A PUSH-PULL FOUR-VALVER

Amateur Wireless And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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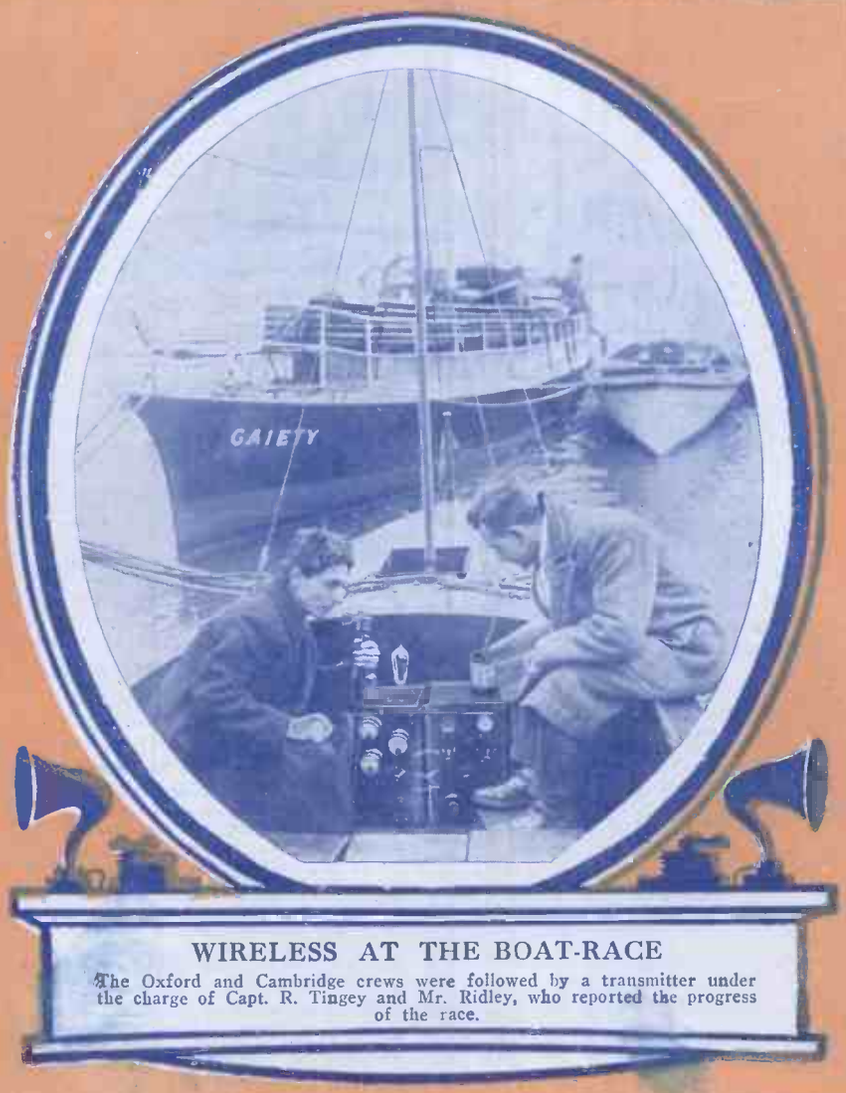


WIRELESS AT THE BOAT-RACE

The Oxford and Cambridge crews were followed by a transmitter under the charge of Capt. R. Tingey and Mr. Ridley, who reported the progress of the race.

Amateur Wireless and Electrics

Vol. VI. No. 149 April 11, 1925

WHY NOT DESIGN YOUR OWN SET?

MANY constructors may feel they are sufficiently advanced or otherwise sufficiently interested to consider the designing of their own crystal receiver. The more the amateur experiments and puts his own ideas into practice, the more we are likely to obtain rapid advancement in crystal research work.

There are many who are of the opinion that all that can be done has been done as regards crystals, and I have even heard similar remarks applied to valves. This is, in the opinion of the writer, incorrect, and, moreover, it may be said that earnest research work has hardly been begun. Although no one has as yet succeeded in making the crystal itself act as an amplifier with any great success, the writer still believes that this is possible. Nobody has yet known how the crystal works, and until this mystery is solved progress will be slow. Every amateur is capable of formulating a theory which may cast a light upon a hidden subject.

Points of Design

The first point to consider in the design of an actual receiver is naturally the tuning inductance. As is known, one cannot expect a crystal receiver to receive signals from a considerable distance, excepting in the case of such high-power stations as Chelmsford, nor yet on a high range of wavelengths, if one coil is used.

Tuning Inductance

Whatever type of tuning inductance is chosen, these points should be observed: Capacity should be kept as low as possible; thick wire of, say, No. 16 or No. 18 gauge is preferable to thin wire, therefore a fair amount of space should be available; capacity effects should be reduced by the use of an air-spaced coil—that is to say, none of the turns of wire should touch each other; they should be wound upon a former which gives as little contact with the wire as possible. The ideal coil in fact is one wound "in air," and this may be done, although considerable space is occupied by winding the wire closely upon the cardboard former of any diameter, and then sliding the winding from the former, which in the case of stiff wire results in a spiral spring. The further the turns of wire from each other, the lower the capacity, but, of course, moderation must be employed on account of space.

Tuning

Points to be observed in the tuning of a receiver are as follows: Once again to keep the capacity low it is better to dispense if possible with variable condensers. In doing this the coil must be so made as to give fine tuning in one turn of wire. This may be done by means of a slider passing along the coil, but a more satisfactory method is by means of taking tappings in tens and units.

Several other ingenious devices are, of course, available, not forgetting the variometer. The drawback of the variometer is its short wavelength range, especially where stout wire is employed. An inductance designed to receive signals from the local broadcasting station should not require more than 100 turns of wire. No object is gained by making an inductance with a very large number of turns of wire, as tuning immediately becomes complicated and such a length is not necessary. Where, however, longer wavelength ranges are desired, a plug-in loading coil should be embodied in the circuit. Keeping low-capacity effects still in view, the type of coil chosen should be considered. Very few coils are more efficient than basket coils extra air spaced. In designing a receiver with the object of obtaining a certain wavelength range, the natural wavelength of the aerial used should be considered. This natural wavelength should be at least two-thirds or three-quarters of the range of wavelengths to be received upon the set.

Natural Wavelengths

To ascertain the natural wavelength of an aerial, the electrical lengths (in metres) of the aerial plus the down lead, plus the earth lead should be multiplied by four. This applies to the usual L-type aerial.

Detectors

Points to be considered regarding the detector are as follows: For constant reception a perikon detector should be used employing zincite and bornite crystals, or a carborundum detector is quite good, but this necessitates the use of small batteries and a potentiometer. If catwhisker detectors are used they should be of good design. From an experimental point of view it is quite a good idea to embody a plug upon the receiver to receive the detector.

Variable Condensers

Where variable condensers are embodied in the receiver to assist in tuning, the following points should be remembered. A condenser in series with the aerial should not have too small a value, .001 being suitable, and where the condenser is used in parallel the value should not be too great. If the coil is tapped in fives or tens, .0003 will be large enough, or .0005 will tune most plug-in basket coils.

Wiring

Points of efficiency are often overlooked in such details as wiring. This should be as simple as possible. Stout wire again should be used and all connections should be firm. The writer has found from practice that it is advisable to travel backwards and forwards as little as possible in linking up; a series of connections running straight round from aerial to earth are highly satisfactory. Those who design a receiver will find plenty of scope for their own ideas.

RADIO.

GETTING THE BEST FROM THE AMPLIFIER

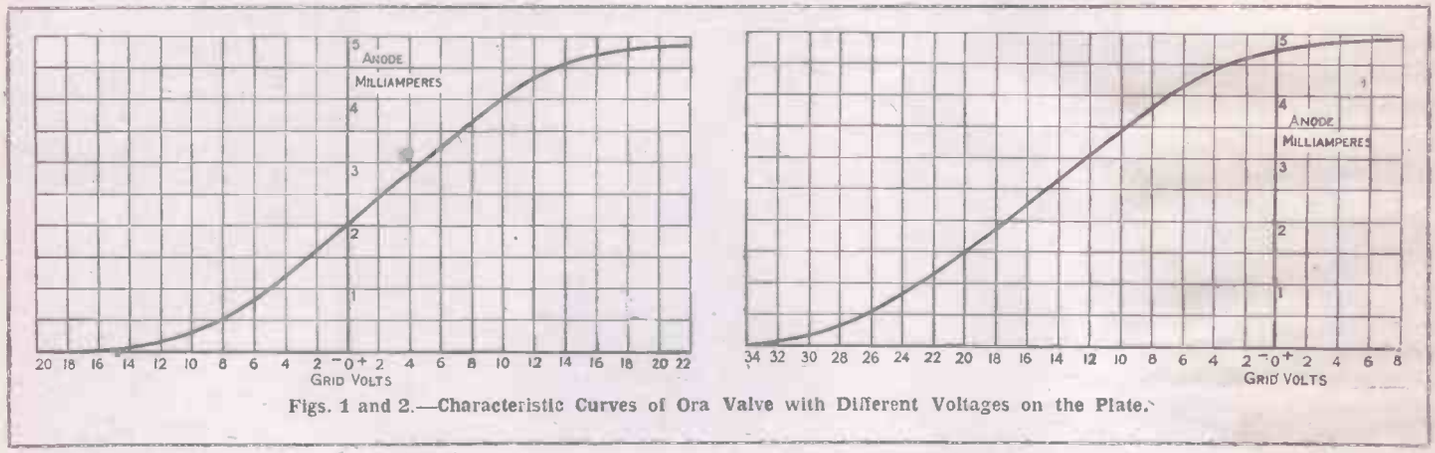
SOME ADVICE ON ELIMINATING DISTORTION

SINCE L.F. amplification has been greatly to the fore for outdoor and other loud-speaker work, a great deal has been said on the subject of distortion, and many loud-speakers have been blamed quite unjustifiably. The best method of eliminating this distortion has always been stated to be the application of a negative potential to the grids of the amplifiers to eliminate grid current, when using a high H.T. voltage on an ordinary R, Ora or AR valve. Many, however, have tried this with most disappointing results. Also great difficulty is experienced in getting sufficient current free from distortion to operate a large loud-speaker. We have all seen the very nice explanation of how on, say, 80-100 volts we are too near the upper bend of the characteristic and have to add negative potential on the grid and so on; but take the complete characteristic of an Ora R-type valve on 70-80 volts. We are not near the upper bend, but we are nearer the lower than the upper! On such a valve it takes 100-160 volts to get in the exact centre of the curve on zero-grid volts. By adding grid bias on 80 volts we eliminate one source of distortion and introduce another, because we try to make the valve amplify at the lower bend when we get any load. The reason why success is sometimes obtained is obvious, as is also the difficulty of getting large currents.

Valves

Ordinary valves are quite suitable for any ordinary loud-speaker smaller than the largest Magnavox, given suitable H.T. and grid bias. Try using, say, 250 volts on an Ora for loud-speaker work. On zero-grid volts and normal filament voltage the valve is saturated, or nearly so, but on putting on a grid bias of 15 volts or so, loud signals such as are obtained from power valves, are given. This is because we are using the whole of the straight part of the characteristic curve and are getting far more out of the valve without distortion than when using lower H.T. and bias on grid.

When a battery of loud-speakers is to be worked there may not be enough output from a note magnifier used in this manner, but if we use a small transmitting valve a very high voltage indeed will be necessary; in fact 1,500 volts would not be too much on most 30-watt valves. This is, of course, out of the question in most cases. The best thing to do is to use two valves of identical make in parallel or to underrun the filament of a larger valve, and use as high an H.T. voltage as possible.



Figs. 1 and 2.—Characteristic Curves of Ora Valve with Different Voltages on the Plate.

The Correct Characteristic

If we reduce the total emission from the filament we get a more reasonable curve to work with. In larger valves the curve is shifted more than would be expected on altering the filament current to low values. It is usually better to put two or three valves in parallel, although care must be taken in selecting them. Separate vernier rheostats should be used for each valve in order to help to correct slight differences. If possible the characteristics should be drawn for several valves and the best pairs selected. It is also possible to get a larger volume of undistorted current by using an excessive filament voltage on, say, a French R valve. Under some circumstances this is the best method. We gain in number of valves and lose in life as regards expense, so that this comes to about the same in the long run. About 4.75 to 5 volts should be used and up to 500 volts H.T. with some valves, though 300 may be all right for others.

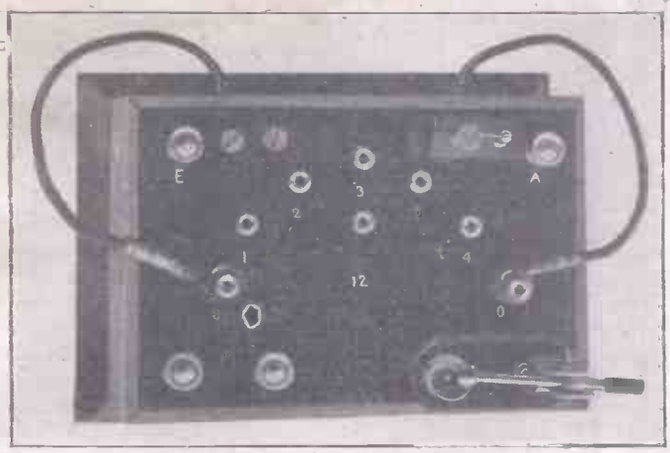
Another Novel Crystal Set.

H.F. Amplifiers

In any case the best thing to do, if possible, is to take the characteristic under working conditions, and from the information gained adjust things to as near the ideal as possible. The distortion in H.F. amplifiers is as much due to the valve as to the transformer and often more so. The transformers should always have high primary impedance, and have, say, not less than 10,000 turns on the primary. Many transformers have far less than this. The correct combination of a good transformer and a valve worked on the correct part of the characteristic will give an amplifier as good in quality as can be desired. It will be as good as a resistance-coupled amplifier and far more efficient.

The diagrams Figs. 1 and 2 show the curves of an Ora valve with 4 volts on the filament and different voltages on the plate. These will demonstrate what has been explained. 2.S H.

A FIXED-WAVELENGTH CRYSTAL SET



The Complete Receiver.

AFTER experimenting for a considerable period in the search for a crystal set just a "little better" for broadcast reception from the nearest station, the writer has come to the conclusion that, though most stereotyped arrangements work well enough, certain objections to them exist, which may be summarised thus:

(*a*) Long slider coils: dead-end losses owing to the unused windings; shorting between turns; the difficulty of selecting one particular turn with the slider.

(*b*) Variometer: heavy damping when windings are in opposition.

(*c*) Tapped coil with switch arms and studs; tarnishing of studs; imperfect connection between arm and stud and between arms and leads.

(*d*) Plug-in coil and condenser: losses owing to drop in potential introduced by a condenser across the coil, and often to poor insulating material used in cheap condensers.

Fixed-Tuner

With these points in mind, the writer has endeavoured to design a crystal set that will be cheap, simple and of the highest efficiency owing to minimum loss of the energy received from the aerial. He came to the conclusion that the ideal would be to tune the simplest crystal circuit with a coil of minimum self-capacity, wound exactly to the wavelength of the nearest broadcasting station when used with his own aerial. By thus avoiding all tuning devices the maximum energy received would be available.

A compromise was made in order to guard against small fluctuations of aerial capacity and the wavelength of the station, and to compensate for any small error in winding the coil, by allowing for fine tuning within the limits of 15 turns of wire, of which any number between 1 and 15 might be selected. The result of the experiments is a small crystal set, of minimum cost, capable of fine tuning, and giving the loudest signals of any of the various sets made by the writer.

Components

The materials used are as follows: Ebonite, 6 in. by 4 in. by $\frac{1}{16}$ in.; four terminals; one cardboard tube 2 in. by 6 in.; about $\frac{1}{2}$ lb. of No. 18 d.c.c. copper wire; eight Clix terminals and two plugs (or valve legs and sockets); 18 in. of stout flex; wood for a box. The total cost is about six shillings.

