transformer; one Remler oscillator coupling unit; seven valve sockets (baseboard mounting type); two low-loss variable condensers, .0005 microfarad; one Former L.F. transformer (Perfection); one Midget Continental variable condenser, .000075 microfarad; two Lissen rheostats; one Noiseless potentiometer, 300 ohms; filament six-way jack; one phone open-circuit jack; one 1-microfarad T.C.C. condenser; two



Plan View o

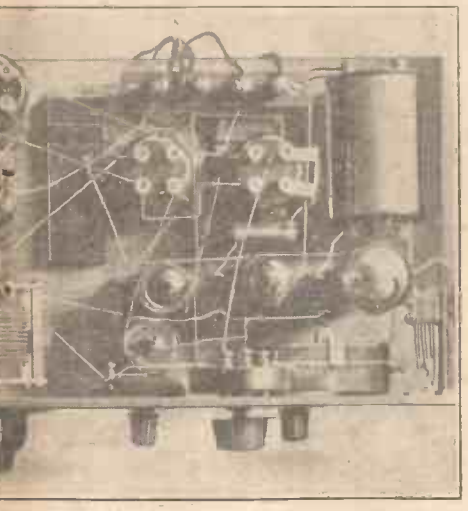
OR THE NOVICE

wonderful results on a small frame aerial



f Super-het Receiver.

.006 Dubilier condensers; one .0005 Dubilier condenser; one .00025 Dubilier condenser; three .0025 Dubilier condensers; one 5-megohm grid leak; eight terminals; one Ever Ready grid-bias battery (9 volts); one Radion panel, 23 in. by 6 in. by $\frac{3}{16}$ in.; one oak baseboard, 23 in. by 8½ in.; frame aerial or material to make one.



of Receiver.

Whilst the above list represents the actual parts used in the set under discussion, the constructor may, of course, vary his selection to suit his fancy. The utmost care must be taken to choose component parts of proved efficiency. The main considerations are the H.F. transformers and the variable condensers and valves. Results with parts other than these named may lead to difficulty being experienced in getting the set to work satisfactorily, and the constructor must be prepared for a large amount of experiment should he deviate very much from the list. If, on the other hand, the list is adhered to, little difficulty will be experienced after the usual preliminary practice which is necessary with any newly-built super-heterodyne receiver.

The Panel

The panel layout is illustrated in Fig. 2.

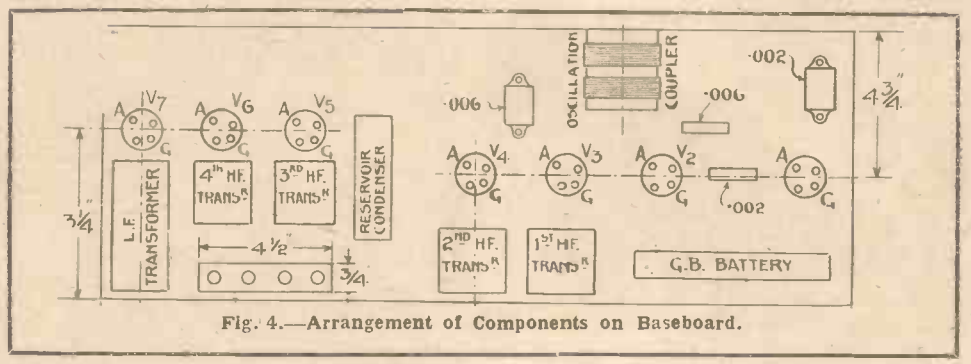


Fig. 4.—Arrangement of Components on Baseboard.

A full-sized reproduction of this sketch should be made and then pasted on the ebonite panel, and the requisite centres punched by means of a suitable tool.

All the holes are next drilled at the points marked. As the sheet of insulating material is somewhat large and will therefore be liable to crack across its width, the drilling should be done on a good flat surface.

The Components

The baseboard should be next prepared. Very often the amateur is tempted to use a plain piece of board, but in building a large set of this description it is advisable to take precautions to prevent the board from warping. A pair of fillets are therefore used, one across each end of the board, as illustrated in Fig. 3. These fillets may be either tongued and grooved or merely pinned to the board by means of stout wire nails.

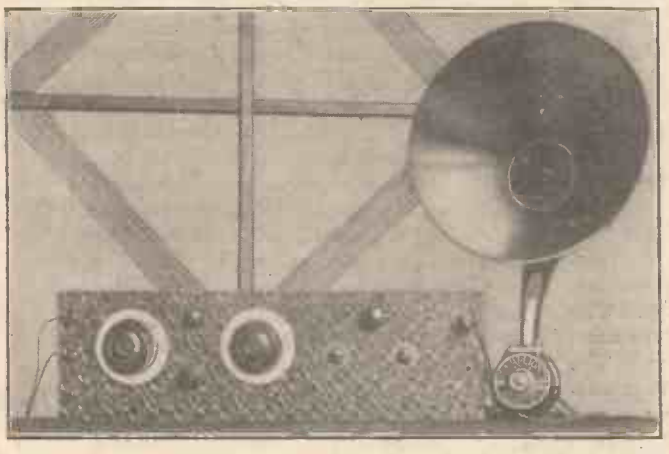
The component parts are mounted upon the board in the positions shown in outline in Fig. 4. It will be found that there is ample room for them in the space allowed. Before leaving this part of the construction, all transformer windings should be tested for continuity. The most ready means is by means of a pair of telephones. The phones and a pocket-lamp battery are connected in series across the windings, and as soon as the circuit is completed a loud click should be heard in the phones. If only a faint click is heard the winding is faulty and the transformer should be returned to the makers untouched. Fixed and variable condensers should be treated in a like manner, but in this case only a very faint click should be apparent, if anything is heard at all. It is as well to make these simple tests at this stage, for an undiscovered fault can very easily lead to a lot of trouble later. It is as well to also test the oscillator-coupler windings in the same manner.

Wiring-up

The theoretical circuit diagram is given in Fig. 1. The markings as shown on the terminals of the intermediate transformers correspond with those on the Remler transformers. In wiring up the set, and in order to avoid errors, it is suggested that the low-tension circuit should be dealt with first. In this connection it will be noted that the two Lissen rheostats are partly in series with one another, and care should be taken to see that they are wired up accordingly. The second stage of the wiring is the high-tension circuit. As regards the high-frequency end (or input end) of the receiver, it will be noted that the first detector valve does not employ a grid leak and condenser, as commonly used in the super-heterodyne receiver. This valve is operated at the bottom end of its characteristic curve by means of a grid-biasing battery. It has been found that this sharpens up the tuning of the set and preserves the clarity of reproduction. Care should be taken that the small fixed condensers are wired in the proper positions, otherwise it is possible to short-circuit the high-tension battery.

The Loop Aerial

A specially-made loop aerial embodying a centre tap is necessary for the successful operation of the set. The centre tap feature in conjunction with the small condenser provides a means of obtaining reaction from the first detector valve and considerably sharpens up the tuning and cuts out interference in difficult districts.



Super-het with Frame Aerial and Loud-speaker.

The loop aerial is wound on a square wooden frame made of 1-in. square wood. The frame is built in the ordinary way, and is wound with 12 turns of No. 26 d.c.c. wire, a centre tap being taken from the sixth turn.

Operation

The tuning of the super-heterodyne receiver is a somewhat difficult matter until the operator has become accustomed to the peculiarities of such a set. On the other hand, when once the user has had a little experience he will find that it is the simplest set of all to tune. In the early stages the experimenter should remove the centre-tap connecting wire from the centre terminal on the panel and short-circuit this with the L.T. terminal on the bottom of the panel. The remaining frame aerial leads are connected one to each of the outside terminals on the front of the panel.