The construction presents no difficulty, and details will be clearly understood from the photographs and drawings. First remove any conducting surface from the ebonite with emery-paper and oil, then drill and tap it and fix the terminals and the eight sockets (see Fig. 1), numbering the latter 0, 4, 8, 12, 3, 2, 1, 0. Wire the under side with tinned copper wire (soldering all joints) as shown by Fig. 2. Any good detector may be fixed to the panel, the writer's being home-made with an oval of ebonite in which are fixed a cup and arm connected to two valve legs which plug into two sockets on the panel. When finished, place the panel on the box or other support, and proceed to wind the d.c.c. wire on to the cardboard tube, after the latter has been well dried and shellacked.

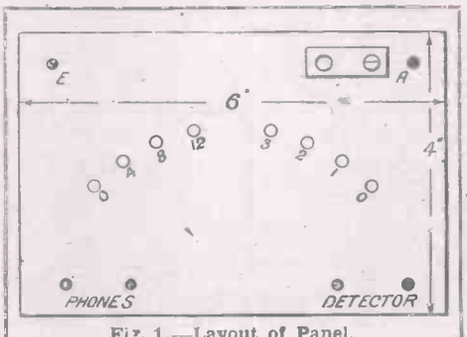


Fig. 1.—Layout of Panel.

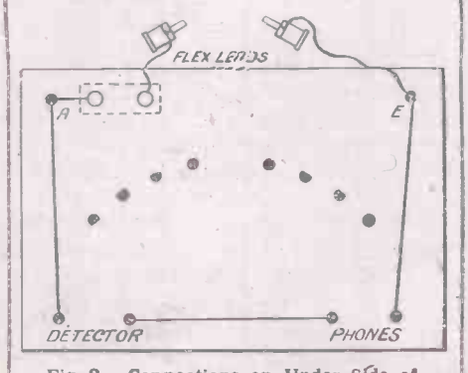


Fig. 2.—Connections on Under Side of Panel.

The number of turns depends entirely on the aerial in use, but with the average aerial it should be about 70 (see Fig. 3). Secure the end of the wire as usual through two small holes, about $\frac{1}{4}$ in. from the end of coil. Wind on four turns, leave a 1-in. loop tightly twisted for tapping, wind on four more turns and repeat. Continue until there are 12 turns, tapped at the 4th, 8th and 12th turns respectively. Now wind on about 60 more turns untapped, and fix temporarily with tape without cutting the wire from the bobbin. The coil is now ready for testing to discover the exact turn that gives the loudest signals from the broadcasting station. The simplest way is to connect the starting end of the coil to the aerial terminal, fix the aerial and earth leads to their respective terminals, and also to the earth terminal fix a length of wire to which is soldered a safety pin. Adjust the crystal detector, don the phones, and then gently insert the pin point into the cotton covering of one of the turns until it touches the copper beneath. Try different turns until that which gives the loudest signal has been determined. If the last turn is best, wind on a few more turns, testing them with the pin until it is certain that the coil is long enough fully to tune in the signals. If done carefully the pin pricks will not harm the coil in the least.

Completing the Tuner

Now suppose that 65 turns is the final number decided on, then make the coil one of 72 turns, which will allow it to be tapped up to 7 more and 8 less than this number, thus covering fully any small errors and differences, and still leaving a coil approximately wound to the aerial for the broadcasting station wavelength. Loop each of the last three turns for tappings, and secure the end of the wire as at the beginning. Cut off any unused portion of the tube, and neither wax nor shellac the windings, as either introduces unwanted capacity. The result now is a coil tapped at 0, 4, 8, 12 turns from one end and 0, 1, 2, 3 from the other.

Connections

Now scrape away the cotton covering just at the end of each loop, and solder a short length of the same wire to each. Connect the extreme ends of the coil under the panel to the Clix plugs marked 0, 0,

(*Concluded at bottom of next page*)

DUAL LOUD-SPEAKERS

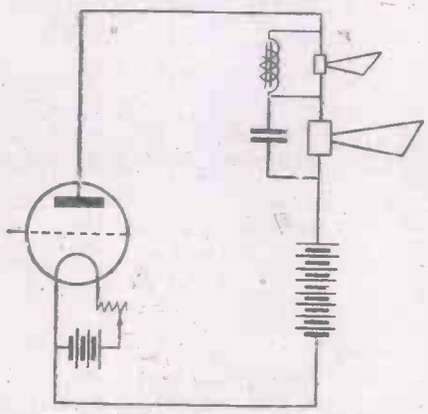
A VERY interesting line of experiment with loud-speakers is in using two instruments placed a small distance apart.

It would seem that listening to orchestral or band music from one loud-speaker is quite wrong, not only from the point of view of overloading the instrument, but also for the following reason. Suppose an orchestra to be playing in a concert hall; a listener does not hear the sound proceeding from one point (as would be the case if he were listening to a loud-speaker), but from the various instruments of the ensemble, which are generally well spread about.

Musical Perspective

Listening to orchestral music from a single loud-speaker appears to the writer as being analogous to viewing an object with one eye, whereas listening with two instruments suitably arranged may be likened to the stereoscopic effect we get by using both eyes.

The modern loud-speaker is constructed so as to give, as far as possible, an even balance of tone throughout the musical scale, but nevertheless some types give prominence to the higher notes and others vice versâ. However, if two instruments are used, one may have a relatively large thick diaphragm, or may be of the pleated-paper type, to give prominence to the lower register, and the other one have



Connections for Two Loud-speakers.

a small light diaphragm to give prominence to the upper register.

A further improvement is to suppress the current undulations corresponding to the high notes from the large diaphragm loud-speaker, and the current undulations corresponding to the low notes from the light diaphragm loud-speaker.

This may be effected by connecting a condenser across the "baritone" loud-speaker, and an iron-cored inductance or choke across the "soprano" instrument. The condenser should have a value of between .004 and .01 microfarad—try any value between these limits you have at hand. The choke should have an inductance of about 1¼ henries, but here again try anything in the nature of an iron-cored choke that you have handy.

The Choke

If you feel inclined to wind an experimental choke, put 1,500 turns of No. 36 insulated wire on an old intervalve transformer core, with a tapping at 700 and another at 1,100 turns. The illustration shows the plate circuit of the last valve of an amplifier, with the two loud-speakers arranged as described. Further very interesting experiments along these lines will suggest themselves. It should be added that when two loud-speakers are being used the listener should not stand very much nearer one than the other, as in this case not only will the sound from the nearer loud-speaker predominate, but also, owing to the relatively slow speed at which sound travels, the sound from the farther instrument will reach him an appreciable fraction of a second later than that from the nearer. This, of course, would cause distortion. R. H. J. McC.

A FIXED-WAVELENGTH CRYSTAL SET *(continued from preceding page)*

and the tappings to the others numbered accordingly. These connections are sufficient to hold the coil firmly to the panel

View Showing Under Side of Panel.

without further support. Solder about 9 in. of flex to the shanks of the aerial and earth terminals, bringing them out through two small holes at the back of the box. Place the panel on the box, which should be deep enough to allow the coil just to clear the bottom. Finally fit Clix plugs to the outside ends of the two flex leads, and the set is ready for use.

Tuning is done by plugging the flex lead from the earth terminal into one of the sockets 0 to 12, and that from the aerial terminal into one of the sockets 0 to 3. When the best adjustment of the plugs has been determined there will be little need to vary them, and with a good crystal the signals will be very loud. If required, a socket may be fixed to take a loading coil for Chelmsford, which coil can also be wound exactly to the size by the method described before. The wiring will require slight adaptation only. From the photograph it will be noticed that plug No. 12 has been placed in the centre under the curve of the others; this is immaterial.

V. P.

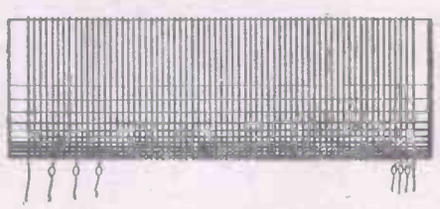


Fig. 3.—The Inductance Coil.

It is understood that Tetrazzini was paid £1,000 for her wireless concert.

VALVES IN PARALLEL

THE valve user's greatest problem is how to get the biggest volume with the least distortion, and in this connection the following suggestion may be helpful.

The use of too many low-frequency transformers should always be avoided, as the iron cores tend to cause distortion.

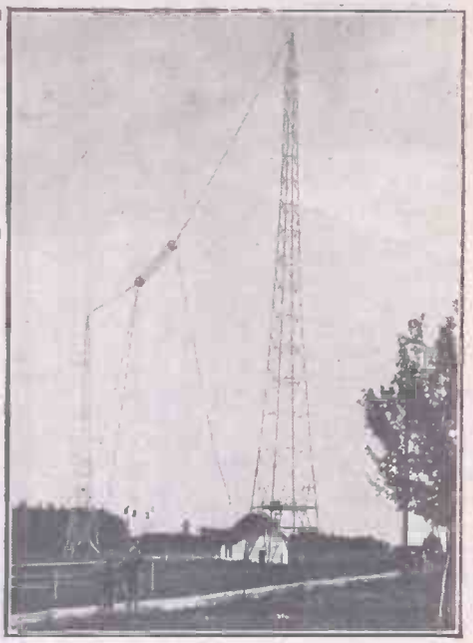
Two stages of L.F. amplification should always be sufficient, and a power valve should be employed if maximum volume is desired.

Receiving valves of the "hard" type may be used in place of power valves, and if two ordinary valves are paralleled (connected grid to grid and plate to plate), a high value of anode voltage may be applied.

Valves used in parallel must, of course, have exactly the same characteristics, or all kinds of difficulties will arise; the filaments can be controlled by one rheostat.

U.

"ALLO! HIER RADIO-STATION ZÜRICH!"



The Aerial of Radio-Genossenschaft, Zurich.

THE broadcasting station at Zürich (Radio-Genossenschaft, Zürich) opened in August, 1924, under the direction of Mr. A. Spoerri. The aerial and transmitting shed, seen in the first photograph, are situated at Höngg on the top of a hill, about 2½ miles N.N.W. of Zürich.

The Aerial

The aerial is of the cage type, and is approximately 100 ft. long and 215 ft. high. Transmissions are carried out on a wavelength of 515 metres, with an energy of about 500 watts in the aerial, power being obtained from a 2½-kilowatt generator.

The Studio

The studio is situated in Zurich. As can be seen from the photograph, it is rather small, but otherwise it is similar to the studios of the B.B.C. On the right-hand side of the photograph a case is seen standing on the table. The front of this is made of glass and is divided into ten divisions. On each pane of glass is a word, behind which is an electric light, one of the ten panes being left blank. The words on these panes translated into English mean: "Wait," "Nearer," "Silence," "Good," etc. By means of this indicator, the engineer in charge of the control room can keep in touch with those in the studio by switching on the lights behind the glass windows, thus illuminating the necessary words. The light behind the blank window is flashed on and off as a warning before switching on any of the other lights.

The Zurich Studio.

Range

The station is regularly heard in Egypt and Finland, besides, of course, in the British Isles and in many other parts of Europe. The writer regularly receives the evening concerts from Zurich on a double-slider crystal set, without amplifier, the distance being 220 miles.

At the time of writing this article considerable alterations are being made to the station. A new microphone has been in use since the end of January and the reproduction has greatly improved.

Transmissions

The times of all transmissions can be found every week in the "Broadcast Telephony" columns of AMATEUR WIRELESS. The afternoon concert starting at 3 p.m. is usually relayed from the Hotel Baur au Lac.

The station's call is: "Allo! Hier Radio-Station Zürich auf Welle 515!" For the benefit of those readers who would not be able to follow that when spoken in German, it is herewith given in a phonetic manner: "Allo! Here Ra(r)dio-Shtatsione Zürich owf vella finfhundert-finftsane!" Translated into English means: "Hullo! Here Zürich (broadcasting) station. Wavelength 515 (metres)." Another means of identifying the station is that the German language is used, but instead of saying "Achtung" the word "Allo" is used.

Licences

A broadcast-receiving licence in Switzerland costs 10 francs (approximately 8s. 6d. per annum). There are about 30,000 listeners. Reports are welcomed from any readers and should be addressed to the Director, Radio-Genossenschaft Zürich, Lindenhofstrasse 19, Zürich. (The photographs are by Nic. Aluf, Zürich.)

F. H. S.

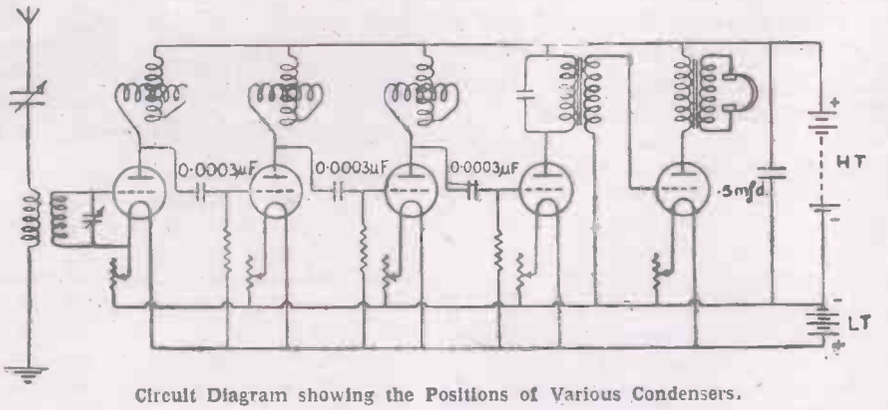
A number of light wireless cars, equipped with hidden receiving apparatus designed by Scotland Yard experts, are now ready for service.

The Transmitting Room.

WHERE TO USE A CONDENSER

An Informative Article Explaining the Purposes of By-pass and Other Condensers.

THE beginner in wireless is frequently puzzled by the many different ways in which condensers are used in a wireless circuit. In valve circuits, particularly, they often appear to be scattered throughout the diagram without apparent rhyme or reason. One might almost imagine that, just as a bridge player when in doubt goes "no trumps," so the wireless expert puts in an extra condenser here and there in the pious hope that it may "score a trick."



Circuit Diagram showing the Positions of Various Condensers.

In actual fact the useful purposes of a condenser are limited to: (*a*) To the tuning of a circuit by balancing its inductance; (*b*) the "by-passing" or separating of high-frequency from low-frequency oscillations; (*c*) blocking the passage of direct current in order to avoid the short-circuiting of a battery, etc.; (*d*) acting as a reservoir or "smoother" where a direct-current source is giving an irregular or fluctuating supply.

Tuning Condensers

For tuning purposes a *variable* condenser is always used. By turning the handle, more or less capacity is brought into the circuit until, for the particular frequency required, the "inductance" factor is balanced by the "capacity" factor. The oscillatory currents can then flow in the tuned circuit without experiencing any "impedance" effects. In other words, they flow with the maximum ease and attain the greatest possible strength, a value, in fact, which is only limited by the resistance of the circuit.

Before turning to the other purposes of a condenser it will be helpful to consider for a moment the relative meaning of large and small capacities. A condenser of infinitely large capacity possesses no impedance whatever. It cannot be "charged up," and so cannot exert any back pressure against the applied current. In fact, it acts as a direct short-circuit. If the two poles of an accumulator were connected to such a condenser the cell would "run down" just as effectively as if it were "shorted" by a copper bar.

On the other hand, if the two ends of a pair of leads from the opposite poles of an accumulator are brought slowly together they form a condenser, infinitely small at first, but growing to a definite value as the ends of the wire approach each other. Until they actually touch, however, the circuit is "open." The insertion of a condenser of definite capacity across a direct-current supply therefore "open-circuits" it, and prevents any current from flowing.

A.C. and Condenser Action

In the case of alternating current the action of any particular condenser depends upon the *frequency* of the applied current. In the first place it must be borne in mind that a condenser takes a certain definite *time* to charge up.

If the alternations of current occur at a slow rate the condenser will have time to become fully charged, and will accordingly exert its full "back voltage." For any given frequency it is a simple matter to adjust the size of the condenser so that the "back voltage" will equal the applied voltage, and so choke back the passage of current of that particular frequency.

If, however, current of a much higher frequency is applied to the same condenser, the latter has not sufficient time in which to develop a charge, that is, to exert a back thrust, before the direction of the applied current is reversed. Consequently the condenser offers comparatively little impedance, and the higher frequency passes through practically without hindrance.

Considering the typical five-valve receiver shown in the diagram, the variable condenser in the grid circuit of the first valve is for tuning that circuit to the frequency of the aerial circuit.

The .0003-microfarad condensers inserted between the plates and grids of the next three valves serve a double purpose. Primarily they pass the high-frequency component of each plate current and thereby apply corresponding potential-differences to the next grid. At the same time they "block" the steady or direct component of the plate current, and incidentally prevent the grid from acquiring the same high potential as the plate.

H.T. Condensers

Also, if the circuit is followed carefully from the positive high-tension it will be seen that the high-tension battery would be "shorted" through the parallel high resistances were it not for the insertion of these condensers.

Next the .001-mfd. condenser across the primary of the iron-cored transformer of the second-last valve separates out the high-frequency components and gives them free passage, whilst it "stops" the low-frequency rectified currents and forces them to pass through the coil windings, through which they are required to flow in order to influence the grid of the succeeding valve across the secondary windings of the transformer.

Finally, the fixed condenser of .5 microfarad shunted across the high-tension battery acts (*a*) as a reservoir, in which any intermittent "gushes" of current due to the irregular emission from the cells are absorbed or "buffered" so that they do not get through to the plates of the valves, where they would give rise to noises in the phones, and (*b*) it serves as a "by-path" condenser to divert high-frequency currents past the high impedance of the battery.

D. A. L.

A PECULIAR FAULT

SETS that are mounted in cabinets are sometimes found to give very different results when not mounted, but are left lying on the bench. This has been found due to the fact that the varnish of the cabinet increases the distributed capacity of the set with detrimental results. Unvarnished boxes and cabinets are reported not to cause any difference in operation, and so the use of an unvarnished box may be found to cure the trouble. If ample clearance is left between the panel and the box no difficulty should be encountered.

B.

Some Users' Opinions

GECoPHONE

BRITAIN'S BEST BROADCASTING SETS

High tribute to the efficiency of GECoPHONE Wireless Sets is continually being given from users in every corner of the Kingdom. Here are a few recent testimonials:—

Wallingford.

"Last October a present was made me of one of your Single Valve GECoPHONE Sets.

When fitting it up I was told by many local wireless enthusiasts that any single valve set would be practically useless in this neighbourhood as it was so far from a broadcasting station.

In spite of these gloomy prognostications I finished erecting set, and working with a telephone board and three headphones, I immediately got London with perfect distinctness. After I became used to tuning in I found I could get Cardiff, Bournemouth and Birmingham quite clearly. I could also listen with pleasure to lectures sent broadcast from Manchester besides being able to get music from other stations when conditions were favourable.

A neighbour had almost abandoned the notion of a wireless installaton because all the sets he had listened-in with had been so unsatisfactory, was so delighted after listening to mine that he immediately ordered one of your three-valve sets, which is now working perfectly.

I send this unsolicited testimonial as I consider the GECoPHONE is by far the best instrument of its kind on the market—certainly better results have been obtained in this neighbourhood with it than those of any other make. I shall always be pleased to recommend it."

Rosyth, Fife.

"I am pleased to report the following test made on a 2-valve GECoPHONE Wireless Receiving Set recently erected at Rosyth, Fife.

Although the aerial, including lead-in was only 55 ft. long and having on average height of 25 ft., it was possible to obtain the following Stations without any difficulty: Aberdeen, Dundee, Edinburgh, Glasgow, Newcastle, Manchester, Belfast, Bournemouth and Madrid. Glasgow and Edinburgh came through at loud-speaker strength, whilst Bournemouth was quite loud enough to be easily understood. It was quite evident that with a little extra adjustment the other Stations could be heard at a similar volume. The tuning presented no difficulty, it being possible to tune out all Stations completely.

Taking the entire conditions into consideration, I think the above is quite an excellent achievement and, though perhaps not a record, pays high tribute to the set in use."

Birmingham.

"You may perhaps be interested in the results obtained with one of your 1-valve sets by an ordinary amateur possessing no particular skill in handling.

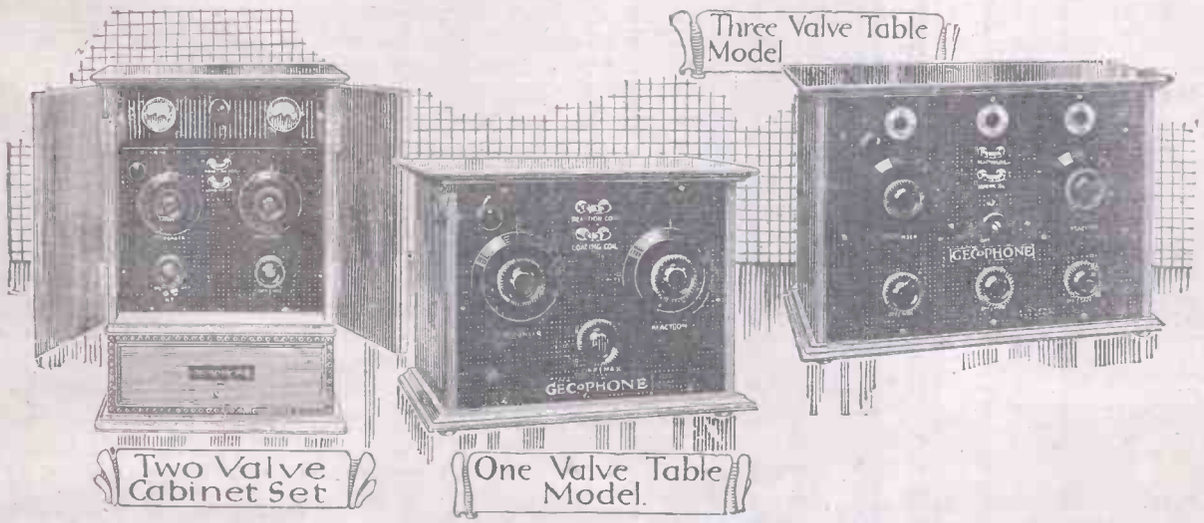
My aerial is about 38 ft. high and 60 ft. long (single wire) and is situated 2¼ miles from 5 I T, the Birmingham Station.

I have received American telephony on five nights during the past week, a feat which I have previously found impossible, even when using three and four valves. I think it is possibly the very fine control that one has over the reaction that accounts for its efficiency.

I used one additional valve (L.F.) for the American Stations, but all the others were received on the single valve."

To obtain maximum enjoyment of Broadcasting use a GECoPHONE. There is a model to suit every purse.

Prices from £2 10s. to £119



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Manufacturers and Wholesale only—

THE GENERAL ELECTRIC CO., Ltd. Head Office: Magnet House, Kingsway, London, W.C.2

That low filament consumption fetish!

TWELVE months' experience with Dull Emitter Valves working from Dry Batteries has proved to most wireless enthusiasts two things; first, that the low current consumption necessary for a Dry Battery means a whittling down of the filament to the point of fragility. Secondly, that if a multi-valve Set is used, large and expensive dry cells must be purchased to cope with the heavy current demands. It is not surprising, therefore, to find that prominent wireless engineers and experts attached to the various wireless magazines are wondering whether the price they are paying for the convenience of Dry Batteries is not out of all proportion to their advantages.

Obviously there are three distinct factors to be considered when choosing a Dull Emitter. They are (*a*) first cost, (*b*) upkeep cost, and (*c*) length of life.

No sensible man ever spent ninepence to save sixpence, yet that is exactly what you are doing if you choose your Dull Emitter on filament consumption alone. Current consumption, generally speaking, is influenced by the diameter of the wire used in the filament. The thinner the wire the less current it will consume. But obviously there is a very decided safety-limit, and a Valve that will give a tolerably long life in the hands of a careful laboratory worker would certainly not last long in the rough-and-tumble of everyday Broadcast reception.

The Cossor Wuncell Valve has been designed with a true realisation of the part it has to play in the hands of the average wireless enthusiast. In view of the immense popularity of the Cossor Bright Emitter we should not be doing our duty if the Wuncell carried the risk of fragility or lack of efficiency in the hands of the inexpert.

The Wuncell Valve is a long-life valve for two reasons—(*a*) because its filament glows only at 800 degrees (a dull red heat almost invisible in daylight), and (*b*) because its filament is essentially as robust and as stout as in any standard bright Valve.

Naturally this special filament is not an ordinary type of coated filament. It is manufactured under a process which is exclusive to the Wuncell.

That the Cossor policy of placing long life before current consumption is right is proved by the wave of popularity the Wuncell is enjoying. On every hand there is unmistakable evidence of public appreciation of its sterling qualities of greater sensitiveness, absolute reliability, and exceptional purity of tone coupled with an entire absence of microphonic noises. You'll end your search for an ideal Dull Emitter when you try the Wuncell.

Wuncell exclusive advantages featured:

IF you own a multi-valve Set using Bright Valves you will naturally decline to discard all your present valves in order to try out Dull Emitters. There's a better way than that with Wuncells. You can choose Wuncell W.R.1 or W.R.2 (see below) and use it at once alongside your other Valves. It has a special resistance within its base which enables it to function from a 4- or 6-volt accumulator. When all your bright Valves have been replaced by Wuncells you can short-circuit these resistances by means of the screws provided and alter your accumulator to give 2 volts with a greatly increased capacity. This advantage is found on no other Dull Emitter.

Technical Data:
Filament voltage, 1·2 to 1·8
Fil. consumption, ·3 amps.
Plate voltage, 20 to 80

Prices:
W.1 For Detector or L.F. Amplifier
W.2 (With red top) for long distance reception
18/- each

*W.R.1 Corresponding to W.1
*W.R.2 Corresponding to W.2
20/- each

*Fitted with internal resistance so that Valve can be used with 2-, 4-, or 6-volt Accumulator without alteration to Set.

Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

On Your Wavelength!

A Tetrazzini Echo

ONE of the topics of the week amongst those interested in broadcasting—as artistes, organisers, or "catchers" like ourselves—has been the smallness of Tetrazzini's Albert Hall audience and the subsequent correspondence in the newspapers. It was manifestly unjust to insinuate that people deliberately stayed away because they had received a wrong impression of the quality of the great artist's voice owing to "the imperfect reproduction of wireless transmission." No one who heard Tetrazzini broadcast, and who has any music in his soul, can have failed to register a vow to attend the next possible concert of hers. Yet when she gave one the Albert Hall was half empty. The *diva* herself hit the nail on the head when she wrote a letter saying that she had had no proper *réclame*—in plain English, advertisement. Did you know that she was to give a concert? I was in London that day and would have gone to hear her had I known that she was to sing. As it was, I had seen no announcement anywhere and knew nothing of it. The same was the case with nine out of ten of those with whom I discussed the matter. It is most unfair to make out a case against wireless in this way.

Broadcasting Parliament?

Should the Parliamentary debates be broadcast so that the free and independent voter, no matter where his abode may be, may keep an eye, or rather an ear, on the doings of the House without so much as leaving his armchair? The question has been raised during the last few days in both Houses, and it seems likely that something may come of it. The difficulty is to know just what to broadcast. You can hardly confine broadcasting to the speeches of the big men on both sides, for one seldom knows just at what time they will get on to their legs. Also the selection of the "big men" might lead to a good deal of jealousy. It seems to me that if Parliament is to be broadcast at all we must either have the whole of the proceedings or must confine ourselves to occasional tit-bits such as the Chancellor of the Exchequer's speech on his introduction of the Budget, and things of that kind. The first alternative would mean a special broadcasting station with a wavelength of its own dealing with nothing but Parliamentary business. Listeners could then tune in whenever the House was sitting to see whether there was anything worth hearing. The second might lead to a good deal of complaint from listeners, for big speeches often take up a very great deal of time, and many would prefer music to a whole evening devoted to speechifying, no matter how interesting the subject might be.

Some Difficulties

One of the difficulties in the way of broadcasting the whole of Parliamentary doings lies in the number of microphones that would be required—unless indeed we adopted the procedure of some foreign parliaments and made each speaker address the house from a special rostrum. Another is that no one really knows whether the demand for the wirelessing of the doings of the House is sufficient to justify the expense. If you have ever sat in the Strangers' or the Special Gallery at Westminster you cannot have failed to realise that the majority of the business is unutterably dull. Heaps of people pay one visit to Parliament out of curiosity. Very few of them show any anxiety to repeat the experience! My own view is that if a Parliamentary broadcasting station were set up very little use of its transmissions would be made by the general public.

One other possible means of dealing with the situation occurs to me. Why should there not be a station specially erected and set apart entirely for the broadcasting of speeches? I do not mean Parliamentary speeches only, but those made at public dinners and so on. In this way there would be no interference with musical programmes and only those who wanted to do so would have to listen to the speeches.

5 X X Breaks Down

The Chelmsford station gave out on Saturday week owing to the breakdown of some portion of the transmitting gear. Capt. Eckersley did not tell us what it was, though he said that no spare was available and that it would be a day or two before things got going again. This is, I believe, the first time that one of our home stations has been out of action for more than a matter of minutes, for in previous cases it has always been possible to fit a duplicate part and to carry on with very little delay. Chelmsford, though, is a monster in comparison with other stations. The transmitting plant "eats" about a hundred kilowatts, and when something goes up in a blue flame the damage, one imagines, may take a little setting right. The B.B.C. are certainly to be congratulated on the amazingly few breakdowns that have hitherto occurred; it is certainly a feather in the collective caps of the engineering staff that the plant has been so seldom afflicted with trouble.

A Fine Combination

For the last week I have been using a really wonderful note-magnifier combination. The first valve is coupled to the rectifier by a transformer of the most modern type, guaranteed by the makers to be absolutely distortionless. It is; and what is more it gives a very fine degree of amplification. Between the two note-mag. valves I am using choke-and-capacity coupling. This is practically the same circuit as the resistance-capacity coupling which is becoming so popular, save that you use a big choke coil instead of an anode resistance. One advantage of this is that you do not need an outsize in high-tension batteries, since the voltage drop across the choke is so small as to be negligible. Another is that you obtain a better degree of amplification combined, provided that the choke is a good one, with a silent background and extraordinary purity of tone. I can strongly recommend those who desire great strength without parasitic noises or harshness to try out this combination.

Soft Valves

Ever since I first began to write these notes, now nearly three years ago, I have sung the praises of the soft valve for use in sets containing no high-frequency stages. The pity is that so far as I know there is no reasonably priced soft valve of home manufacture. We must perforce rely upon the Dutch valves, which are unfortunately rather short lived. Some months ago, whilst lunching with one of our best-known makers, I begged him to put on the market a valve of the general-purpose type, but soft in character. He was distinctly interested, and I demonstrated to him, *using valves rejected at his own works as being too soft,* what tubes of this class could do. But there it ended. As matters stand, we have excellent H.F., L.F. and power valves made in this country. Our general-purpose valves are better than any in the world. But we have no specialised rectifier except at a price that is prohibitive to the ordinary wireless man.

May We Hope?

Now the soft valve is a wonder, as all who have used it will admit. In a single-valve set it will give quite double the range and the signal strength of the hard valve, and it has the additional enormous advantage that it will not oscillate easily. If there was a good British soft valve we should not have half the complaints of "howling" that we have at present. May we not hope, then, that some firm of ours will tackle the problem? The only de-

On Your Wavelength! (continued)

partment of wireless in which America now leads us is this. They have a soft detector valve working with 22½ volts on the plate, whereas we have nothing of the kind.

Data—and Otherwise

I do not think it is any exaggeration to say that the greatest stumbling block in the way of the earnest pioneer in the fields of wireless research to-day is the complete lack of reliable information.

It is practically an impossibility for the amateur to know how far official tests are successful or otherwise. Since the B.B.C. are notoriously "sticky" when it comes to the question of giving information, we are forced to rely almost entirely upon Press reports which are usually contradictory in the extreme. Take, for instance, the case of the recent test carried out by Chelmsford. Here we have a B.B.C. station officially attempting to transmit to America in the hopes that their programme will be relayed locally in U.S.A. as we relay American programmes here.

During this test it was announced that reports had been received from British listeners who claimed that they had heard KDKA on her short wave relaying the Chelmsford programme. Presumably this was to be taken as an indication that the test had been successful and the relay carried out.

Co-ordination Wanted

Once more the plea goes out for better co-ordination between all those engaged in practical wireless research. We shall never know where we are and what we have achieved until we get reliable information as to results. Undoubtedly the game of wireless is like the sport of fishing, but then the fisherman's estimate of the size of his bag is never taken seriously. Even if it were it would not have results of any particular moment.