Searching may now be carried out without the use of the small balancing condenser which provides reaction when the centre tap is in position in the circuit, but which is now short-circuited. Tuning is accomplished by rotating the condenser dials a degree or two degrees at a time, taking care that the aerial tuning condenser is rotated ten or more degrees for each degree of movement of the oscillator dial. Such tuning should take place when it is known that some of the local broadcasting stations are in operation. If the set is functioning correctly a number of stations may be picked up on the phones, and after a little practice the constructor may resort to the aid of the balancing condenser. This is put into operation by connecting up the centre tap from the aerial to the proper terminals. When this is done the "pick up" coil of the oscillator coupler is placed at an angle of 45 degrees and the condenser moved so that the moving vanes are just engaged between the fixed ones. A few tests will soon show how much capacity is required to give the requisite amount of reaction; in any case this will be small. If the value is too high the set will simply fall into oscillation and signals will be untunable, only the carrier wave being received.

The Valves

The valves used by the writer were Cossor Wuncell, and these have given excellent results. Referring to the base-board layout Fig. 4, the valve V1 is a Cossor W2; V3, V4 and V5 are also W2's, whilst V2 and V6 are W1's, V7 being any suitable power amplifier or a W1. The anode voltage in use is 45 on the H.F. stage's oscillator and first detector and 60 to 90 on the L.F. stage. The amount of grid bias used on G.B. 1 (Fig. 1) depends upon the anode voltage in use, but when 45 volts are used on the plate this will be in the neighbourhood of −3 volts. The grid bias of G.B. 2 does not exceed −9 volts, whilst G.B. 3 is − 1½ volts.

The wavelength range with the aerial described is from about 180 metres to approximately 600 metres, but reducing the size of the frame aerial will result in a greatly reduced wavelength range. On no account should the set be used on an outside aerial, as it re-radiates very strongly and no greater distances are reached satisfactorily owing to atmospherics.

A. J. C.

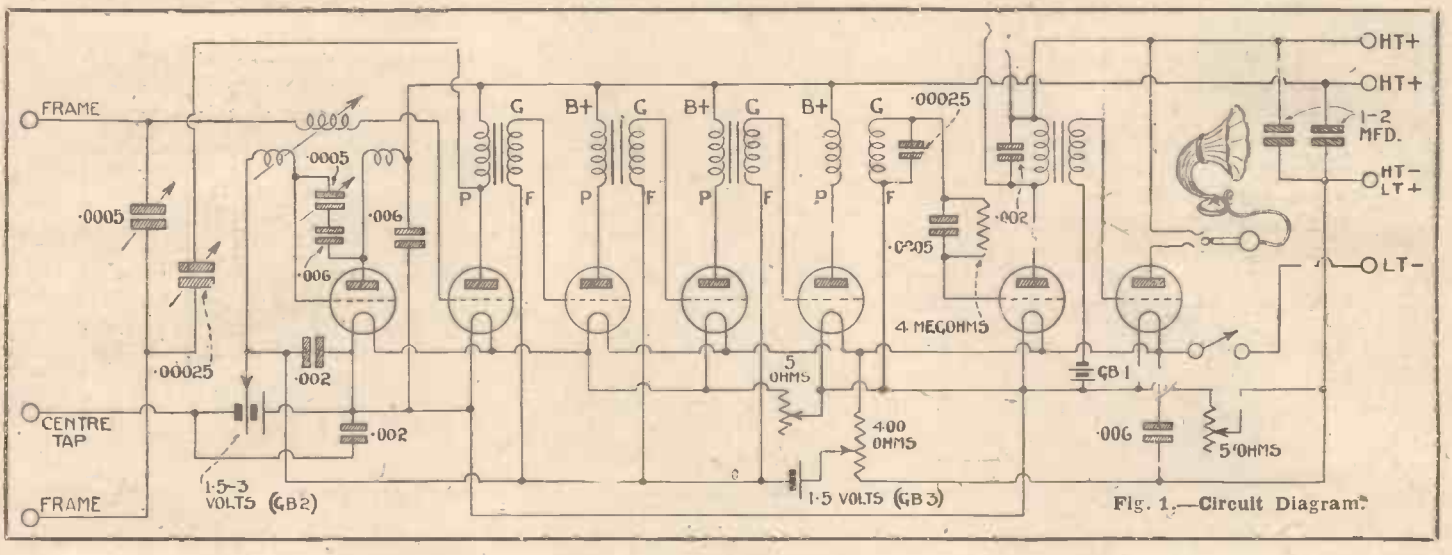
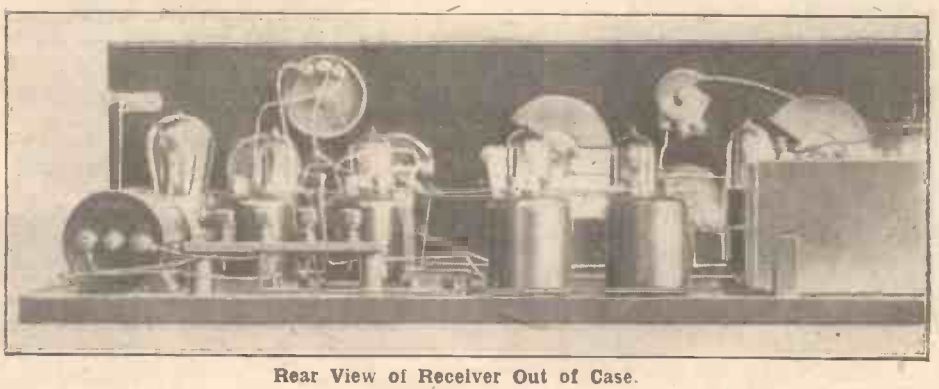


Fig. 1.—Circuit Diagram.



Rear View of Receiver Out of Case.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

C.A.C. Transformer

THE C.A.C. Radio, Ltd., of 10, Rangoon Street, London, E.C.3, are producing a very small low-frequency transformer, the dimensions being 2¼ in. by 2¾ in. by 2¼ in. The windings are enshrouded in a metal case, from the sides of which project the primary and secondary terminals. By clamping the two halves of the metal case by two small nuts and bolts the iron-core laminations are held firmly together, grooves being cut in the laminations to allow the clamping screws to pass through without touching and so shorting the laminations. The transformation ratio of the sample submitted is 5 to 1.

On test, in comparison with our standard 5-to-1 transformer, results were fair, both volume and quality being slightly inferior. It must be remembered, however, that our standard is a very expensive instrument.

C.A.C. Transformer.

In comparison with other commercial transformers of approximately the same price results were very favourable.

Mullard Wire-wound Resistance

ALTHOUGH in theory resistance-capacity coupled L.F. amplifiers give a more silent background than other forms of amplification, yet in practice trouble from crackling noises are frequently experienced. These may be due to the plate-resistance element or to the grid leak, but the former is most probably the cause of extraneous noises. Improved results are to be obtained by the use of a wire-wound resistance in the plate circuit, and the one in the photograph, made by The Mullard Wireless Service Co., is a good example of such a resistance. It is made in two standard values of 80,000 and 100,000 ohms, other values being made to specification. The special method of manufacture ensures an accuracy to within 3 per cent. As the resistance element is wire-wound, its use ensures silence in working, and greater current-carrying capacity than is obtained with the non-metallic type. The specimen submitted to us for test was found to have an approximate resistance

Mullard Wire-wound Resistance.

of 98,000 ohms, which certainly substantiates the maker's claims in point of accuracy. In actual reception it also noticeably improved results. The manufacturers' address is Nightingale Lane, Balham, London, S.W.12.