Another matter which requires attention from the long-distance point of view is the mystery surrounding the origin of all the Morse stations which appear from nowhere and crowd the ether whenever any special tests are to be carried out. It really is a life of trials and tribulations. Whether any of my readers will have got as far as this or not I do not know. As a matter of fact there is really very little of interest to the transatlantic worker to report this month. Conditions have not been particularly good. With the exception of KDKA, short-wave American stations have not been coming in particularly well. WGY especially I have found difficult to receive lately, and WBZ has not been too good.

Most people will have noticed that the distortion on short-wave transmission has not been so bad, but then we are in a period of transition. Atmospheric conditions are changing daily and it is almost impossible to say anything definite until we are well into the summer months.

Can You Steer Straight?

I am reminded by a correspondent that it is time that there was something new in wireless, and he asks what is going to be done about it! Some people are never satisfied. There is in wireless, as I have observed before, a craving for a change in fashion, not so much as regards the transmission end but as regards the receiver. No sooner does Tom, Dick or Harry settle down to "honest-to-goodness" reception with the latest thing in transformers, condensers and what not, but a new gadget turns up which cannot be ignored and the set has its entrails removed once again for the insertion of this component.

I would like to pose as a wireless fashion expert just for a brief minute or so, and, like all fashion experts, I must therefore become something of an "Old Moore." The ascending star of wireless is still on the upward gradient and is at present in the *n*th degree of ascension. From this I predict that before the year has run its course every other multi-valve wireless receiver in the country will be a super-heterodyne. But why a "super-het." you may ask. My answer is that a mariner never sails the ocean without a rudder to his ship, a chauffeur would not think of driving his car across Piccadilly without adequate steering gear, and even the most hardened ether searcher likes to be able to steer his receiver through the appalling riot of noise caused by statics and unwanted signals and reach his desired station without colliding with those nasty little troubles. He cannot manage it with an unselective set, and there is only one circuit with a positive and simple steering gear which will serve his purpose—the "super-het."

Sweeter Broadcast

Having said thus much I am also tempted to refer to the tendency to shorter and shorter wavelength work. Such work is considerably assisted by the "super-het.," for it functions particularly well down on the lower wavelengths. It may be used with the greatest of ease on a frame aerial, and indeed this is the proper combination. L.F. amplification may be easily added for loud-speaker work. If only some of the ham-handed Henrys (of whom I have spoken before) would instal a "super-het." and frame aerial we should be all the happier, and broadcast reception would be sweeter for those who still hang on to the outdoor aerial. Taken all round, the "super-het." set is a benefit to the wireless community.

Tired Telephones

I have come across recently one or two curious cases of what we may call telephone tiredness. The phones depend for their efficiency very largely upon the strength of their permanent magnets. In course of time these tend to become demagnetised, and when this happens the phones are much less sensitive than they originally were. Demagnetisation is very greatly assisted by careless use. If, for example, the phones are connected up so that the steady current of a valve set flows through them in the wrong direction, the magnets are being continually weakened, and it is only a matter of time until they become past their work.

Most good makes of telephone are so marked that the lead which you attach to the H.T. plus terminal of the set is easily recognised. In unmarked head-sets this lead should be identified by the methods that have been described more than once in "A.W." Another point which is not always recognised is that shocks and jars tend to demagnetise steel. If you care to try the experiment yourself you may purchase a cheap magnet and test its strength both before and after subjecting it to a hammering. Nobody hammers telephones, but quite a lot of people produce much the same effect by the light-hearted way in which they throw them down on the table or even drop them occasionally on the floor. If your phones have become weakened through partial demagnetisation you can have them put right at no great expense by the makers.

Another Use for Wireless

Listening round about 200 metres a few nights ago I heard an interesting incident which would afford exercise for the pen of a story writer. An amateur station was carrying out some tests, when he was suddenly called by another station. On replying to this call, he was informed that another amateur transmitter had fallen sick, but had installed his loud-speaker in the bedroom and would be glad of a few words with the testing station. I gathered that these two enthusiasts were able to exchange greetings in spite of the fact that one of them was unable to move from his bed. Thus wireless has for the first time to my knowledge provided a link through space between an invalid and his friends who would otherwise have been as far apart as the poles; certainly one of them, the invalid, felt cheered by the short conversation.

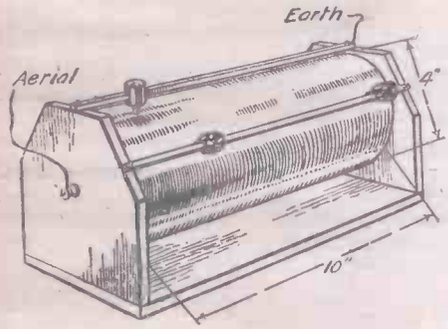
THERMION.

A discovery of wireless interest has been made at the Bradford Corporation Sewage Works at Esholt, where natural wireless crystals have been found during recent blasting operations. These crystals appear to be very sensitive and efficient.

PRACTICAL ODDS AND ENDS

Reducing Dead-end Losses

IF only one slider-tapped coil is used for the reception of Chelmsford and the local station, it may be found that signals are not very strong on the lower waves. This is due to "dead-end" losses in the coil, as the extra wire needed for 5 X X

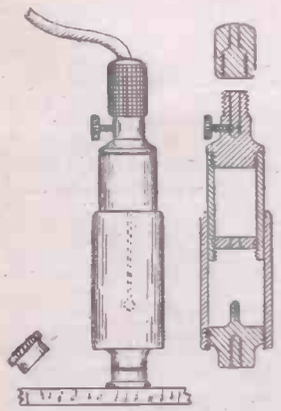


Reducing Dead-end Losses.

uses up energy on the 2 L O wavelength. If a separate slider bar is used as shown in the sketch, the unused turns may easily be shorted. F. W. T.

Variable Series Condenser

THIS little idea should interest those readers who are fortunate enough to possess a small screw-cutting lathe and who believe in making "a job" of anything. It consists of a variable mica condenser arranged on the well-known tubular



Details of the Condenser.

telescopic principle, which can be fitted direct to the aerial terminal of the receiver in the manner shown. The tubes, which are of brass or copper, should be about 2½ in. long by ¾ in. in diameter. The inner tube is covered with mica, which is preferably arranged in thin longitudinal strips and secured with Seccotine. The larger tube is internally threaded at the lower end to accommodate the fixing lug. Integral with the lug is a projection which is split to form a plug, this being so arranged as to engage a hole in a disc, which is screwed into the lower end of the smaller tube. The upper end of this tube is fitted with a lug to accommodate the aerial lead-in and a small manipulating knob.

The larger tube may be split if necessary and the top inside edge should be well rounded off with a smooth file and some emery-cloth, otherwise the mica will be cut or scraped when making adjustments. The device may be simplified by soldering the lugs and the socket-disc to the tubes. By means of the simple plug-and-socket connection the condenser may remain a permanent fixture to any receiver, it being only necessary to push the inner tube hard down on to the plug to obtain the direct lead-in-to-aerial terminal connection.

O. J. R.

Large-capacity Condensers

IN some circuits the use of a variable condenser having a large maximum capacity is necessary. It is not, of course, possible to make a vane-type condenser with an infinite number of plates, as it would be almost an impossibility to obtain the correct alignment. An ordinary vane condenser of .001 or .0005 microfarad capacity can be easily converted into a variable condenser having a much greater maximum capacity. If pure vaseline is inserted between the fixed vanes so that the moving plates have to cut their way through, the capacity of the condenser will be increased. Pure vaseline, as sold for medicinal purposes, has a dielectric constant many times greater than that of air, and the maximum capacity of the condenser will be proportionately increased.

U.

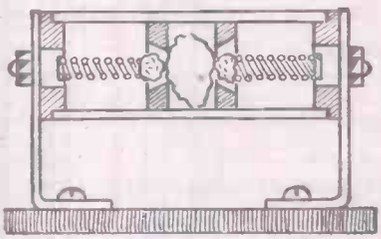
A Stable Detector

CRYSTAL detectors which have the catwhisker type of contact are apt to be affected by vibration, and it is very difficult to keep the whisker on to the sensitive spot. The detector shown in the diagram is capable of withstanding a great deal of vibration, yet is sensitive and easy to construct.

The method of construction is clearly shown in the diagram, but the results obtained with the detector will depend on the materials used. Two wads of tinfoil are pressed lightly on each side of the crystal and are kept in place by means of springs.

The outer containing tube may be made of almost any insulating material, but a short length of ebonite tube will be easy to work. The end supports should be made of springy brass strip in order that the detector may be easily assembled.

The crystal is clamped as shown in the

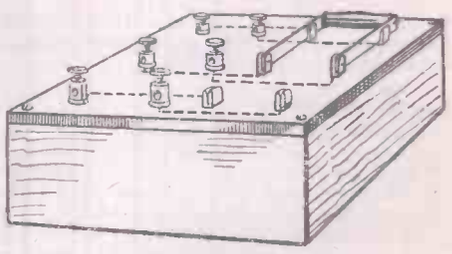


A Stable Detector.

centre of the tube, and it should be noted that the tube is the only part free to revolve. The bushes, springs and tinfoil contacts are kept in position by the brass end strips, and adjustment of the detector is made by just turning the tube. J. O.

A Neat Switch Box

EVERY amateur needs some easily hooked-up means of switching-in alternative pieces of apparatus, phones, etc., for quick comparison and test. Such a means is provided in the simple-to-make gadget described here. A piece of scrap ebonite, a panel-mounting D.P.D.T. switch and six phone terminals are required. The sketch is self-explanatory and



Switch Panel.

shows how to assemble the parts. If a little care is taken in the making, especially in the alignment of the contacts, it will be seen that a neat little switch-box can be produced, the uses of which are legion. W. G.

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, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 616).

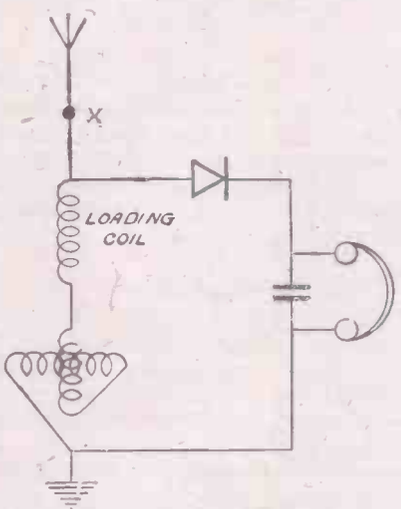
Dull-emitters and Safety

Q.—I have purchased a dull-emitter and wish to insert some device which will prevent my accidentally burning out the valve by connecting the H.T. across it. I believe a resistance is all that is necessary.—R. P. (Ely).

A.—The resistance should be a non-inductive one, and its value can be found from Ohm's Law. Current = $\frac{\text{Voltage}}{\text{Resistance.}}$ Thus, if the safe value of the current is '05 ampere (assuming that the valve is a DE.06) and the H.T. is 50 volts, a 1,000 ohms resistance will be needed in the H.T. lead.

Receiving Chelmsford

Q.—My crystal set works satisfactorily on the broadcasting wavelengths, but will not receive Chelmsford when a loading coil is added. The loading coil is guaranteed suitable for 1,600 metres, and I have added it in the aerial lead-in as shown in the diagram.—C. C. (Bexhill).



Circuit for Chelmsford.

A.—The loading coil should not be connected in the aerial lead (as shown at x in the diagram), but should be placed *directly* in series with the variometer as shown.—U.

Secrecy of Wireless

Q.—If secrecy is impossible, of what use will the wireless telephone be ?—A. B. (E. 10).

A.—Its use has been demonstrated already in numerous ways. It will permit of direct conversation without connecting wires.

It already enables invalids at home or in hospitals to enjoy musical performances. Secrecy is not always necessary, and twenty years of commercial wireless telegraphy have shown that, apart from war, little or no trouble has occurred to anybody by the interception of wireless messages.—U.

Accumulator Acid

Q.—What is the correct way of mixing and adjusting the electrolyte of an accumulator ?—A. I. T. (Dulwich).

A.—Acid of 1.22 specific gravity contains about 1 part of concentrated pure acid to about 3 or 3½ parts of water by volume.

In mixing this, add the acid slowly to the water (and *not* the water to the acid) and wait till the solution is cold.

Evaporation from the cells should be corrected by the addition of distilled water only.—U.

Straightening Ebonite

Q.—Can you recommend a satisfactory method of straightening ebonite that has been warped through careless storage ?—C.A. (Rhyl).

A.—The material may be straightened by placing it between two heavy boards of suitable size after they have been warmed in an oven. The ebonite may also be warmed if the straightening process is to be hurried. Weights should be placed in the boards to press the material into shape.—U.

The Position of the Rheostat

Q.—What is the cause of the loss of signal strength when the filament rheostat is changed from the negative to the positive filament lead ?—C. E. (Cambridge).

A.—The position of the filament resistance affects the potential of the grid in respect to the filament, just as when grid control with a potentiometer is applied, and this would be quite sufficient to cause an alteration of signal strength.—U.

Charging Accumulators from A.C. Mains

Q.—I have a 6-volt 40-ampere-hour accumulator which I wish to charge from 240-volt A.C. mains. Do you recommend that I should insert a choke or resistance directly in series, and to connect positive wire to positive terminal of the accumulator in the usual way ?—R. K. (Bath).

A.—The proposed arrangement is quite unsuitable, as alternating current must be rectified before accumulators can be charged from the supply. It will be seen that current which is rapidly changing its direction is of no use for charging an accumulator, which may be regarded as storing up current continuously flowing in one direction. A transformer must be used to transform the voltage down to a more suitable value, say 40 to 50 volts, and a rectifier is then connected in series with the secondary of the transformer and the accumulator to rectify the A.C. into interrupted pulses of D.C. Various types of rectifier,—for example, the electrolytic cell, the thermionic rectifier, and the vibrating reed rectifier—can be used, but as you do not state the periodicity of the mains (which is the chief factor to be known in designing A.C. apparatus) we regret we cannot advise you as to the type of rectifier to use, or as to the dimensions of a suitable transformer.—U

H.F. and the Reflex

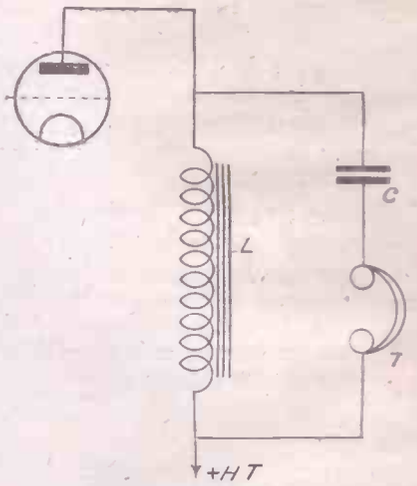
Q.—Could you tell me if it is possible to add two stages of high-frequency amplification to a reflex receiver ? I have built a single-valve reflex receiver (using H.F. and L.F. transformers) that is giving very satisfactory results. Can I add an H.F. amplifier in the ordinary way ?—F. H. (Birmingham).

A.—You do not state what type of reflex circuit you are using, but we suppose that you refer to the standard single-valve reflex circuit using a crystal detector. If care be taken in the construction of the H.F. amplifier, it should be possible to add two stages of H.F. One of the valves may be coupled on the tuned-anode system if desired (in order to obtain maximum selectivity and amplification), but the last valve in the amplifier should br coupled to the reflex valve by means of an H.F. transformer. With most reflex receivers it is possible to add further stages of H.F. amplification; some sets, however, are almost uncontrollable if this is done.—U.

Protecting Headphones

Q.—Is there any method (other than using a telephone equal-ratio transformer) of insulating high-resistance headphones from the steady D.C. supplied by the high-tension battery.—J. G. (Slough).

A.—A very simple and efficient method of protecting the headphones is shown in the



Protecting the Phones.

diagram. A high-impedance low-frequency choke is inserted in the high-tension lead in place of the phones, the latter being connected in series with a condenser C of .01 microfarad and the choke.

The alternating potentials will be choked by the impedance of L, and will be compelled to pass through the circuit CT.—U.

Short-wave Heterodyne

Q.—I wish to construct a short-wave local oscillator and should like data for winding the tuning inductance to cover a wave range of 100 to 200 metres.—J. C. (Wallasey).

A.—To cover so large a waveband with only one coil it will be necessary to use a fair-sized variable condenser, say one of .0003 microfarad and a vernier device will, therefore, be a great help in tuning.

The coil may consist of 25 turns of No. 22 d.c.c. wire upon a 3-in. diameter ebonite tube, the reaction winding consisting of 20 turns of the same wire wound upon the same tube, side by side with the tuned-circuit winding.—U.

THE MULTI-VALVER AND THE H.T. BATTERY

SOME HINTS ON OBTAINING THE BEST SERVICE

WHEN three or more valves are used on powerful loud-speaker sets the high-tension supply needs more careful attention than is generally realised. With small valve sets one can almost look upon the high-tension battery as a permanent fixture and forget about it. Provided a good one has been acquired, it will at any rate perform its function properly for any time between six and twelve months. This is not likely to be so with a multi-valve set, however.

A standard well-made high-tension battery is capable of giving up to about 10 milliamperes of current and might be expected to stand up to such a demand for two months if used approximately fourteen hours a week. If only 5 milliamperes are taken the normal life should be about six months with the same amount of use.

Current Requirements

The amount of current required from the high-tension battery depends upon the types of valve used, the number of valves employed, and the potentials at which the grids and plates of the valves are operated. A representative good-class general-purpose valve when working with 80 volts on the plate (or anode) passes a current of just under 1 milliampere with no special grid bias. Two such valves in cascade demand nearly 2 milliamperes, three and four or five valves correspondingly more. If the high-tension voltage is increased to

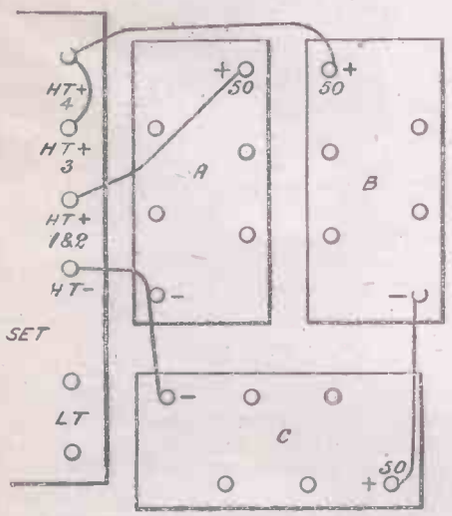


Fig. 1.—The Use of Multi H.T. Units.

120 volts, which is not uncommonly high, then the anode current jumps up to at least double the previous reading. A set with four general-purpose valves takes, therefore, about 9 milliamperes from the

A Serviceable H.T. Unit.

high-tension battery, which is not likely to stand up to the demand for more than three months.

As previously indicated, when these figures were taken the grids of the valves had no other bias than that given by the slight drop across the rheostats in the negative leads of the filament current supply. In practice, therefore, about 1 volt negative was applied to the grids of the valves. If in addition 4 volts negative is deliberately applied to the grid of a general-purpose valve with 120 volts on the plate, the anode current drops 1 milliampere. Thus it will be seen that if moderately low high-tension voltage is applied to the high-frequency and detector valves and extra grid bias to the low-frequency amplifying valves, the drain of current from the high-tension battery can be kept down to a reasonable amount with beneficial results to the life of the battery.

Power Valves and H.T.

If, as is often the case, small power valves are used as low-frequency amplifiers, the high-tension battery is almost sure to be overloaded, if of the standard type, as these valves are "greedy" with high-tension current. Take the B.T.H. B4 and the Marconi Osram DE5 as representatives of this class of valve; they take 5 milliamperes at 80 volts and about 10 milliamperes at 120 volts on the plate if no extra negative bias is applied. With 4 volts negative on the grid the plate current is reduced to 2.5 milliampères at 80 volts and to about 5 milliamperes with 120 volts on the plate. These figures show clearly the necessity of carefully watching the plate current demand on multi-valve sets.

The simplest method of overcoming the high-tension problem is to use one of the triple-capacity batteries made by several of the well-known firms. These large units will give up to 20 milliampéres and are quite capable of over six months hard service at about 15 milliamperes. Wet- or secondary-cell high-tension batteries meet the position in the same manner, but one has to bear in mind their initial cost, bulk, and the problem of recharging.

There is a way of safely using standard high-tension batteries when the set is fitted with several H.T. + terminals. The method is to employ two or more distinct batteries, both connected to the same H.T. negative terminal. In the case of a four-valve set and using two distinct batteries, one battery could supply the first two valves and the other the remaining two. Such an arrangement is shown diagrammatically in Fig. 1.

Separate Supply

Another arrangement suitable for such a set as one employing two H.F., detector and one L.F. (power) valve is shown in Fig. 2. Here the first three valves, which require round about 50 volts, are supplied entirely by a triple-capacity battery of that voltage. The L.F. valve, which requires 100 volts or more, is supplied by the triple-capacity battery and an ordinary battery in series. The ordinary battery, then, is required to give only the current demanded by the L.F. valve. With such an arrangement the big battery may be required to yield 12 milliamperes and the extra standard battery 5 milliamperes.

In order to be on the safe side and to be able to experiment with ease the writer uses a special high-tension unit made up

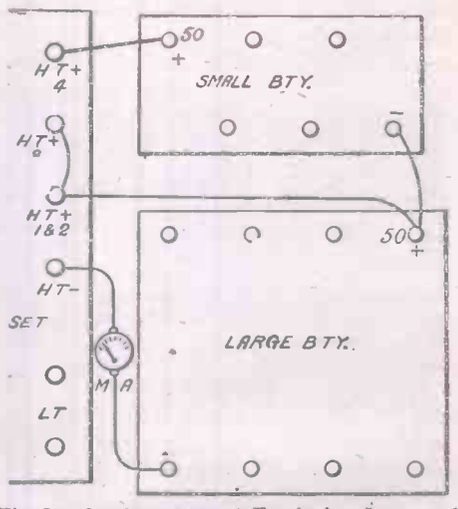


Fig. 2.—An Arrangement Employing Large and Small Batteries.

of Ever-ready No. 126 handlamp batteries wired up in series with 2-in. strips of ribbon aerial, holes being drilled in these strips 1½ in. apart. The batteries have

(Concluded in second column of page 602)

EXPERIMENTAL TRANSMISSION.—XII

MODULATION (continued).

Grid Control

THE method of varying the potential on the grid of the transmitter is self-evident, but the general principle is shown in Fig. 47, since besides being a theoretical explanation of grid control this is an essentially practical circuit. It will be seen that the microphone replaces the grid leak, and that as the diaphragm is affected by sound waves, the resistance of the granules varies, causing a control of the radio-frequency output.

There are, however, two attendant disadvantages to this system. The leads are passing radio-frequency currents, and as no stepping-up device is employed, not very much of the total output will be modulated.

We must remember, though, that with grid control the depth of modulation must not be too great, as even with careful adjustment the range of grid potential which will allow the anode current to oscillate over the full range from zero to saturation, without distortion setting in, is very small indeed.

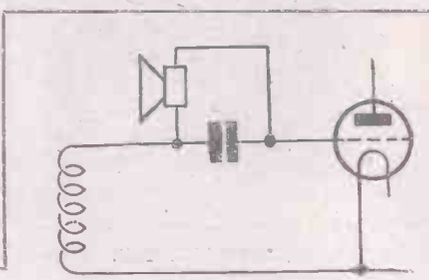


Fig. 47.—Principle of Grid Modulation.

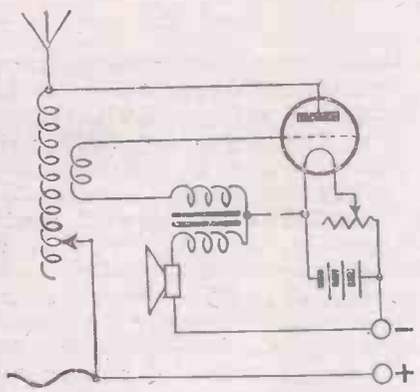


Fig. 48.—Transformer-coupled Grid Control.

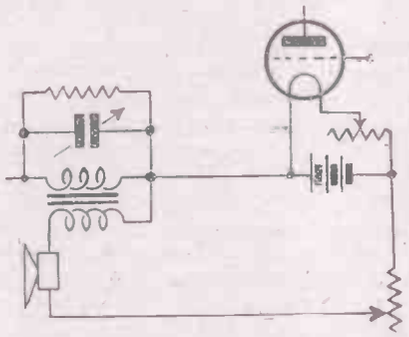


Fig. 49.—Stabilising the Transformer.

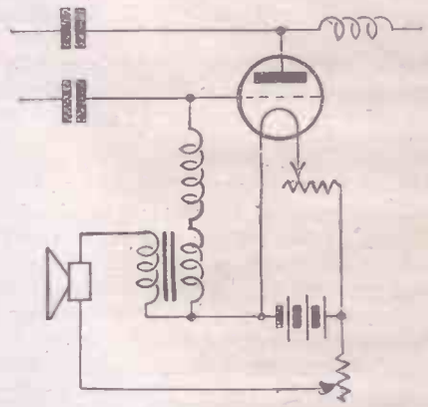


Fig. 50.—An Alternative Parallel Connection

In order to minimise capacity effects, a high-ratio transformer may be included in the circuit in order that the microphone may be operated off the filament accumulator and be at earth potential.

It is advisable to connect the secondary in the low-potential side of the grid circuit, as shown in Fig. 48, or wavelength changes may occur.

Two requirements to this method are illustrated in Fig. 49. These are the connection of a fixed high resistance in parallel with a variable condenser (.0005) across the transformer secondary, and the connection of a rheostat in the primary circuit to control the current flowing through the microphone. A transformer always works at its best if it has a definite load across it; hence the resistance. The variable condenser will be found a great help in stabilising the method of grid control, and it prevents any curious effects arising that might be due to stray H.F. currents.

It is sometimes found desirable to employ a separate accumulator or battery for the microphone, but only in special circumstances will this be necessary, and for the sake of simplicity in drawing this has not been shown.

Fig. 50 shows how the method of grid control may be applied to capacity-coupled oscillators of the Colpitt type, where it will be seen that the secondary winding takes the place of the grid leak, in series with a radio-frequency choke. Primary connections are standard. Of course, this method could be applied to an inductively-coupled circuit, where the secondary and R.F. choke would be connected directly between grid and filament.

KENNETH ULLYETT.

(To be continued)

Photo by Llew. E. Morgan.

WIRELESS CLASSES

During the season just ended, the Breconshire Education Authority has held practical and theoretical classes in wireless at Ystradgynlais, Swansea Valley. The photograph shows a practical class with some of the apparatus made.

AROUND THE SHOWROOMS

Handy Switch Arm

I AM pleased to see that the Athol Engineering Company, of Cornet Street, Hr. Broughton, Manchester, have noted a little fault to be found in most one-hole fixing switch-arms.

When it is desired to mount the ordinary type of switch-arm on the panel it is necessary to dismantle the whole component in order to remove the large one-hole fixing nut, and the tension of the arm is consequently altered.

It will be noticed that in the switch-arm made by the Athol Engineering Co. the large nut can be removed for fixing without having to pull the switch-arm to pieces. The spring washer is enclosed and is locked at the correct tension by the makers, and needs no further adjustment.

Athol Switch-arm.

A very smooth action over the surface of the contact studs is possible with this switch-arm.

Dual Transformer

MESSRS. NATIONAL WIRELESS AND ELECTRIC CO., of 42, Grays Inn Road, W.C.1, are marketing some interesting new components.

A dual low-frequency transformer is particularly interesting. Two transformers are mounted in one case and all eight terminals are brought out to an ebonite panel fitting on the case, which is of polished metal. The connections are clearly engraved on the ebonite top. Two tapped holes (4 B.A.) on the bottom of the transformer make fixing easy. This instrument should appeal to those who are pressed for space in their set. Owing to the hermetically sealed winding I could not see the method of placing the transformers to prevent howling, but it is claimed that L.F. oscillation is entirely absent.

Dual Transformer.

Clix Terminals

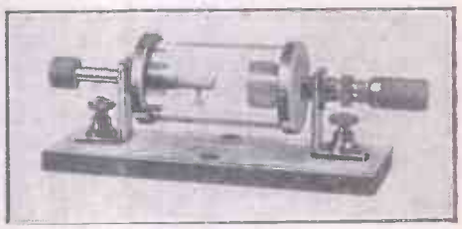
USERS of Clix terminals will be interested to hear that Autoveyors, Ltd., have considerably increased the range of these handy connecting devices. A new model of Clix, and additional accessories for use with them, are now available.

There is now the Clix plug-socket and the Clix adaptor, an additional accessory that has been designed to meet the demand for a somewhat cheaper form of panel insert.

All the new models will adhere strictly to the dimensions of the existing Clix terminals.

Micrometer Detectors

THREE types of neat caps micrometer-action crystal detector are manufactured by the National Wireless and Electric Co. Two are of the horizontal type, one having the micrometer adjustment on the catwhisker, and the other has rough adjustment of the catwhisker with a micrometer movement of the crystal. The third, a vertical one for panel mounting, has the fine movement to the catwhisker.



National Wireless Co. Detector.

These detectors are extremely well made and adjustment is all that could be desired. They are mounted on ebonite bases and all brass parts are very nicely lacquered.

VANGUARD.

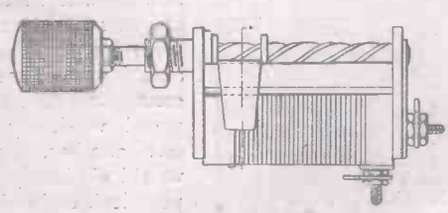
PROGRESS AND INVENTION

Vernier Rheostat

PATENT No. 229,485/24 (George Miller Bowles, of Acock's Green, Birmingham) describes a vernier filament rheostat of the type in which the resistance element is wound on a flat insulating bar, and contact is made at various points by a slider moving on an Archimedean screw.

One method of carrying the invention into effect comprises two discs held apart by three spacing members. One of the spacing members is adapted to receive a sleeve of ebonite having a resistance coil wound on the outer surface. A threaded rod, carrying a spring contact block, is mounted between the two discs so that rotation of the rod slides the contact along the surface of the resistance coil as shown in the sketch.

The two other spacing members prevent the contact block from moving in any other direction than that parallel to the axis of the rod.



Vernier Rheostat (No. 229,485/24)

Valve Electrodes

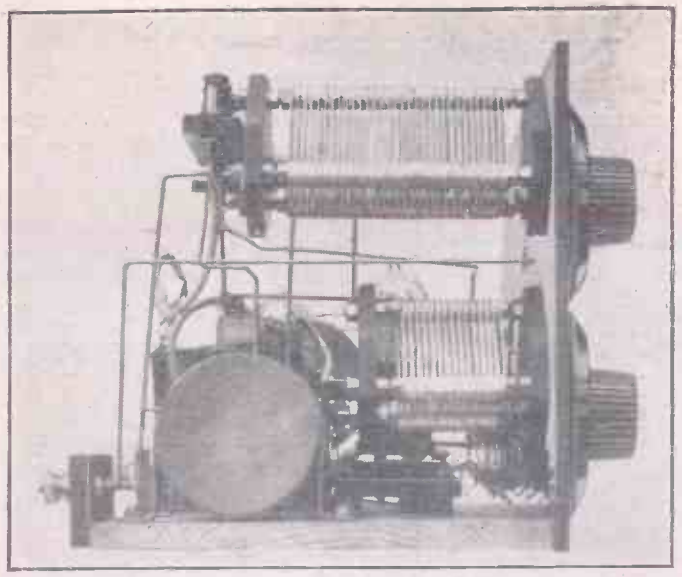
THE mounting of electrodes in large valves has always presented somewhat of a problem to valve manufacturers. The ordinary form of stem on which the electrodes are mounted does not permit very firm attachment to be made.

Patent No. 229,429/23 (The Edison Swan Electric Co., Ltd., Queen Victoria Street, London) describes an effective and convenient means of support. In accordance with the invention the usual stem of glass or silica is provided. A concentric sleeve of similar material is secured to the stem at the desired number of points by fusion so that the sleeve is held in its position concentric with the stem, an annular gap being thus provided between the stem and the sleeve.

The nickel electrode supports are held in these annular grooves by wire twists, any connections are made to the pins of the valve in the usual way.