H.T. Accumulator Charger

AN efficient rectifier for charging H.T. accumulators from A.C. mains may be obtained from the Grafton Electric Co., of 54, Grafton Street, Tottenham Court Road, London, W.1. The Simplex rectifier, as it is called, is made in two types, and is designed to charge an H.T. accumulator at any rate from 20 to 200 milliamps, depending on the wattage of the resistance lamp used. Rectification is effected by a vibrating reed, which is provided with an adjusting knob. The standard frequencies of type A are 40 to 60 cycles and type B 80 to 100 cycles, whilst the rectifier can be obtained suitable for 110- to 120- or 220- to 240-volt mains.

H.T. Accumulator Charger.

On test we connected the rectifier up to 220-volt 50-cycle mains, the output being connected to a 120-volt accumulator battery with a charging rate of .1 ampere (100 milliamps). After adjusting the vibrating spring until its natural period of vibration synchronised with the frequency of the supply (fifty vibrations per second), all sparking was eliminated, and the hum of the vibrating reed was barely audible. This rectifier has our recommendation.

Another Dimic Coil

WE have received from L. McMichael and Co., of Hastings House, Norfolk Street, Strand, London, W.C.2, a sample of their Dimic coil for low wavelengths, type No. S.W.1. This coil is similar to that reviewed in these columns some time ago, with the exception that the ebonite former has been skeletonised, reducing the bulk of dielectric present in the field to a minimum. Losses due to dielectric absorption are thus minimised. On the former two coils are wound magnetically coupled together, each coil consisting of ten spaced turns of wire. The ends of the coils are brought out to contacts made of springy brass strips, which engage with spring sockets mounted on a rectangular ebonite base.

New Dimic Coil.

On test we found the wavelength range of No. S.W.1 Dimic coil, in conjunction with a .00025-microfarad variable condenser, to lie within 75 and 160 metres. The H.F. resistance at all frequencies within the scope of the coil is exceedingly low. The quality of the ebonite on which the coil is wound is of a high grade.

RADIOGRAMS

AMERICAN broadcasting will be heard in future on every Tuesday night from 11.30 until midnight by listeners to the British stations.

The B.B.C. announce that during the summer the two main portions of the evening programme, as from April 25, will be broadcast from 8 to 9.30 p.m., and 10 to 11 p.m. The general news bulletin will be given at 9.30, and dance music will be broadcast, as usual, from 10.30 to midnight on three nights a week.

The Walthamstow Band Contest is to take place in Lloyd's Park, Walthamstow, on May 1, when seventeen bands will be competing. London and Daventry are to relay parts of their playing.

As a result of a recent search for wireless "pirates" in Aberdeen, two owners of crystal sets were fined.

The series of music talks by Sir Walford Davies are to be resumed as soon as he has recovered from his illness.

On May 1 the Edinburgh broadcasting station will celebrate its second birthday. The station has prepared a special programme for this event, in which Mr. T. C. Sterndale-Bennett is taking a leading part. Speeches will also be broadcast by the Lord Provost of Edinburgh, Lady Sleigh, Bailie Philip Smith and Captain P. P. Eckersley.

The military authorities propose to broadcast simultaneously the 6 p.m. and 7.30 p.m. concerts from the Eiffel Tower on wavelengths of 75 and 2,650 metres in order to ascertain whether signals on the lower wavelength are received at a greater distance.

The new Munich broadcast transmitter, which is installed at Stradelheim in the vicinity of the city, has resumed experimental tests on a wavelength of 487.7 metres. Up to the present very many complaints have been made with regard to the poor quality of the transmissions, but the authorities still hope to improve matters shortly and to bring the station into regular operation by the end of April.

At Fort Leavenworth (Kansas) the post signal officer, by means of a single six-valve wireless receiver, has equipped houses of officers and men in the district with some 200 loud-speakers, one further stage of amplification being used for each fifty loud-speakers added. Many of the United States station programmes are tuned in, and although they are conveyed over some fifteen miles of private wires they are satisfactorily distributed.

In the West of Scotland stations in Saigon, Indo-China, Australia, South Africa and Argentina have been picked up on a Reinartz set comprising detector and one low-frequency valve only. This achievement was on the 20-60-metre waveband.

£250 has been raised as a result of a broadcast appeal to provide funds for equipping Edinburgh hospitals with wireless installations. This amount, however, is not considered satisfactory, and arrangements have been made for the placing of collecting-boxes in conspicuous positions in shops and places of entertainment.

During the summer the B.B.C. hope to relay a number of alfresco concerts from London parks. The first will be broadcast on the evening of May 5.

Mlle. de Holthoir will describe a visit to Paris during the spring fashion season at 2 L O on April 29.

It is now hoped to open the new Antwerp broadcasting station within the next few weeks. Although the wavelength on which the Zoological Society concerts will be transmitted has not yet been definitely fixed, it is probable that it will be in the neighbourhood of 260 metres, providing Radio-Belgique secures the authority to broadcast on a higher wavelength.

The Danish military stations of Odense and Hjoerring, which up to the present have been relaying the Copenhagen programmes, will in future, with Ryvang, return to their original duties, and the Danish entertainments on 347.5 metres will now be regularly taken by Soro on 1,150 metres until the new 5-kilowatt central station now under construction is in operation. When Ryvang is broadcasting weather reports on 1,160 metres in order to avoid interference, Soro will raise its wavelength to 1,500 metres.

Lamond will give a pianoforte recital at London studio on May 5.

On May 6 the president of the National Union of Allotment Holders, Mr. D. P. Collins, will talk on "Allotments."

Listeners may expect to hear Mr. John Galsworthy from the London studio on May 7.

The seamen's unions in Australia are demanding that wireless receivers be installed in all vessels irrespective of tonnage.

The programme and syllabus of the B.B.C. from April to July this year has just been issued. It includes a series of "talks" on a wide range of subjects, literary, dramatic and musical criticism, science, commerce and modern languages. The instrumental broadcasts will feature pianoforte studies of the works of the classic composers from Mozart to Brahms, and a series of old English songs will be given.

The demand in Nottingham and district for wireless licences continues to increase. For the week ended March 27 another 265 were applied for and issued.

That the greatest possible use should be made of the Dublin broadcasting station for the revival of the Irish language was the purport of a resolution passed recently by the Gaelic League.

It is estimated that $578,000,000 (£115,600,000) were spent on sets and accessories in the United States last year. It is said that 4,250,00 out of the 25,000,000 homes in America (17 per cent.) are equipped with receiving sets.

According to the latest statistics, there are now 648 broadcasting stations in the United States of America.

Additional interest was lent to the presentation of the "Wooing Scene" from *Cyrano de Bergerac,* at Glasgow, on April 19 by the incidental music. This was provided by Miss Elizabeth Buchanan on the guitar-mandolo, an instrument of the period.

A big undertaking of the Glasgow station will be the studio performance of Act 1 of *Parsifal* on May 2. Walter Hyde and Norman Allin are among the operatic "stars" expected to take part.

On April 29 the Glasgow station augmented symphony orchestra is giving a public concert. Mr. Albert Sammons, the violinist, is participating.

The B.B.C. are to attempt another relay of the nightingale's song towards the end of the month.

The first of the Spring Chamber Music concerts, which are to be given in the Chenil Galleries and relayed to listeners, will be given on April 26. The B.B.C. state that on the same evening there is to be another relay of programmes from Continental stations.

During the coming season the following relays will be made from the Royal Opera House, Covent Garden: Act 2 of *Figaro* on May 10, Act 3 of *The Valkyries* on May 14, and Act 2 of *The Twilight of the Gods* on May 19.

In the early summer it is hoped to secure a return visit to the London studio of Mr. J. R. Roberts, who will on this occasion broadcast an old-time smuggling scene staged in a real cave at Plymouth.