A PUSH-PULL FOUR-VALV

Constructional Details of a Four-valve Receiver with Push-pull System of Amplification.



End View of Receiver.

RECEIVERS do not fulfil their chief purpose if they fail to reproduce speech and music in a faithful manner, for the sole object of broadcasting is to provide entertainment, and entertainment in the form of sound ceases to be entertainment when that sound offends the ear. Good reproduction of the original sounds in the studio may, therefore, be said to be the first essential of a wireless receiver.

Obtaining the Best Results

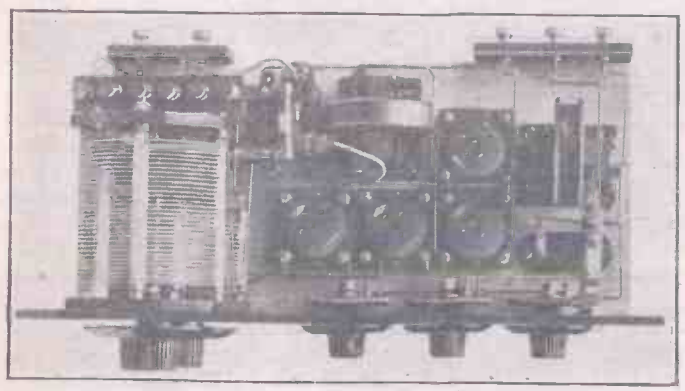
There are various methods of attaining this ideal in a loud-speaking wireless set, nearly all of which are applied to the low-frequency amplifier employed. Good volume demands a large current output from the set, and in the great majority of receivers this is achieved by the use of power valves and high H.T. voltages, while the inter-valve coupling is either transformer, resistance-capacity or choke, or a combination of any of the three. The ordinary transformer method has quite the best electrical efficiency as regards output for a given input, but unless very great care is exercised in the final stages, and unless expensive power valves, together with high H.T. and grid bias voltage, are used, considerable distortion may occur.

The resistance-capacity and choke methods are both excellent as reproducers, but both suffer from the comparative defect of poor amplification per stage and necessitate the use of an excessive H.T. voltage; so that unless the user has plenty of battery power available and the wherewithal to buy and maintain both power valves and batteries, the above systems do not recommend themselves.

Push-pull Amplification

The solution to the problem is found in the push-pull system of amplification—a method used in America to a far greater extent than in England. Now, however, properly-matched pairs of push-pull transformers are available in England, so that anyone desiring a large degree of amplification requiring only ordinary R-type bright- or dull-emitter valves may avail themselves of this method.

Briefly, the method consists of employing two ordinary valves to do the work of one power valve, the transformers being designed and connected in such a manner that the push-pull valves are in parallel. One winding of each of the special transformers is split, the split winding of the first transformer being the secondary and of the last transformer the primary. Reference to the circuit diagrams (Figs. 1 and 2) will show exactly how these connections are made. In the actual transformers the connecting tags are disposed vertically above one another, and it would obviously be impracticable in Fig. 2 accurately to show this, so that for convenience the terminals are shown horizontally. No difficulty in following the scheme should exist, however, for the necessary terminal identifi-



Plan View.

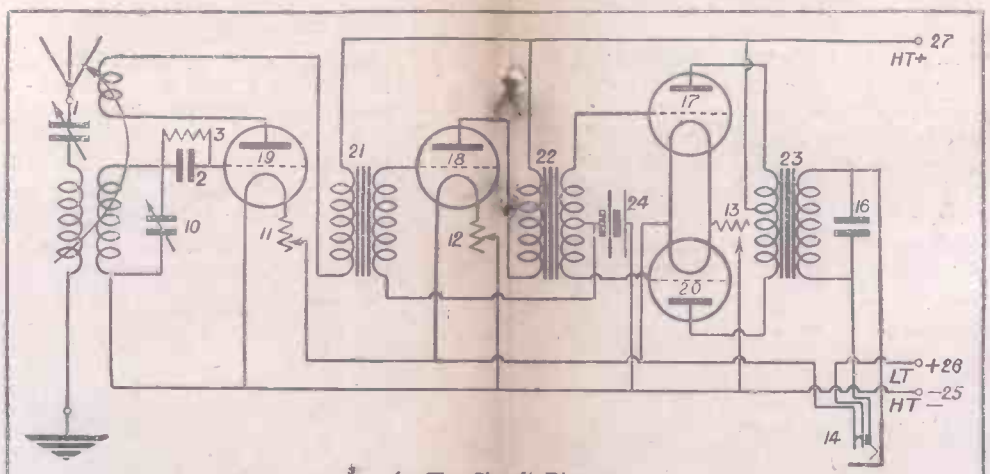


Fig. 1—The Circuit Diagram

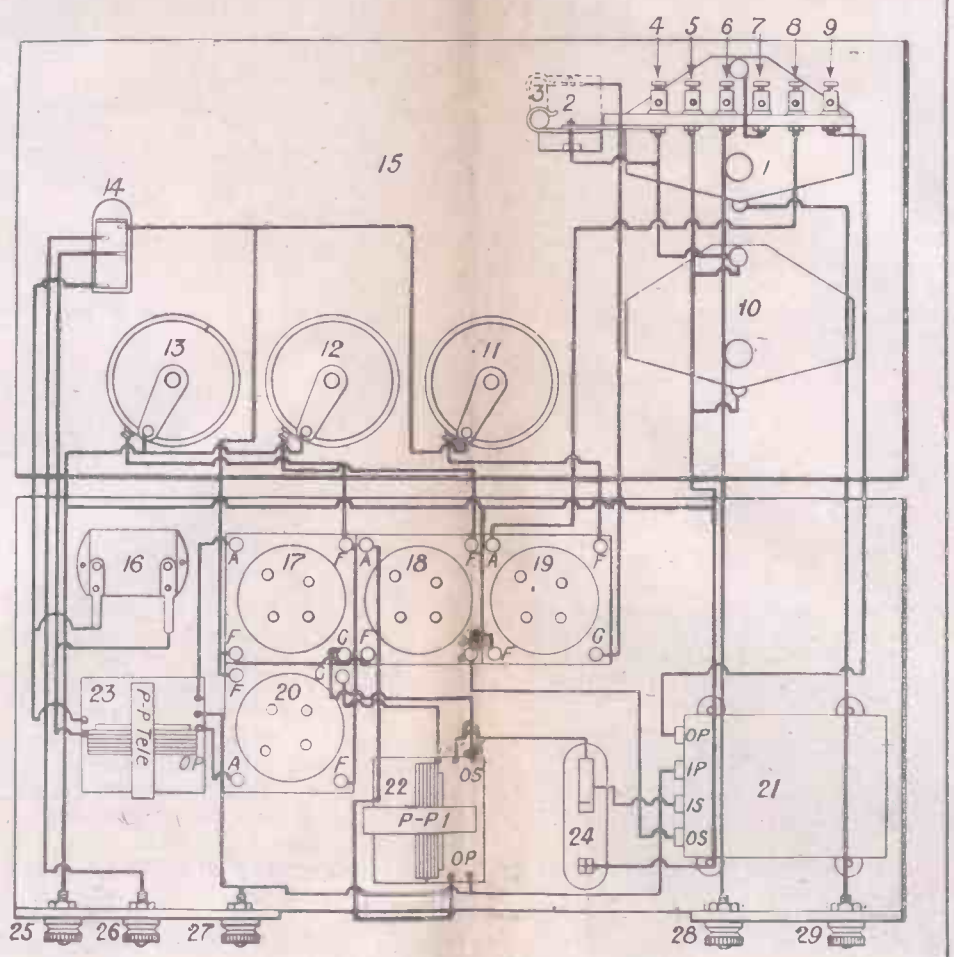


Fig. 2.—General Layout of Components.

VER

cation signs are clearly given in the diagram.

Volume and Purity.

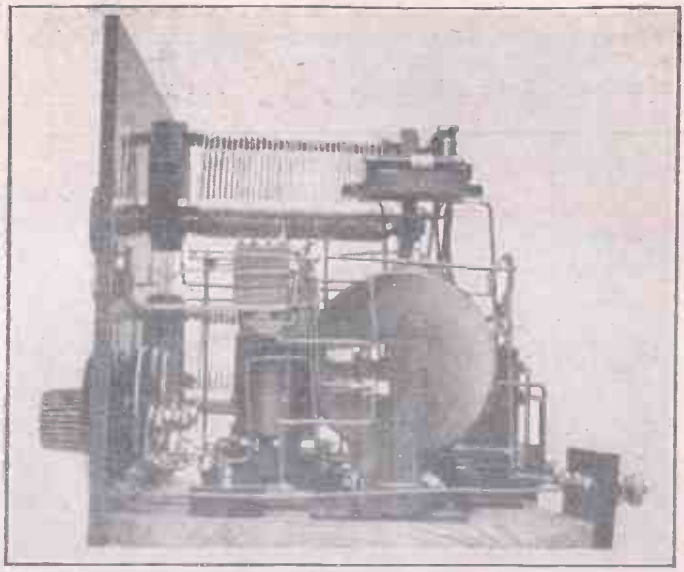
The receiver, as described, has enormous volume and remarkable tonal purity on the local station, and 2 L O, about eight miles away, can be cut out and other B.B.C. stations brought in on the loud-speaker at good strength. Under the aerial conditions available, which necessitate a very long lead-in extending right through the house, this is a comparatively excellent result, as such conditions have a very bad effect as regards selectivity. The Igranic gimbal-mounted coils are a revelation as regards selectivity and sharpness of tuning. The ingenious and effective vernier device on the Gimbolder may entirely take the place of a vernier condenser, as it is possible to give an almost imperceptible rotary motion to any desired coil in addition to the usual angular movement. Further, due to an almost complete absence of self-capacity in the coil mountings, great selectivity is obtained.

In this article the exact parts used are mentioned by name, so that anyone desirous of so doing may make the set exactly as described. Where other similar high-class apparatus is available, however, it may be used without detriment, always providing the electrical characteristics are approximately the same.

Materials

The following is a list of the parts used:

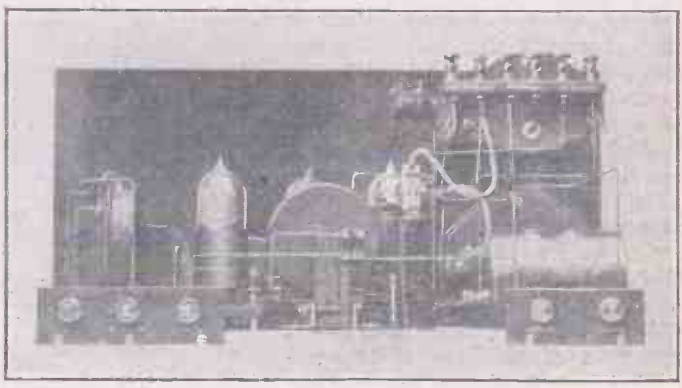
One Radion mahoganite panel, 14 in. by 7 in. by $\frac{3}{16}$ in.; three scrap pieces of ebonite; two rheostats, 15 ohms each; one rheostat, 7 ohms; one Peto-Scott square-law variable condenser, .001 microfarad; one Peto-Scott square-law variable condenser, .0005 microfarad; four Peto-Scott anti-microphonic valve-holders; one Edison-Bell fixed condenser, .002 microfarad; one Edison-Bell fixed condenser, .0003 microfarad; one Edison-Bell grid-leak, 2 megohms; one Elwell radio jack, type S.F.; one pair of Pye push-pull transformers; one Eureka concert-grand transformer; three Radion mahoganite dials, 2¼ in. diameter; two Radion mahoganite dials, 3 in. diameter; one Igranic Gimbolder and suitable Igranic coils; eleven terminals; two coils of glazite; one set of transfers; four Cossor Wuncell valves.



Another View showing Components.

In the following description of the construction of the set, all the components bear a designating number which may be found by reference to the wiring diagram Fig. 2. The panel (15) is illustrated in Fig. 3, from which the dimensions and positions of all the holes for fixing the various parts may be gathered. All the components are of the central-hole fixing type, and therefore no tapping of the panel is required. The mahoganite has a polished surface which need not be removed or matted, as it is the result of a special polishing process.

The rheostats (11 and 12) which regulate the filament current to the first two



View from Rear

valves (19 and 18) have each a resistance of 15 ohms, while that (13) which controls the push-pull valves (17 and 20) and which are in parallel, is of 7 ohms resistance. The Elwell type S.F. jack (14) automatically switches the filaments "off" or "on" when the telephone plug is pulled out or pushed home respectively. It will be noted in the photographs that the rheostats are held away from the panel by means of thick washers slipped over the spindle bearings between the back of the panel and the rheostat formers. Their object is to prevent the rheostat bushes from projecting too far from the front of the panel—a fault which would prevent the dials from lying close to the panel. The dials are fitted so that when the rheostats are "off," the zero marking is placed at the top of the dial.

The variable condensers (1 and 10) are arranged one above the other at the extreme right hand of the panel looking from the rear. Their dials read in reverse directions, one being clockwise and the other counter-clockwise. This detail is clearly shown in the photographs.

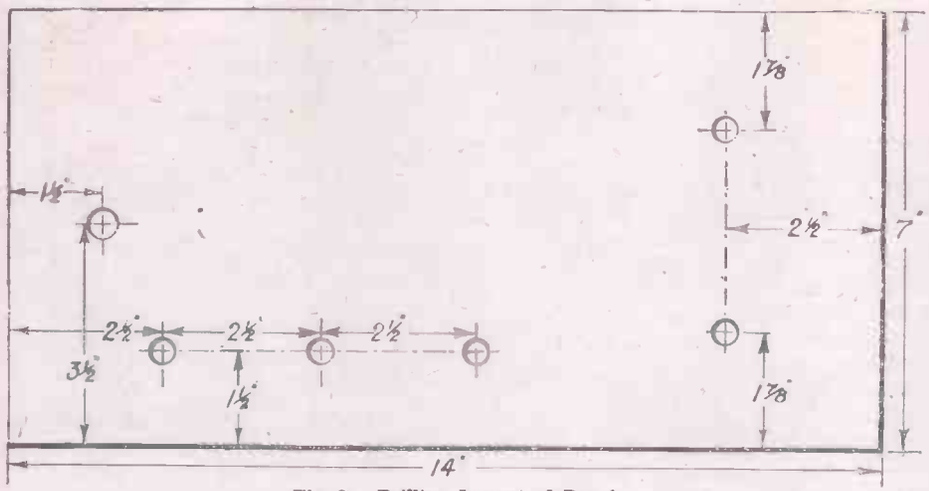


Fig. 3.—Drilling Layout of Panel.

All the uncontrolled parts of the set are mounted on a wooden sub-base 14 in. long by 6½ in. wide. This base may be made of well-seasoned wood ⅜ in. in thickness. If it shows any tendency to warp or twist, it should be tongued and grooved at both ends by strips of wood whose grain runs at right angles to that of the main member. The base is attached by three long brass countersink wood-screws to the back of the panel at its lower edge.

The positions of the valve-holders (17, 18, 19 and 20) may be gathered from the practical wiring plan shown in Fig. 2, and in the plan photograph of the set. The first L.F. transformer (21) is fixed to the right-hand front corner of the base as seen from the rear. The terminals face the left. Just by the latter is the 4½-volt pocket-lamp battery (24) for grid biasing all the L.F. valves. The battery is gripped in a U-shaped clip of brass strip, which is secured to the base by a central hole through which is passed a wood-screw.

To the left again is the first Pye push-pull transformer P.P.1. (22). It is fixed to the base so that its contact strips face the grid battery, the iron core being at right angles to the panel. The second push-pull transformer (23), marked P.P. tele., is placed in the position on the left end of the panel corresponding to the Eureka instrument at the right. The contacts of the last transformer face the panel. A telephone condenser (16) of .002 microfarad capacity is screwed directly to the base between the last transformer and the panel.

R. B. H.

(To be concluded.)

BROADCASTING DEVELOPMENTS IN FRANCE

UP to the present southern France has had but little opportunity of enjoying broadcast telephony. The Landais Radio Club, however, by private subscription, has now installed a low-power transmitter on the Mont de Massan, and is providing a broadcast entertainment every Wednesday between 18.00 and 19.00 G.M.T. The wavelength chosen has been that of 365 metres, which might account for the interference noticed on one or two occasions in the 2LO transmissions.