The afternoon service on Sunday, May 2, will be relayed from King's College Chapel, Cambridge.

"AMATEUR WIRELESS"

GREAT HOLIDAY BALLOT COMPETITION

FIRST PRIZE £100 SECOND PRIZE £50

and Twenty other Prizes of £5 each

WHICH IS YOUR FAVOURITE EAST COAST HOLIDAY RESORT?

Perhaps it is SCARBOROUGH, or FELIXSTOWE, or SKEGNESS. WHATEVER IT IS, BY SELECTING YOUR SIX FAVOURITES, according to what you think will be the most popular vote, YOU STAND A CHANCE OF WINNING £100, or one of the other 21 Prizes. THIS COMPETITION IS SIMPLICITY ITSELF. BELOW YOU WILL FIND A LIST OF 20 of the most popular RESORTS—ALL ON THE LONDON AND NORTH EASTERN RAILWAY, which, as you know, runs from King's Cross to Lossiemouth and from Manchester to Grimsby. ALL YOU HAVE TO DO IS TO STATE, IN THE SPACE PROVIDED BELOW, which you think will prove to be the most popular among all the competitors. FOR INSTANCE, if you think SCARBOROUGH will be at the top, put that FIRST, or if you think FELIXSTOWE, put that FIRST, or if you think SKEGNESS, put that FIRST, and so on in order. YOU MAY ONLY SELECT SIX PLACES—NOT MORE—AND ONLY THE PLACES NAMED BELOW MAY BE USED.

LIST OF TWENTY RESORTS.

SCARBOROUGH	WHITBY.	YORK.	REDCAR.	DUNBAR.
BRIDLINGTON.	YARMOUTH.	CROMER.	CLEETHORPES.	NORTH BERW
WHITLEY BAY.	LOWESTOFT.	CLACTON.	HARROGATE.	EDINBURGH.
NORFOLK BROADS.	FELIXSTOWE.	SKEGNESS.	SALTBURN.	ABERDEEN.

Before deciding on your favourite six East Coast Holiday Resorts, read below what distinguished residents say about them:—

SCARBOROUGH. By Councillor G. Whitfield, His Worship the Mayor.
"There are entertainments to suit every taste, and it is the Children's Paradise. Scarborough, as the 'Queen of Watering Places,' still 'reigns supreme.'"

YORK. By Coun. W. Wright, The Lord Mayor.
"York is unique. It is surrounded by mediæval walls with ancient Bars and Towers. Its Minster is the largest and most beautiful in the Kingdom. It is *the* centre for excursions to the Coast, Moors, Rivers, Abbeys and Castles of Yorkshire."

YARMOUTH. By Councillor A. W. Yallop, His Worship the Mayor.
"Yarmouth's health-giving breezes and invigorating air are unsurpassed. It provides all that is best in amusements, has the most up-to-date attractions, and its golden sands make it the ideal resort."

REDCAR. By Alderman W. Wardman, His Worship the Mayor.
"Redcar possesses the finest stretch of beach to be seen in the United Kingdom. These sands are unparalleled, and at low water there is a width of sand three-quarters of a mile."

WHITBY. By F. W. Horne, Esq., Proprietor of *The Whitby Gazette*.
"You can spend a fortnight at Whitby, have the beach, bathing, tennis, etc., in the morning, visit a different beauty spot every afternoon, and come back to music and entertainments in the evening."

FELIXSTOWE. By H. F. Douthwaite, Esq., Chairman of the District Council.
"Felixstowe is Peter Pan's own playground. For the tired—rest and recuperation; for the virile—games galore. Merry entertainers, bright music, clean air, sparkling seas and golden sunny days."

SKEGNESS. By Councillor F. Cooper, Hon. Sec. Skegness Advancement Assoc.
"The bracing air of Skegness acts as a tonic. There are miles of golden sands for the kiddies. If it is for life and health, will you not find it where innumerable others have done?"

NORFOLK BROADS. By H. Blake, Esq.
"A Norfolk Broads holiday is 'better than the seaside,' because it is 'the holiday that is different,' being free from the usual irksome routine. 'For health and rest, the Broads are best.'"

EDINBURGH. By Sir W. L. Sleigh, the Lord Provost of Edinburgh.
"Edinburgh is the most beautiful city in the world. Its picturesque charms appeal to all lovers of nature; its romance and history to all students. With its bright sunshine and bracing climate, it forms the ideal holiday resort."

NORTH BERWICK. By A. D. Wallace, Esq., Town Clerk.
"North Berwick is the world's golfing centre. It has 9 first-class golf courses within 6 miles; tennis courts; finest safety swimming pool in the country; safe, sandy beach; picturesque sea-board."

HARROGATE. By F. J. C. Broome, Esq., Publicity Manager to the Harrogate Corpn.
"Harrogate offers the money-and-time-saving proposition of a 'cure' and a holiday combined. 'The Mecca of the Ailing, the Playground of the Robust,' expresses Harrogate in a few words."

CROMER. By Commander Locker-Lampson, M.P.
"Cromer has the record for sunshine of any seaside resort in England, and its sands, its sea, and its surroundings are as charming as anywhere in the United Kingdom."

LOWESTOFT. By Councillor W. Smith, His Worship the Mayor.
"Lowestoft is the first town in the British Isles to greet the rising sun, and it is the most invigorating resort on the English coast. Its inhabitants welcome visitors."

BRIDLINGTON. By W. A. Storr, Esq., His Worship the Mayor.
"Bridlington is one of the most delightful and popular health resorts on the East Coast. With its glorious sands, aptly described as 'The Children's Paradise,' its facilities for sports, it offers unrivalled attractions."

WHITLEY BAY. By Arthur Barker, Esq., Clerk to the Whitley Urban District Council.
"Whitley Bay is well known as Northumbria's happy holiday centre-by-the-sea. For bracing air and facilities for every form of outdoor recreation and indoor amusement, it would be hard to beat."

CLACTON. By Councillor W. Fenton-Jones, J.P., Chairman of the District Council.
"Clacton-on-Sea faces South, and combines a tonic air with warmth and abundant sunshine. It is a garden city by the sea which provides every facility for a healthy and pleasant holiday."

CLEETHORPES. By W. J. Womersley, Esq., M.P., J.P.
"Cleethorpes provides bracing air with facilities for golf, tennis, bowls, boating, fishing, and it possesses Britain's largest bathing pool. The sands are safe for children."

SALTBURN. By Sam H. Rapp, Esq.
"Saltburn sands are the finest in Europe, firm and clean. The town is surrounded on three sides with beautiful glens and sylvan woods. Special facilities for the moors and neighbouring resorts."

ABERDEEN. By Councillor Doeg, Convener of Public Health and Advertising Committees.
"For a bracing holiday there is no place in the British Isles can surpass Aberdeen, 'The Silver City by the Sea,' with its fresh air from the North Sea and the Grampian Mountains."

DUNBAR. By J. B. Brook, Esq., Town Clerk.
"Dunbar is a main-line seaside resort with a most bracing climate, and ample facilities for holiday recreation and amusement. The affection visitors acquire for Dunbar brings them back year after year."

ALL ENTRIES MUST BE POSTED TO Cassell & Co., Ltd., "HOLIDAY BALLOT COMPETITION," La Belle Sauvage, London, E.C.4, NOT LATER THAN MAY 12th, 1926, and the result will be published in the JUNE 19 ISSUE of this paper.

No Entrance Fee—Free to All. Simply Fill Up This Coupon

COUPON

The following are, in my opinion, the SIX most popular Resorts on the East Coast.

1 ..... 4 .....

2 ..... 5 .....

3 ..... 6 .....

Name.....

Address.....

A.W.2. .....