It would appear that the above-mentioned move on the part of wireless amateurs has stirred the French Government into action, as a new official broadcasting station is already in course of erection at the Hôtel des Postes, Marseilles. Although the wavelength has not yet been definitely fixed, it is fully expected that the first tests will take place within the next few weeks.

According to French reports, now that the Eiffel Tower is transmitting concerts on 1,500 metres thrice weekly, it is almost impossible for the Paris listeners to secure clear reception of 5XX on those evenings. Owing to interference from numerous harmonics considerable difficulty is encountered in tuning-in most of the foreign short-wave broadcasting stations. The 1,500-metre transmissions are broadcast from the small aerial affixed to the first-floor platform of the Eiffel Tower.

J. G. A.

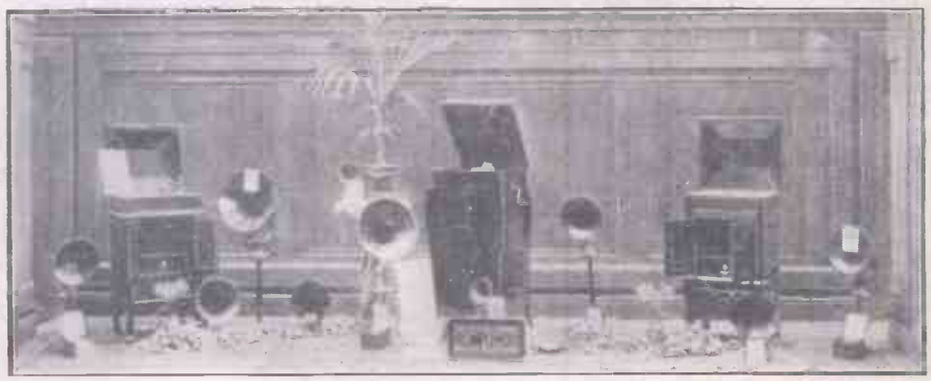
"THE MULTI-VALVER AND THE H.T. BATTERY"
(*continued from page 597*)

very convenient terminals, but in connecting them up care has to be taken to clean up all contacts, as they are usually coated with a certain amount of wax. The photograph shows an 80-volt battery made up in the manner described, there being eighteen 4½-volt batteries.

In order to know with certainty what demands are being made on the high-tension battery by a set, a milliammeter should be wired in series with the negative lead as shown in Fig. 2. Such a meter can with advantage be permanently wired into a set, but then a switch should be arranged so as to short-circuit the meter at such times that readings are not being taken.

D. G. O. H.

The new 5-kilowatt transmitter now being installed at Munich will be in operation next July. Work has already begun on other German broadcasting stations.



ART IN SHOP-WINDOW DISPLAY

The picture shows a window of Messrs. Selfridge & Co. Ltd., with a large range of Amplion loud-speakers.

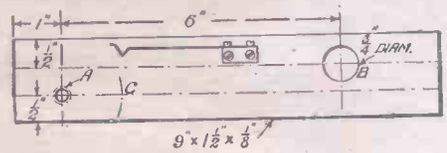
MAKING A COIL WINDER

The Complete Winder.

SOME articles on the construction of low-frequency transformers cheerfully instruct the would-be maker to wind the transformer by means of a winder constructed of "Meccano parts" or a common drill! Only one who has attempted the task of winding some 15,000 to 20,000-turns of a fine wire, such as No. 42 gauge, can appreciate how next to impossible it is to make anything like a good job of a transformer wound by either of the two means.

In winding, in a lathe, any multi-layer coil, the inconvenience of altering the direction of travel at the termination of each layer, as, for instance, in constructing a transformer 1½ in. long with some 75 to 80 layers, is considerable. The winder now to be described reduces this labour to the simple task of lifting the wire from one side of a grooved wheel to the other.

The device consists essentially of a



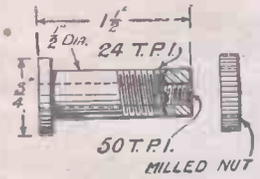


Fig. 1 (above).—Frame Member.

Fig. 3 (left).—Saddle.

multi-grooved drum (over which the wire passes) revolved by the tension of the wire and moving laterally at a very slow rate, acting as a guide to the wire and closely coiling it on the reel or former. It comprises a frame, a mandrel for revolving the reel or former, and a grooved drum revolving on a finely-screwed rod.

The Frame

The frame may be made in various ways, but may conveniently be constructed of a piece of mild steel 1¼ in. or 1½ in. wide by ⅛ in. thick mounted on a leg terminating in a foot, which can be conveniently screwed to a wooden base. The frame may, of course, if preferred, be screwed to a wooden bracket.

The steel should be not less than 9 in. long. First scribe lines as shown in Fig. 1. Drill at point A and tap ¼-in. Whitworth. Obtain a piece of brass tube (Fig. 2) ¾ in. outside diameter by ½ in. bore and 4 in. long and drill a hole at point B (Fig. 1) in the steel plate to fit. Sweat a bush in one end of the tube, drilled $\frac{3}{16}$ in. Sweat the tube in the hole B flush with the face so that it projects 3⅞ in. to the right (see Fig. 2).

Prepare a spindle A (Fig. 2) of ¼-in. silver steel rod 7⅝ in. long, and screw one end for a distance of ⅜ in. ¼-in. Whitworth, and the other end to a distance of about ½ in., leaving a plain part 6¾ in. long. A round milled brass nut should be fitted to the end screwed ½ in. The ⅜-in. screwed portion should be firmly screwed home on the part projecting (Fig. 2).

Gears

A suitable pair of gears of about 1 to 3 ratio should be obtained and the smaller one bored a revolving fit to the above-mentioned spindle. A pair of ¼-in. thick brass gears, with ten and thirty teeth respectively, will be a convenient size. Place the smaller gear on the spindle, and after engaging the other in mesh, scribe the centre C on the longitudinal line of the frame. Drill a hole through the frame at this point about ¼ in. in diameter. The distance of C from the centre A cannot conveniently be accurately determined but can only be fixed by trial.

A short piece of thick brass tube C1, about 2 in. long, with a bore of ¼ in. (assuming the gears are bored ¼ in. or under), is obtained and the hole C enlarged to the outside diameter, the tube being securely sweated in position—flush with the inner face, and projecting at the same side as the large brass tube (Fig. 2).

A piece of silver steel C2 to fit the bore of the brass tube is then sweated into the large gear wheel (so as to form a spindle) and screwed at the other end about ⅜ in. so that it will revolve freely in the tube with the threaded part projecting. A small handle, say 2 in. long by ⅜ in. by ¼ in. thick, fitted with a knob is to be tapped to fit the short spindle (Fig. 2). A grub screw fitted to the handle will make this secure, as the motion being anti-clockwise it tends to unscrew. For those who prefer a clockwise motion a small jockey wheel should be interposed between the large and the small gear wheels.

To prevent the gears moving except when the handle is operated a strong flat spring bent at the end to engage in the teeth of the large gear should be mounted on a small block on the inner face of the frame. (See Fig. 1.)

Before leaving this part of the work the constructor should make sure that the motion of the handle and the large and small gears is as satisfactory as possible, as accurate winding largely depends on the smooth working.

Guide

The guiding mechanism should now be taken in hand. This consists of a threaded brass rod about 12 in. long—screwed for about 6 in.—rigidly held in the projection on which a "saddle" revolves, carrying a series of "stepped" grooved discs or a single grooved drum for the purpose of leading the wire on to the coil.

The construction of the spindle and the "saddle," screwed as they are fifty turns per inch, is beyond the capacity of most amateurs, and recourse must therefore be had to an optical instrument maker.

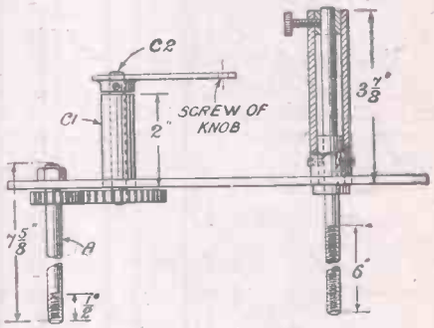


Fig. 2.—Plan of Winder without Base.

Having obtained a brass spindle ¼ in. in diameter 12 in. long and screwed 50 turns per inch for a distance of 6 in., the bush at the outer end of the tube must be bored out an easy fit for the plain part of the spindle. A small set-screw should be fitted through the bush so as to lock the spindle in position.

Another bush about 1 in. long should be fitted at the other end of the hole. It should be bored to fit the plain part of the spindle easily and be a push fit in the tube. It should have a flange about ¾ in. in diameter, and three grub screws should be fitted to the tube (top and sides) so as to hold this bush firmly in position (Fig. 2).

The simplest form of saddle should be 1½ in. long by ½ in. in diameter with a small flange at one end ¾ in. in diameter; this should be screwed for about ¾ in. and fitted with a round nut (Fig. 3). This device will be found quite sufficient and satisfactory for the purpose. H. C. H.

(To be concluded)

RADIOGRAMS

ALTHOUGH the new Wireless Telegraphy and Signalling Bill, recently laid on the table in the House of Commons, has not been proceeded with, it still stands as originally constituted.

The National Association of Radio Manufacturers has decided to arrange a special wireless programme which will be broadcast on the night of April 28. The artists will be chosen as far as possible from those who have found most favour with the British public.

Mr. Victor Smythe (2 Z Y) (Manchester) states that the B.B.C. is considering broadcasting at 8.30 a.m. At first early morning broadcasting would be done on, from London, but probably there will be simultaneous breakfast-time broadcasting later on.

Two-way wireless communication with a New Zealand station has been established by a local amateur at Galt, Ontario. The distance is 9,600 miles.

A claim has been made against the Blyth Corporation for the death of a man who was caught by an aerial which had been blown down, and judgment was entered against the corporation. It was decided to request owners of aerials across public roads to enter into an agreement to insure against accidents to individuals caused by falling aerials.

Capt. Eckersley, of the B.B.C., says that many technical difficulties stand in the way of broadcasting Parliament, and while it is possible to give front-bench speakers, to broadcast the whole sound picture in the House is probably impossible. It will therefore be necessary to erect new stations on different wavelengths to give a Parliamentary broadcast service.

On April 16 the programme will include instrumental music by the London Piano Quartet, a new combination consisting of Mr. Samuel Kutcher (violin), Mr. Harold Berly (viola), Mr. John Barbirolli (violoncello), and Miss Ethel Bartlett (piano).

After a severe earthquake shock, accompanied by heavy rumblings, which occurred in Switzerland, people who were listening to a sermon being broadcast from Lausanne station were able to hear more clearly.

The Turkish Government has decided to build at Angora the most powerful sending station in the world. Capt. Edward Walker, a former British Army officer, is responsible for the new plans, which have been laid before the Turkish Cabinet. The Turks insist that the station shall be more powerful than any in existence, so that it will reach every corner of the world under any atmospheric conditions. The old Constantinople station may be repaired for European service.

The Post Office do not wish to treat broadcasting services as a substantial source of revenue to the State, and will give every consideration to the possibility of reducing the licence fees as the number of licences increase, states the Postmaster-General.

Plans have been completed for the erection of a wireless station at Manila. The transmitting station, with eight steel towers, will be located on Mariveles Peninsula, near the entrance to Manila Bay. The receiving station will be about three miles from Manila. A submarine cable will connect the receiving and transmitting stations, and both will be operated by means of "remote control" from a building in the business centre of Manila. It is said the project will involve an outlay of $4,000,000.

Sir W. Mitchell-Thomson, the Postmaster-General, addressing a special deputation of the Radio Association, agreed that sympathetic consideration should be given to the association's suggestion for the reduction of the penalties on listeners-in proposed by the new Bill.

The Ecole Centrale des Arts et Manufactures, Paris, is now broadcasting short

(Continued on page 606)

RADIOGRAMS (*continued from page 604*)

talks and musical items from a small experimental station installed in the college. The wavelength is about 300 metres and the power 250 watts. The call sign is 8 D K, and tests are made nightly and also from 12.00 to 15.00 G.M.T. almost daily.

The L.C.C. Education Committee proposes to extend the use of wireless in the elementary schools.

In view of the general satisfaction given by the new 1-kilowatt station at Strasnice, the Czecho-Slovakian Government has decided to erect relay stations in the principal cities of Bohemia, Moravia and Slovakia. A new high-power broadcasting station is to be installed at Prague.

April 18 is a musical comedy night, but it will include at about 9.30 p.m. a performance of *An Arabian Morn*, an operetta by Mr. Arthur Wood.

The artistes in the ballad concert for April 19 are Miss Kate Winter, Mr. Walter Glynne, Mr. William Anderson (of the B.N.O.C.), and Miss Isabel Gray, pianist. Additional items will be provided by the 2 L O quartet.

An occupant of a Glasgow steel house of the Athol type states that he has used a two-valve set for four months and had splendid reception. He used also a home-made crystal set with satisfactory results seven miles from the broadcasting station. No shielding effects, such as one might suppose would be caused by the steel walls, are noticeable.

The orchestral programme for April 20 will include, in addition to orchestral music, songs by Miss Bella Redford, Mr. John van Zyl (bass), and part songs by the Brompton Quartet. During the programme Mr. A. R. Nickolds and Mr. Albert H. Howe will entertain, as will Mr. Frank Dunlop and Miss Dorothy Wills in a novelty mixed double-set.

The Scandinavia-Baltic Fair authorities have arranged an exhibition of wireless apparatus in Stockholm from June 14 to 21. Finland, Esthonia, Latvia, Lithuania and Poland will be represented.

La Société des Amis de la Téléphonie sans Fil, of Luxemburg, has offered a receiver to the Berbourg Institute for the Blind.

One of the aerial supports of the University of the City of New York, plans for which have been completed, will be a mast from *Shamrock IV*, Sir Thomas Lipton's yacht. The lower section, 113 ft., is of steel, and the other section, 56 ft., of wood.

Between 8 p.m. and 10 p.m. on April 21 a concert arranged by *The News of the World* will be broadcast from London and some other stations. Savoy bands from 10.30 p.m. till 11 p.m.

By means of loud-speakers placed at various points along the course, crowds at the Oxford and Cambridge boat race were able to hear a full descriptive account of the race.

A concert by Barclays Bank Male Voice Choir, assisted by Miss Carrie Tubb (soprano), Miss Edith Furmedge (contralto), Mr. Peter Dawson (bass), Lamond, the famous pianist, Mr. J. H. Squire, the popular 'cellist, Mr. F. W. Holloway at the organ, and Miss Muriel George and Mr. Ernest Butcher in folk songs and duets, will be relayed from the Royal Albert Hall on April 22. The concert is being given there in aid of the Westminster Hospital.

About £2,000,000 worth of apparatus will be shown at the second Radio World's Fair, to be held on the *New York Times* premises from September 14 to 19.

Although her agents declare that the broadcasting was the cause of a poor attendance at the recent Albert Hall concert, Tetrazzini herself believes that there is no connection between the two matters. She says that arrangements were "rushed through," and that, in her opinion, the day of the week was badly chosen. An official statement issued by the B.B.C. denies that there was faulty transmission which was likely to give a poor impression of the great singer's voice.

An appropriate St. George's Day programme, consisting of some of Edward German's bright, jolly and essentially English music by the Wireless Symphony Orchestra conducted by the composer, will be broadcast on April 23. In addition part songs arranged to old English tunes will be sung by the London Male Voice Octet, and folk songs by Miss Winifred Fisher. At 10.30 p.m. Sir Edward Elgar's cantata, *The Banner of St. George*, will be relayed from the Birmingham station. Savoy bands will be heard from 11 p.m. to 11.30 p.m.

For the first time in history two airmen, several thousand feet in the air and more than five miles apart, have held conversation. This interesting feat was recently accomplished at the Wilbur Wright Field, Ohio, U.S.A., by two army aviation officers, Major H. J. Knerr and Lieutenant M. N. Stewart, during a test of new wireless apparatus. Two aeroplanes were equipped with transmitting and receiving instruments, and the officers conversed with each other with perfect ease while travelling through the air at a speed of 126 miles an hour in different directions.

Sir Landon Ronald will conduct a symphony concert on April 24, the artiste being Miss Daisy Kennedy, violinist.