SUMMER PROGRAMMES

WITH the arrival of Spring, broadcast programmes should change their character, attuning themselves to the changing habits of the listener. Gone are the long nights and the hot fire, and in the mind are thoughts of the open, of summer pastimes and pleasures. The amusement to be afforded by radio in summer-time is quite as abundant. The point to emphasise is that the origins of the transmissions must be different to those of the winter months.

Radio in the Garden

There is nothing so pleasant after a hard game of tennis as to hear some pleasing light orchestral music floating through the garden. It should not be heavy, but simply pleasing, so that the mind, lulled into happiness, can join in conversation yet appreciate the restful hour of evening. As a follow to any form of exercise—the river, a walk, or manual labour—the pleasing atmosphere engendered by a light musical programme is ever welcome.

It is an absolute necessity that the times of the various features be altered so that those items whose appeal is to the minority occur during the active hours. By this arrangement an unbroken period will be available for the majority, who, having completed their period of physical recreation, feel the need of musical stimulus to round off a pleasant summer's day.

From 9.30 to 12 wireless should serve up the lightest fare, a large proportion of which should be dance music—dance songs and light humour. All "heaviness" should be ruthlessly pruned, for there are but a few months of summer.

This period of the year should be the most active time for the B.B.C. engineers. They have a wide field to choose from. There is the seaside with outdoor amusements. Such breaths of ozone to the town dweller are rare gifts bringing memories of childhood. Then there are tattoos and bands, races and horse shows, historic pageants to be described.

In making use of outdoor material it is essential that a careful watch be kept on variety, thus avoiding an endless chain of the same type of fare. Park bands become monotonous if broadcast too often.

Cabarets

One of the outstanding features of post-war London night life is the growth of the cabaret entertainment. These productions are no longer in primitive form. Material is used which would grace the bill of any "super" revue. This type of entertainment provides a source from which the late transmissions of summer-time can radiate charming broadcasts. The promoters, as a general rule, are willing to rearrange the programme for the benefit of broadcasting, and listeners need have no fear of receiving indifferent music

The Spirits of the Woodlands

A fascinating thought for a summer broadcast can be conjured up in the mind of the town dweller when it is mentioned that the fairy woodlands of England can be connected by wireless to the heart of London. Having chosen a suitable spot, the Londoner would hear the evensong of the birds, the "cherup" of the moor-hen, the "cockle" of wild duck—the thousand and one mysterious calls of the lake woodlands.

It is a very fascinating thought this eavesdropping on Nature. In the past the song of the nightingale was broadcast, but in Surrey such happenings are but an obligate to the thousand and one mysterious "calls" of the inhabitants of the English woodlands.

ROBERT GLENDINING.

THE *DAILY GRAPHIC* BROADCAST CONCERT

ON Friday, April 30, a programme of exceptional interest will be simultaneously broadcast from all stations. This will be the *Daily Graphic* £500 mystery wireless concert organised in aid of the Infants Hospital, Westminster, and listeners will have an opportunity of winning £500 in cash prizes. The first prize (£200) will be awarded to the listener who succeeds in solving the greatest number of the mystery items and the others (£100, £50 and numerous consolation prizes) to those following in order of merit.

Some idea of the high standard of the concert may be gauged from the following provisional details. Sir Gerald du Maurier and Miss Gladys Cooper have consented to give an excerpt as their contribution to the programme, and Mr. Henry Ainley and a famous musical comedy actress will also broadcast. Selections are to be given by the famous Kneller Hall Band.

Mystery items will be groups of sound-effect cameos. Madame Miriam Licette and Mr. Tudor Davies will sing, and Max Darweski will give a "pot pourri" of musical items. A famous comedian will broadcast for listeners to guess his identity, and this will be followed by a transmission from a famous centre and listeners are invited to name its location. Another item will be a "mystery" by Father Knox. Also during the evening De Groot with the Piccadilly Orchestra will give selections, and there will be a real mystery play, with several questions which the public will be invited to answer.

CINEMA PICTURES BY WIRELESS

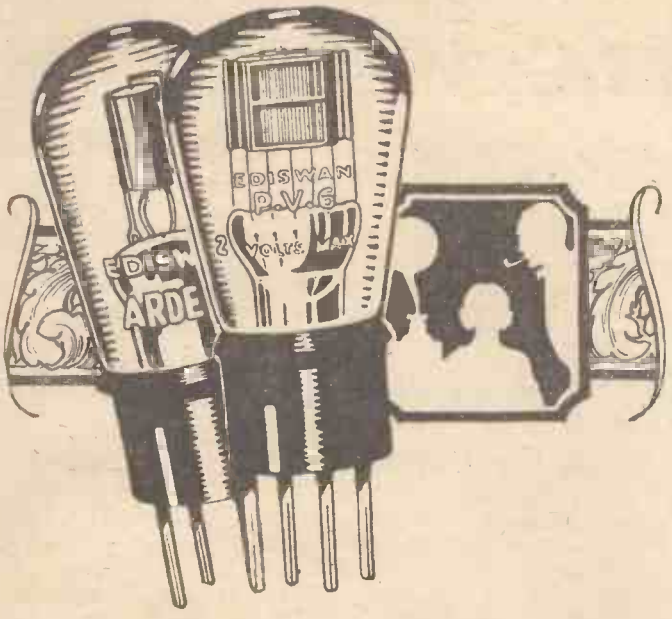
ONE of the easiest ways of visualising a method of sending cinematograph pictures by wireless is to imagine each of the separate pictures on a gramophone record, the whole record to be "run" in a sixteenth part of a second. This would mean that the part of the apparatus comparable with the needle would sweep over the entire surface of the record within that time. The "needle" would be a beam of light in the transmitting apparatus which actuated a photo-electric cell, and in the receiving apparatus it would be a beam of light controlled in intensity by the incoming electric currents.

This happens to be almost identical in idea with the new system for broadcasting pictures by wireless that is being worked out by Mr. Francis Jenkins. A beam of light is so controlled that it will "simultaneously scan" a number of sections of a picture area by separate pencils of light. Although patents were taken out for the method nearly four years ago, it is only now, with the added advantages of new photo-electric cells, that a practical issue can be looked for, but there is good reason to hope that such a practical solution of picture broadcasting will soon be found.

In all the different avenues along which picture-telegraphy and television are progressing one finds evidence of activity. Last week a new photo-electric cell, depending on cadmium as the sensitive element, was exhibited in London at the artificial sunlight display held at the Middlesex Hospital. This cell is being used for the quantitative measurement of ultra-violet radiation, and seems to have possibilities for wireless vision.

Edouard Belin, who is at the moment setting up apparatus for the transmission of photographs between Graz and Vienna, has announced that he will be ready within three months to transmit kinematograph pictures. No useful purpose, however, can be imagined from the transmission, wireless or otherwise, of motion pictures: It is television that we want, and wireless motion pictures are merely a stepping-stone to its attainment. It is satisfactory to see, nevertheless, that yet another newspaper has adopted the photo-telegraphic system for dealing with its "stop press" pictures.

T. THORNE BAKER.



Once the *first* Valve ever made: now, the *best* Valves ever made

EDISWAN VALVES

®

A SCIENTIFIC COMBINATION
achieving results unrivalled in clarity, purity and economy, is obtainable by the use of the Ediswan

P.V.6. (The Loud Speaker Valve) & A.R.D.E VALVES

For 2 Volt Battery

Tests in thousands of experiments have endowed this combination with a wonderful record.

Two More Ediswan Combinations
AR. & P.V.5 for 6 VOLT ACC.
AR.06 & P.V.8 for 3 VOLT BATT.
At all wireless Dealers.

Made in Britain's Most Efficient Valve Works by
THE EDISON SWAN ELECTRIC CO., LTD.,
123-125, Queen Victoria Street, London, E.C.4.

The Only Perfect Coil Holder

Make a Note!

POSITIVELY NO BACK-LASH

MAKE a note of the exclusive features which are found combined in the PENTON Type "A" Geared Coil Holder, *and in no other*—aids to better reception, easier tuning, smoother movement and finer adjustment:

1. **Adjustable Metal Bearing**, which absolutely banishes backlash and (by a simple half-turn of the screw) re-engages the gears if they become worn after long use.
2. **Metal-to-metal Gears**, reducing the speed of the moving block by 8 to 1, and so secure that the moving block cannot fall back.
3. **Special PENTON Locking Device** for securing the moving block rigidly in any position.
4. **Extra long anti-capacity Handle.**
5. **Special Plugs** provide perfect and instantaneous electrical contact.
6. **Four sturdy mounting screws** instead of the usual two.
7. A combination of all these features with a high degree of skilled workmanship, producing

THE ONLY PERFECT COIL HOLDER

PRICE 6/- ONLY

MAKE A CHANGE TO-DAY AND NOTE THE DIFFERENCE:

Replace your ordinary Coil Holder with a PENTON Type "A" Geared Coil Holder. The extra ease of tuning-in and the greatly improved reception will be more than worth while.

If not yet obtainable from your local Wireless Dealer, send us his name and address and ask for illustrated pamphlet, or send P.O. for 6/-, and we will send you a PENTON Geared Coil Holder by return, Post Free.

The Penton TYPE "A" GEARED COIL HOLDER

GEAR RATIO 8-1

Patent No. 193150. Other patents pending.

THE PENTON ENGINEERING CO.
15, Cromer Street, Gray's Inn Road, London, W.C.1.
Phone: Museum 4681.

NEXT WEEK AT 2LO

By THE LISTENER

A SPECIAL Tchaikowsky anniversary programme will be given at 2LO on Sunday. The scheme includes some of the lesser-known compositions, such as the Cossack Dance from *Mazeppa*, as well as the more familiar works, such as the "1812 Overture."

Sunday, this also being Anzac Day, it is hoped that in commemoration of this fact General Sir Ian Hamilton, G.C.B., G.C.M.G., will give a description of the landing at Gallipoli in 1915. The short evening programme is supplied by Albert Sandler from the Grand Hotel, Eastbourne.

Listeners should note that an alteration comes into force on Monday, when the second news bulletin will be broadcast at 9.30 instead of 10 o'clock. The evening programme at 8 o'clock comprises songs by Scott Gatty, and others sung by Olive Kavann and the Wireless Chorus. At 8.30 begins a new series of chamber concerts, given at the Chenil Galleries, Chelsea. The scheme includes Bach's Brandenburg Concerto and excerpts from *Hugh the Drover*.

Tuesday is a popular orchestral night, when Dan Godfrey conducts the Wireless Orchestra, with two famous singers, Edith Furmedge and Frank Titterton, as vocalists.

At 9 o'clock a speech by the Rt. Hon. David Lloyd George will be relayed from the Holborn Restaurant. Later, at the studio, a short variety programme, which includes songs by the well-known singer Cyril Lidington, the Amboyna Banjo Quartet, and excerpts from episodes known as "That Child," will be given.

On Wednesday a very well-known singer makes her first appearance before the microphone in the person of Evangeline Florence, who made her name as a coloratura singer. It may be of interest to note that Sir George Henschel wrote his song "Spring," now so popular, especially for Miss Florence. Later will follow a light programme by the J. H. Squire Celeste Octet, and Ronald Gourley.

J. H. Squire.

Edith Furmedge.

Cyril Lidington.

Oscar Wilde's play *Lady Windermere's Fan* is to be broadcast on Thursday.

On Friday a very special programme, arranged by the *Daily Graphic*, is to be given. Details of this are on another page.

On Saturday a one-act musical farce entitled *May Day* is to be broadcast.

"Is there an All-purpose Receiver?"

SIR,—An article recently appeared in "A.W." entitled "Is There an All-purpose Receiver"? Probably there is no receiver which will do everything required, but there is a receiver which will receive from 20 metres to 1,600 or higher, and that is the Reinartz, using plug-in coils. Tuning is simplicity itself. In my own case I have a three-valve set coupled to a 60-ft. indoor aerial, wound pancake fashion, in the attic. The aerial has a switch to cut 50 ft. out when on short-wave work, so that leaves 10 ft. and the lead down of 30 ft. On this and using two valves (the second L.F. valve is seldom used), I get morse from 20 metres upwards and America on 62 metres, amateur telephony included. On a good night on the B.B.C. band, for example, Oslo, Copenhagen, Hamburg and Madrid come in at remarkable phone strength. On Daventry the set is not quite as efficient, since it is necessary to use a wave-trap to cut Sheffield (one mile away) out, as the aperiodic aerial coil is approximately tuned to Sheffield's wavelength. The latter station can, however, be cut out by reducing the tapping turns, but with some loss in strength of Daventry.

Is any other circuit so adaptable over the whole range of wavelengths with such simplicity in tuning as the Reinartz?—J. C. S. (Sheffield).

The "Concert Six"

SIR,—Some interesting points arise in connection with the "Concert Six" receiver described by MR. J. HARTLEY REYNOLDS.

As regards the H.F. end, direct coupling of the A.T.I. is used, without deliberate reaction, followed by two H.F. stages coupled by the tuned-anode method. It is noticeable that *double* stabilising is employed by a potentiometer for applying positive bias to the grids of the valves, and also by variable resistances across the coupling inductances. It is well known that both these methods reduce amplification and lower selectivity, and it is hoped that in the forthcoming concluding article a detailed account of results will be given as regards range and selectivity, because the writer would like to be convinced that two stages of H.F. used on short or moderate wavelengths without "neutrodyning" can give any better results than one stage on account of the practical impossibility of obtaining stability without introducing "losser" methods.

Much of what appears to be amplification obtained from an H.F. stage usually turns out, on careful investigation, to be merely the results of regeneration or "accidental reaction" caused by stray capacities and couplings. In the "Concert Six," as in other two-H.F. receivers, enough "accidental reaction" is evidently present to cause self-oscillation when the circuits are tuned. This is proved by the presence of the potentiometer and stabilising resistances, which otherwise would have no function whatever to perform, and would not be included. The question which then arises, and to which I have never been able to get a satisfactory answer, is: Why use two stages, which need so much damping that it is very doubtful whether any genuine amplification at all is obtained from them, rather than a single stage (which can be rendered perfectly stable without any deliberate damping whatever) and add, if necessary, a little controlled reaction to obtain the range and volume required? To say that it is undesirable to introduce reaction into a set such as the "Concert Six" would be absurd, because it is already there *to excess*. Better, surely, to have less of it under control.

It seems to me that MR. HARTLEY REYNOLD'S remark that when it is necessary to press the H.F. valves a marked falling-off in quality occurs is highly significant. In all probability this, expressed in other words, means that when damping is reduced the excessive "accidental reaction" present, at once brings the set near to oscillation point, a condition in which rather severe distortion always occurs, as is well known. Practical support of this view is provided by my own receiver, which has one H.F. stage and is perfectly stable on any wavelength, although no deliberate damping of any kind is used. On the contrary, it has been rendered as "low loss" as possible in every detail. There is no doubt as to the real genuine amplification it gives, and I am always striving for more, yet no distortion is caused by it even when "pressed" to the utmost, and the addition of a fair amount of deliberate reaction is needed to start self-oscillation.

As regards the L.F. end of the "Concert Six," it is stated that the object is to obtain considerable loud-speaker volume together with high quality. It certainly seems that the set should do both of these things, and it is interesting to examine the circuit in some detail, because it affords an object lesson to those who endeavour to obtain big volume by means of 5-1 ratio transformers used with valves having fairly large "m" factors.