Arrangements have been made with the Exchange Telegraph Company by which a continuous stream of news will be flashed by land-line to the loud-speaker stations.

Hanover recently relayed a concert broadcast by 5 X X. This relayed transmission was picked up in Switzerland.

CHIEF EVENTS OF THE WEEK

SUNDAY, April 12.

London	3.0	Tchaikovsky Concert.
London	9.0	De Groot and the Piccadilly Orchestra.
Aberdeen	3.0	Bach Afternoon.

MONDAY

London	8.0	Bank Holiday Programme.
Glasgow	8.0	Old English and Pastoral Scenes.

TUESDAY

London	8.0	Star Ballad Concert.
5 X X	8.0	Chamber Music and Drama.

WEDNESDAY

Cardiff	8.0	Pre-war Reminiscences—III.
Glasgow	8.0	Operatic Night.
Belfast	7.30	Symphony Concert.

THURSDAY

London	8.0	Chamber Music and Drama.
Birmingham	8.0	British Composers' Night.
Aberdeen	8.0	Operatic Night.
Glasgow	7.35	Jacobite Memories.

FRIDAY

Bournemouth	8.0	Comic Opera Night, *La Mascotte*
Manchester	8.0	Symphony Concert.
Glasgow	8.0	Scots Composers and Authors.

SATURDAY

London	8.0	Musical Comedy Night.
Bournemouth	8.0	Musical Cross Word Puzzle.
Glasgow	8.0	Around the British Isles in Folk-Song and Dance.
Belfast	7.30	The Orchestral Players' Benevolent Fund Concert.

Ask "A.W." for List of Technical Books

ILFORD AND DISTRICT RADIO SOCIETY

A VERY interesting lecture was given by Capt. Eckersley under the auspices of the above society on Thursday, March 26, in the Town Hall, Ilford. Dr. W. H. Eccles, D.Sc., F.R.S., occupied the chair. The title of the lecture was "The Story of Broadcasting in Britain." Capt. Eckersley's chief theme was concerned with the troubles that have been encountered by the B.B.C. since the inception of broadcasting and the difficulty of pleasing all sections of the community. The audience numbered seven hundred.

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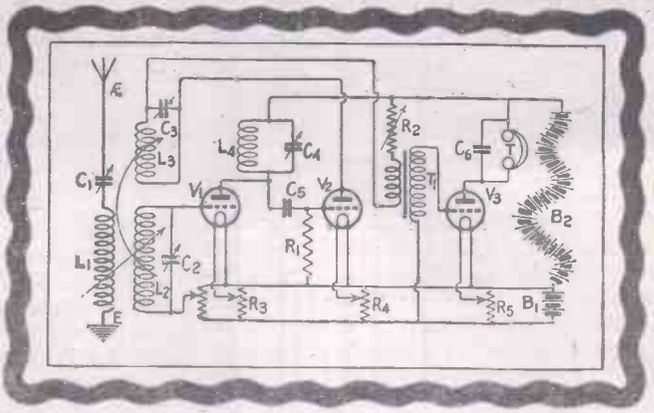

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Mansbridge Condensers

SIR,—In view of the big demand for condensers suitable for high-tension use and other parts of the circuit where a fairly large capacity is required, it is interesting to note that some manufacturers and a large number of dealers are uncertain as to the exact significance of the term Mansbridge condenser. The Mansbridge condenser was invented by Mr. Mansbridge—a gentleman, I believe, who is still on the staff of the G.P.O.—and its claim to fame is based on the fact that tinfoil is actually deposited on the surface of the paper.

To the best of my knowledge Mansbridge rights of manufacture have never been licensed to any Continental firms, and, in fact, were only licensed to about four manufacturers in this country, one of the best known being the Telegraph Condenser Co., Ltd., of Kew.—E. R. G. (London, W.C.).

K D K A on a Crystal

SIR,—I have read with interest, in your issue of February 28, the personal account of the remarkable achievement of Mr. Stafford, who claims to have received K D K A on a crystal.

Is Mr. Stafford satisfied that K D K A was not being relayed (1) by a Continental station, or (2) by an English amateur? Also is Mr. Stafford prepared to give reasonable facilities for hearing his crystal set working when tuned-in on all the B.B.C. stations, which he claims he can accomplish?—GEO. W. ESSEX (Thrapston).

SIR,—One or two further points in connection with Mr. Stafford's claim arise, namely (1) it is difficult to reconcile his statement about visiting local valve users and finding that they had not been working with his previous statement that "powerful oscillation" was heard at various times. Obviously the reception was being accomplished by local valve sets and Mr. Stafford was getting the benefit of them. (2) Speech which could be heard anywhere between 250 and 500 metres must have been very loud indeed. I cannot do this on my variometer-tuned crystal set half a mile from the local station. (3) K D K A's wavelength was changed to 309 metres in January.—J. G. R. (Glasgow).

"Solving the Current-supply Problem"

SIR,—*Re* the article "Solving the Current-supply Problem" in Nos. 143 and 144, I should like to point out a few misleading statements.

1. In Fig. 3 an ordinary lamp (not a neon tube) is shown in the smoother circuit, thus the resistance of the smoother is 2,000 ohms + resistance of lamp, say 2,200 ohms in all. Taking the total resistance of the three valves in parallel as 10,000 ohms, the voltage across them will be $\frac{240 \times 10{,}000}{10{,}000 + 2{,}200} = 197$ volts with this arrangement, which is far too high for the average general-purpose valve.

2. In Fig. 2 the blocking condenser C3 is quite unnecessary in the circuit shown, since the whole set, except the A.T.I. and A.T.C., is insulated from earth.

3. An average current of .5 ampere is assumed to be taken by the valves, and this is also assumed to be the current taken from the mains; but the writer has evidently overlooked the fact that the shunt resistances are only by-passing the surplus current and not reducing the whole current.—J. S. B. (Glasgow).

Other Correspondence Summarised

D. T. (Birmingham) has a Dutch valve which he bought for 7s. 6d. in August, 1923, and which is still "going strong" although he has had 2,420 hours' work out of it.

L. D. (London, W.1) has received 2 L O, 5 X X, 2 Z Y, 6 B M, 5 N O, 5 S C, 5 I T, 2 B D, S F R (Radio Paris), Radio Iberica (Madrid), Munster (Westphalia), and Schenectady (New York) on his single-valve Flewelling super receiver.

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), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Tues. and Thurs. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NQ), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

Chelmsford (high-power station), 1,600 m. Experimental transmission every Monday at 10.30 p.m. from one or other main or relay station.

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), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig., weather; 14.30, Stock Ex. (exc. Sun.), news; 15.10, children (Fri.); 17.10, lec. (Mon., Tues.), con. (Fri.); 17.30, lec. (Thurs., (Sat.); 18.45, Eng. (Mon., Wed.); 18.30, news, weather, time sig., con., lec.; 20.30, dance (Wed.).

Graz, 404 m. Testing.

BELGIUM.

Brussels, 265 m. (1¼ kw.). 16.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 17.00, news; 19.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV) (250 w.), 1,100 m. (250 w.). 12.00, 13.00, 15.50, 17.50, weather.

CZECHO-SLOVAKIA.

Prague (Strasnice Stn.), 570 m. (1 kw.). 09.00, Stock Ex.; 10.00, con. (Sun.); 10.30, Stock Ex. (weekdays); 16.00, Stock Ex., con. (Wed., Sat.); 17.00, Stock Ex. (weekdays); 18.15, con., lec., weather, news; 20.00, dance (Sat.).

Brünn (OKB), 1,800 m. (1 kw.). 09.00, con. (Sun.); 13.00, Stock Ex., news; 18.00, lec., con. (Tues., Thurs., Sat.).

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 775 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.); 20.30, Esperanto (Wed.). * This con. is also relayed by the Aalborghus ship station on 445 m. Sun.: Copenhagen only.

Lyngby (OXE), 2,400 m. Weekdays: 18.20, news, Stock Ex.; 20.00 and 21.00, news, weather, time sig. Sundays: 15.00 and 20.00, news.

Ryvang, 1,190 m. (1 kw.). 19.00, con., news (Tues., Wed., Thurs., Fri.).

FRANCE.

Eiffel Tower, 2,650 m. (6 kw.). 05.40, weather (exc. Sun.); 10.00, markets (exc. Sun. and Mon.); 10.15, time sig., weather; 13.45, 14.35, 15.30,* Stock Ex. (exc. Sun. and Mon.); 17.00, con.; 18.00, weather; on 1,500 m., con. (Wed., Fri., Sun.) at 19.00; 21.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (CFR), 1,750 m. (1¾ kw.). Sundays: 11.45, orch.; 12.45, news; 15.45, lec., con.; 19.30, news, etc.; 20.00, dance music. Weekdays: 11.30, orch., Stock Ex., news; 15.30, markets, Stock Ex., con.; 16.45, Stock Ex., news, women; 19.15, con.; 20.00, dance (Thurs.).

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 13.00, lec. relayed from Sorbonne University (Thurs.); 14.00, outside relay (Sat., irr.); 14.45 and 16.00, lec. relayed from Sorbonne (Wed.); 15.00, outside relay (irr.); 19.00, Eng. talk (Tues.); 19.30, lec. or con., almost daily; 19.45, lec. (Sun.); 20.30, con. (Sun.).

"Le Petit Parisien," 345 m. (500 w.). 20.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyon (Radio Sud-Est), 340 m. 20.00, con. (Tues., Fri.).

Radio-Lyon, 387 m. (temp.). 11.30, news, con., Stock Ex.; 19.30, news; 20.00, con. (exc. Tues., Fri.); 21.00, dance (Tues. Fri.).

Agen, 318 m. (250 w.). 19.30, con. (irr.).

Mont de Massan, 365 m. 19.00, con. (Wed.)

GERMANY.

Berlin (Vox Haus), 505 m. (1½ kw.). 08.00,

(*Continued on page 614*)

"BROADCAST TELEPHONY" (*cont. from page* 612)

sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets, time sig.; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues. and Sun.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30. Telefunken Co. tests on 290 m. about 22.30.

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,900 m. (6 kw.): 10.30, con. (Sun.), Esperanto lec. 3,150 m.: Telegraphen Union, 06.45-18.45, news. 4,000 m. (10 kw.): News, 06.00-20.00 (daily).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sun.); 17.00, shorthand (Sat.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig.; news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 m. (1½ kw.). Relay from Frankfort.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Eberswalde (Lorenz Co.), 280 m. Testing daily about 22.30.

Frankfort-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto (Mon.); 16.05, orch.; 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 9 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Wed., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (700 w.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

Münich, 485 m. (1 kw.). 10.30, lec., con.: 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1 kw.). 06.30, time sig., time sig., con., news (Sun.), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays), Esperanto (Thurs.); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.). Will shortly be increased to 6 kw.

FINLAND.

Helsingfors (Helsinki), 380 m. Testing 17.00, daily.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex. (PX9), 1,070 m. (400 w.): con., 20.40 (Mon.). (PA5), 1,050 m. 19.40, con. (Wed.).

Hilversum (HDO), 1,060 m. (2½ kw.). 11.40, news, etc.; 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, relay of Mendelberg orch. (Thurs.); con. or lec. (Wed., Fri., Sat., Sun.); 21.40, lec. (Sun.).

Bloemendaal, about 345 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (2 kw.). 950 m. (temp.). 06.45, news. Tests daily.

ITALY.

Rome (1RO), 425 m. (3 kw.). Weekdays: 16.15, orch., Stock Ex.; 19.30, time sig., news, Stock Ex. Sundays: 09.45, sacred con.; 15.45, children, Stock Ex.; 16.15, orch., jazz band; 19.30, con., news, weather, dance.

Milan, 650 m. (temp. W.L.). Testing shortly.

Radio Club Italiano. 320 m. 20.00, con. (irr.).

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

NORWAY.

Oslo, 380 m. (500 w.). Testing, daily, about 19.30.

POLAND.

Warsaw (Radiopol), 385 m. (½ kw.). 17.00, tests.

RUSSIA.

Moscow (Central Wireless Station), 1,450 m. Sundays: 12.45, lec.; 15.30, news and con. Weekdays: 13.00, markets; 15.30, news or con.

(Sokolniki Station), 1,010 m. Sundays: 14.30, con.; 17.00, lec. and con. (Tues, Thurs., Fri.).

(Trades Union Council Station), 450 m. 17.00, con. (Mon., Wed.).

Reval, 350 m. Testing.

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 12.30, news, talks (weekdays only); 22.00, weather, Stock Ex., time sig., con., news.

Radio España (EAJ2), 335 m. 8.00, con. and tests.

Radio Espanola (8 kw.), 370 m. (abt.). Testing shortly.

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

Bilbao (Radio Vizcaya), 380 m. (temp.). Testing.

SWEDEN.

Stockholm (SASA), 427 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children;

(*Continued on page* 616)

"BROADCAST TELEPHONY" (*cont. from page* 614)

17.00, sacred service; 19.00, con.; 20.00, news, con., weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 19.00, lec. (irr.), then same as Sun.; 21.00, dance (Wed., Sat.).

Gothenburg * (SASB), 290 m. (500 w.). 09.55, sacred con. (Sun.). From 11.30 onwards S.B. from Stockholm.

Malmoe * (SASC), 270 m. (500 w.). As Gothenburg.

Sundsvall * (SASD), 545 m. (500 w.). As Gothenburg.

Boden * (SASE), 2,500 m. (500 w.). As Gothenburg.

Falun (SMZK), 370 m. (250 w.). 19.00, S.B. from Stockholm thrice weekly.

Joenkoeping (SMZD), 265 m. (250 w.). See Falun.

* Local programmes are also broadcast at times.

SWITZERLAND.

Lausanne (HB2), 850 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 515 m. (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con. (exc. Sun.); 17.15, children (Mon., Wed., Thurs., Sat.); 18.00, weather, news (exc. Sun.); 19.15, lec., con., dance (Fri.); 20.45, news.

Geneva (HB1), 1,100 m. (temp.). New station shortly testing.

The Home Constructor's Easy to Build Wireless Sets, by F. H. Haynes (Iliffe and Sons, Ltd., Dorset House, Tudor Street, E.C.4), price 1s. 6d. net. This book has been prepared to meet the requirements of the man who wishes to construct an inexpensive and reliable set.

Designs are given for a crystal set, single-valve set, note magnifier and power amplifier, and two three-valve receivers.

In these designs the limitations of the skill of the amateur have not been overlooked, and although the sets described are of good appearance, difficult constructional operations have been avoided.

Coventry and District Co-operative Radio Society
Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. At the meeting held on March 25 the chairman, Mr. E. P. Beaumont, gave a brief talk on "Heterodyning."

Dublin Wireless Club
Hon. Sec.—MR. A. C. BRIDLE, 29, St. Anne Street, Dublin.
A MEETING was held on March 19, with Mr. H. J. Wilson in the chair. Mr. D. L. Finlay delivered a lecture on "The History of Wireless" and "Some Possible Explanations of To-day."

IMITATION COMPONENTS

A LIVERPOOL electrician was granted judgment for £50 and costs in the Liverpool County Court last week. He saw in a shop window a notice offering a reward of £50 to anyone who could prove that any of the articles in the window sold at less than retail price were imitations of the genuine article. He bought a pair of phones which were stated to be Ericsson headphones, but on examination they were found to be, in his opinion, imitations of Ericsson phones. He applied for the reward, which was refused.

We are informed by Messrs. C. A. Vandervell and Co., Ltd., of Acton, W.5, that owing to the fall in price of lead and lead oxide they are withdrawing the advance of 10 per cent. recently placed upon certain types of their batteries.

Fuller's United Electric Works, Ltd., of Chadwell Heath, have issued a revised edition of their Sparta accessories list, No. 315c, new features in which are the Little Sparta loud-speaker, American-type vacuum sockets, and a new single-coil holder.

The Radiotjaenst Akt. has now added two further stations, Falun and Joenkoeping, to its broadcasting system in Sweden. The latter is working on the same wavelength as Brussels, namely, 265 metres.

The Marconi wireless station at the Basle Aerodrome (Switzerland) will shortly broadcast daily concerts.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent 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 & 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.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to **first post on Thursday morning** for following week's issue, providing space is available.

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

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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.

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