Assuming that, as recommended, power-amplifier valves, such as the DE5 or B.T.H. B4, are used in all the L.F. stages, the voltage amplification in the first stage will be $2.7 \times 6 = 16.2$ maximum, practically, rather less. In each of the two subsequent stages the actual voltage amplification obtained will hardly be more than 75 per cent. of the "m" factor of the valves, say 4.0 approximately. For the three stages together the total voltage amplification will be $16.2 \times 4 \times 4 = 259$ approximately. This may sound very low, but from experience I can say that *when*

(*Concluded on page 644*)

Louden Valves

"for both volume and clarity"

Messrs. Fellows Magneto Co. 9/2/26.
19, Cardiff St.,
Treorchy, Glam.

Dear Sirs,

I beg to acknowledge herewith receipt of Parcel which came safely to hand on Friday last, and to state that the Louden Valves are giving every satisfaction.

They are all that you claim them to be and much more.

I have been using valves of various makes for three years, and thought I was getting best possible results, but I find that for both volume and clarity none, so far, is equal to your Loudens, and needless to say no other make will, in future, adorn my set.

All my "wireless friends" think them wonderful.

You are at liberty to make whatever use you like of this letter, as I feel that the public ought to know the full value of good reception combined with economy.

Yours faithfully,
Edward Rundle.

The sale of Louden Valves is still going up by leaps and bounds. From all hands we get glowing tributes such as the above from delighted users who now number scores of thousands. You will see from the list below that there is now a Louden Valve for every receiving purpose. Send for your Louden Valves by post to-day and get "both volume and clarity."

Send for free 44-page Illustrated Catalogue No. 11

Type	Filament Volts.	Filament Amps.	Anode Volts.	Purpose.	Price
DULL EMITTERS					
F.E.R.1	6	0·1	40 to 80	Detection & L.F. Amplification	9/-
F.E.R.2	6	0·1	40 to 80	H.F. Amplification	9/-
F.E.R.1	4	0·1	40 to 80	Detection & L.F. Amplification	8/-
F.E.R.2	4	0·1	40 to 80	H.F. Amplification	8/-
L.E.R.1	**2**	**0·2**	**40 to 80**	**Detection & L.F. Amplification**	**8/-**
L.E.R.2	**2**	**0·2**	**40 to 80**	**H.F. Amplification**	**8/-**
DULL EMITTER POWER VALVES					
P.E.R.1	**6**	**0·2**	**60 to 200**	**For Transformer Coupled Amplifiers**	**12/-**
P.E.R.2	**6**	**0·2**	**60 to 200**	**For Resistance Coupled Amplifiers**	**12/-**
P.E.R.1	**4**	**0·2**	**60 to 200**	**For Transformer Coupled Amplifiers**	**11/-**
P.E.R.2	**4**	**0·2**	**60 to 200**	**For Resistance Coupled Amplifiers**	**11/-**
BRIGHT EMITTERS					
F.1	5 to 5·5	0·4	40 to 80	Detection & L.F. Amplification	4/6
F.2	5 to 5·5	0·4	40 to 80	H.F. Amplification	4/6

Postage: 1 Valve 4d., 2 or 3 Valves 6d., 4, 5, or 6 Valves, 9d.

The Fellows Magneto Co., Ltd.,
Cumberland Avenue, Park Royal, Willesden, N.W.10

Branches:

LONDON.
20, Store Street,
Tottenham Court Road.
(Museum 9200.)

CARDIFF.
Dominions Arcade,
Queen Street.
(Cardiff 7685.)

NOTTINGHAM.
30, Bridlesmith Gate.
(Nottingham 5551.)

E.P.S. 83

"Just listen to the difference this LEWCOS Coil *makes!"*

CLEAR as a bell the typical French Orchestra came through as the listener tuned in with his LEWCOS Coil. Coil after coil had been tried and discarded in an endeavour to realise that rare selectivity and fine tuning so essential to complete radio enjoyment.

Test this new coil yourself. Each LEWCOS Coil is tested in our laboratory. It is then boxed and sealed up, and reaches you in perfect condition. Be sure the LEW seal is unbroken.

Ask your radio dealer for a demonstration.

LEWCOS
Inductance Coil

3 LEWCOS advantages

1. High electrical efficiency with great mechanical strength.
2. Great selectivity resulting in extremely fine tuning.
3. Exceptionally low high frequency resistance with increased signal strength.

The LONDON ELECTRIC WIRE CO. & SMITHS LTD.

Manufacturers of Glazite.

Playhouse Yard, Golden Lane, London, E.C.1.

JUDD

CORRESPONDENCE (*continued from page 642*)

actually obtained it is, if anything, more than ample. Indeed, I would go farther and suggest that it would almost certainly lead to improved reproduction, without any serious loss of volume, if a valve such as the DE5A, having an "m" factor of only 3.5, but capable of handling a much larger input than any of the ordinary small power amplifiers, were used in the last stage.

To maintain high quality, choke-capacity coupling is used in the last two stages of the "Concert Six" to avoid the very serious H.T. difficulty that would be entailed were the slightly superior resistance-capacity method adopted. There is, however, a point involved on which I dare to disagree with MR. HARTLEY REYNOLDS and other writers. Where, as in the "Concert Six," one of two main considerations underlying the whole idea of the receiver is the attainment of extremely high quality, it is a case of deliberately "putting the cart before the horse" to start off with transformer coupling in the first L.F. stage, which is by far the most important, and follow this with resistance- or choke-capacity coupling. Any loss of quality in the first stage can never be recovered, and any slight imperfections arising here are magnified in subsequent stages. Admittedly a 2.7-1 Ideal transformer will give very good quality indeed, but not so nearly perfect as a resistance coupling. If resistance coupling were used in the first L.F. stage instead of a transformer, no extra H.T. voltage would be required beyond the 120 volts or so which would in any case be necessary with a receiving set such as the one under discussion, because the coupling resistance would be in the anode circuit of the detector valve, and even if a DE5B valve were used as a detector with a 100,000-ohm resistance, an actual anode voltage of about 27 would be obtained. Such a valve, with its high "m" factor, would be useful for very weak signals, but for ordinary use one of the general-purpose type with medium "m" factor and impedance would probably be preferable on the score of quality.

Suppose a small power amplifier, with a low impedance, were used in the first L.F. stage, this could very well be coupled to the second L.F. valve by means of the Ideal 2.7-1 transformer, which, working in this situation and under these conditions, would give results which could hardly be surpassed by any form of coupling. The coupling to the last valve could then be by means of a choke, as in the "Concert Six," the reason being that resistance-coupling is ruled out as unnecessary and also prohibited on account of the H.T. difficulty. Transformer coupling is inadmissible, partly because it would tend to lower quality a little, but mainly because the use of a transformer with even a small step-up ratio would certainly result in severe overloading of the last valve, unless something of the LS5 type were employed with a very high anode voltage, in which case any single ordinary loud-speaker would be overloaded and the volume in an ordinary room would be deafening.

The suggested arrangement gives just the same overall amplification as in the "Concert Six" and also avoids the use of more than one transformer, merely substituting resistance coupling for a stage of choke coupling.

It may sound extraordinary to suggest using three types of coupling in one amplifier, and at first sight this is apt to arouse prejudice, but there is a definite reason for the type of coupling adopted in each stage. Provided that suitable valves, correctly adjusted, are used, it is hard to find any logical reason why it should necessarily prove more difficult to operate successfully than any other three-stage L.F. amplifier, though it may be remarked that this is not likely to prove an easy problem whatever circuit is used.
—J. H. S. F. (Llandudno Junction).

CHIEF EVENTS OF THE WEEK

SUNDAY, APRIL 25

London	3.30	Tchaikovsky Programme.
Aberdeen	9.15	Orchestral Concert.
Birmingham	3.30	American Programme.
Bournemouth	3.30	Light Symphony Programme.
Glasgow	3.30	Tchaikovsky Programme.
Newcastle	3.30	A Light Orchestral Programme.

MONDAY

London	8.30	The B.B.C. Spring Series of Chamber Concerts.
Aberdeen	8.30	*Remnant Acre.*
Aberdeen	10.0	Chamber Music.
Belfast	8.0	The "Bubbles" Concert Party.
Newcastle	10.0	The Funbeams Concert Party.

TUESDAY

London	9.20	Variety.
Daventry	8.0	Request Programme by "The Roosters."
Aberdeen	8.0	Italian Scenes.
Birmingham	8.0	Request Night.
Bournemouth	10.0	Valses, old and new.
Belfast	4.15	Music for Shakespeare's Plays.
Cardiff	8.0	Song and Pianoforte Music.
Glasgow	10.0	Popular Song Recital.

WEDNESDAY

London	9.30	Speeches at the Pilgrims' Dinner to the Earl of Reading.
Aberdeen	8.0	The Fraserburgh Academy Choir.
Birmingham	10.30	Chamber Music.
Bournemouth	8.0	Grand Concert relayed from the New Central Hall, Southampton.
Cardiff	7.30	*Billetted.*
Dundee	8.0	The Dundee Select Choir.
Glasgow	8.0	A Popular Evening.
Manchester	8.0	Violin Recital by Don Hyden.
Newcastle	8.30	"The Grandfather Clock."
Nottingham	8.0	A Notts and Derby Night.
Plymouth	8.0	"Melody and Song."
Stoke	8.0	A Russian and Old English Concert.

THURSDAY

London	8.0	The Band of H.M. Grenadier Guards.
Aberdeen	8.0	Nautical Programme.
Belfast	8.0	International Folk Song.
Glasgow	8.0	Orchestral Concert.
Manchester	8.0	Helen Henschel in Songs to her own Accompaniment.

FRIDAY

London	7.0	*Daily Graphic* Concert.

SATURDAY

London	8.0	*May Day*, a Musical Farce in One Act.
Aberdeen	8.0	Scottish Programme.
Birmingham	8.0	*Listening Time.*
Bournemouth	8.0	May Day Merriment.
Belfast	8.0	"Polyglot" a Competition.
Cardiff	7.25	Light Orchestral Programme.
Edinburgh	8.0	Celebration of the Second Birthday of 2 E H.
Glasgow	8.0	*Listening Time.*
Manchester	8.0	May Day Merriment.'

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 387 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 407 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 304 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily (exc. Sun.), 7.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 535 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 397 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 264 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 374 m. (5 kw.). Con., 20.00-23.00 daily. Also tests on 800 m.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service; 17.30-21.30, same as Copenhagen; 20.00 (Wed., Thurs.), lec., con., news, orch.

Sorö,* 1,150 m. (1½ kw.). Also occasionally relays 5XX. Also broadcasts at times on 1,500 m.

* Relay Copenhagen

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.)

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 260 m. (500 w.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpellier, 238 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.00, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (nightly). Relayed on 1,300 m. by Koenigswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news; 21.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (233 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 06.55, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

(*Concluded on page 648*)

"BROADCAST TELEPHONY" (*cont. from page 646*

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 412 m. (2½ kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Will shortly test on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 550 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (2½ kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-01.00, con., jazz band. Testing on 425 to 430 m.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Bergen, 358 m. (1½ kw.). Testing.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 13.30 and 18.55, news and con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (1 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-20.00 news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 18.00, news, weather, con. Close down 21.00 or 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. 19.00-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 400 m. (1 kw.). 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle, about 400 m. Testing.

WIRELESS IN SWEDEN

AT the beginning of this year Swedish broadcasting, as it was organised by the Radiotjänst A/B, celebrated its first anniversary. There are few countries where broadcasting in the course of such a short time has had as great a success as has been the case in Sweden. When the concession in the beginning of 1925 was given to the Radiotjänst A/B—a private concern very much like the British Broadcasting Co.—the estimated number of Swedish listeners was about 1,000, whereas by January 1, 1926, more than 125,000 amateurs were registered.

At present there are five main stations and ten relay stations, and a few more are under construction; furthermore, it has been decided to erect a high-power station in the middle of the country (probably near Orebro) at a total cost of about £75,000.

Each listener pays 10 kroner (about 10s.) for his licence.

From a technical point of point the stations are of a high standard. The Malmo station, which has been built by the Western Electric Co., is generally considered as being the best Swedish station. In spite of Malmo only having a population of about 100,000, more than 23,000 amateurs are registered; besides these, several thousands of Danish amateurs in Copenhagen are listening in to Malmo every evening, as the station easily may be heard in Copenhagen on crystal sets.

Most of the programmes are sent out either from Stockholm, Malmo or Gothenburg, and relayed to all the other stations by land line. During this season retransmissions from foreign stations have taken place regularly every fortnight, the stations most used being Daventry and Königswusterhausen.

With regard to the composition of the programmes, it is noticeable that more than one-quarter of the transmissions consist of programmes of an educational nature. A very popular item is the weekly English lessons given from the Malmo station and relayed to all other Swedish stations. Retransmissions from theatres, concert halls and other places of entertainment also are very popular.

EDAN.

"Painting the Front of the House" is the title of a seasonable article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in the same number are: "The Reflecting Telescope and How to Use It," "A Few Uses for Dowelling," "A Portable Wardrobe and How to Make It," "Moths and Upholstered Furniture," "The Season's Overhaul of the Small Car," "Simple Spring Terminal," "Simple Tests for Finding Correct Connection for Headphones," "Practical Hints on Caravaning," "Some Hand-made Silver Spoons," "Overhauling the Lawn-mower," "Choosing a Photographic Printing-paper," "Choosing a Carburettor for Motor-cycle."

Igranic Tone Control.—Attention is called to an error in the Igranic advertisement on page 546 of No. 201. Above the illustration appears the wording "Igranic High-resistance Potentiometer (30,000 ohms), Patent No. 228,432." This should read "Igranic Tone Control and Damping Resistance (Patent No. 228,432)."

TRADE NOTES

THE GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, has issued a booklet describing the DE2 H.F. and L.F. valves. Much valuable data is given, together with a number of circuits in which these valves may be used.

Constructors will be interested to know that Yesly components can now be obtained from Yesly Electrical Supplies, Ltd., of Iliffe Yard, Crampton Street, S.E.17.

G6QB (Mr. L. H. Thomas, of West Norwood) has been in communication with U2CVJ (Hartsdale, N.Y.) with an input power of only 10 watts. The valve in use was an Osram LS5.

Leaflets describing the Philips-Mullard PM4 dull-emitter and the Philips A.C. rectifier for accumulator charging have been received from Philips Lamps, Ltd., of Philips House, 145, Charing Cross Road, W.C.2. The battery chargers are full-wave rectifiers operating on the thermionic principle and are capable of charging accumulators from A.C. mains irrespective of voltage or periodicity.

A pamphlet describing the Ever Ready Super One H.T. battery has been issued by the Ever Ready Co., Ltd., of Hercules Place, Holloway, N.7. This new type of battery has been introduced to provide the H.T. supply for super-heterodyne and other multi-valve receivers.

An artistic showcard illustrating Claritone loud-speakers has been produced by the Automatic Telephone Manufacturing Co., Ltd., of Milton Road, Edge Lane, Liverpool. A catalogue giving full particulars of these loud-speakers has also been issued.

Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS AGENCY LIMITED, Saturday, April 24, 1926.