

The WIRELESS WORLD AND RADIO REVIEW



RADIO TOPICS

THE WAVELENGTH REVOLUTION

LESS than a year has passed since such a stir was created by the extraordinary successes of amateurs in bridging the Atlantic with small power transmitters on wavelengths of the order of 100 metres. As is well known, prior to those eventful days, wavelengths of that order were regarded as unsuitable for commercial purposes, because it was thought that the range of a station increased proportionately to the wavelength, or perhaps it would be more correct to say that it was considered that the absorption which took place over long ranges on short wavelengths made these wavelengths unsuitable for application to commercial purposes. What has taken place during the past year may rightly be described as a revolution in wavelengths because almost every enterprise of importance which is concerned with long distance transmission has turned its attention to short wave transmissions.

We know that Senatore Marconi has been conducting exhaustive research work in this direction over a considerable period and as instances of other transmissions being conducted in an experimental way, one may refer to the Eiffel Tower tests on wavelengths of 115, 75, 50 and 25 metres, the British Admiralty transmissions on various short wavelengths which have been going on for some months past, the broadcasting transmissions by **KDKA**, **WGY** and other American stations on wavelengths of the order of 115 metres, and now we have Koenigswusterhausen, whilst still more recently we learn that transmissions of a similar character are emanating from the French station at St. Assise.

Probably there are other concerns which

are no less active than those we have mentioned specifically above.

With so much concentration and research work being carried on in a field which has hitherto been practically neglected, it is impossible to foreshadow how great may be the developments and the possibilities in the direction of efficient long distance communication by wireless. Even if the only gain in adopting short wavelengths for transmission, were the increased efficiency, the possibilities would be remarkable, but we find that in this direction also lies a solution to the problem of congestion of wavelengths and interference between one station and another, which is so serious on some of the longer wavelengths.

On this page in our issue of last week we reminded our readers of the enormous advantage gained by employing short wavelengths where a large number of transmitters were required to work, because when we convert wavelength into kilocycles we can then appreciate how much wider a band is available than on the longer wavelengths which are now commonly used for long distance transmission.

ARTIFICIAL AERIALS AND CALL SIGNS.

IT is reported that the Post Office is likely to issue a distinctive call sign to those experimental stations which are authorised to conduct experiments with transmitting apparatus on an artificial aerial only. As a consequence the whole question of the allotment of call signs for artificial aerial experiments has been brought up again.

It would be interesting to know the reason why such stations, which under the terms of their licences are not permitted to communicate with any outside station, are allotted any distinctive call sign at all, unless

it is that the Post Office anticipates that the licensee is likely to disregard the conditions and communicate with distant stations, and that for this reason it is desirable that these transmissions should be easily identified.

Holders of full transmitting permits do not wish to assist those licensed to use artificial aerials to infringe the regulations by co-operating with them in any communication tests in which they may indulge, and at the present time, with no official list available, there is no means of knowing whether the calling station is authorised to carry out transmission tests. Several instances have occurred where holders of non-radiating licences have put their signals on to the ether, but the distinctive call sign will make the offence so blatant that it is doubtful if this sort of thing will continue.

Again, of course, this question raises the point which is contested by many as to whether the Post Office is in order in demanding that for non-radiating transmitting experiments a special transmitting permit is necessary at all.

We believe that the Council of the Radio Society is fully alive to these disputable points and therefore we may look for some definite decision in the near future.

THE 1,600-METRE STATION.

ALTHOUGH the 1,600-metre station of the B.B.C. is now working regularly, it must not be overlooked that it is still an experimental station and the Post Office authority has yet to be obtained before it can be included as a permanent station of the B.B.C. organisation.

The permit under which the B.B.C. operates the station experimentally at present is only of a temporary nature and the station has got to justify its existence before it will be sanctioned as a permanency.

The daily press has had a good deal to say regarding the station and yet no very definite expression of opinion as to the merits of the scheme has been put forward.

The amateur and general listener in particular has so far refrained from expressing any views and it would be extremely interesting to hear from readers of *The Wireless World and Radio Review* their opinions either in favour of the establishment of the station as a permanency or against it.

If every reader would note his views on a post-card and forward it to the Editor, the information so obtained would be of considerable interest and if sufficient postcards are received, a summary of the views expressed would be published.

THE NEED FOR CLOSER CO-OPERATION AMONGST AMATEURS.

THE outstanding impression given at the first meeting of the General Committee of Affiliated Societies, which was held in London on Saturday, July 26th, was the need for closer co-operation amongst societies and individual amateurs in order to stimulate a more democratic spirit, especially between the parent Society and affiliated societies and groups.

The aim should be to establish a wireless fraternity in this country, certainly not less enthusiastic than the American organisation, the American Radio Relay League.

Anything which can possibly be done to stimulate enthusiasm and united effort should be encouraged to the utmost both by Societies and individuals.

The General Committee of Affiliated Societies would, we feel sure, welcome communications from any amateurs who may have suggestions to make as to how a national amateur spirit can be fostered.

FREE VALVES FOR IDEAS.

IT nearly always happens that a visit to a fellow amateur's station discloses some original ideas incorporated in the detail of the apparatus, but the owner of the station possibly never realises that such ideas are of very great interest to others.

In order to encourage readers to look round their stations and see what novel ideas of interest to others they have introduced, we are arranging to include a page of ideas and devices of this kind and for every suggestion accepted for publication under this section a receiving valve will be forwarded to the reader. We ask all readers therefore to look round their stations and see how many new valves their ideas may represent.

THE EDITOR.

THE HIGH POWER STATION.

A DESCRIPTION OF THE EQUIPMENT AT 5 XX.

The 1,600 metre station has been set up by the British Broadcasting Company in order to permit of crystal reception over an extensive area, to allow of relaying between existing stations by means of wireless instead of Post Office lines and thus avoid a good deal of distortion, and also to provide listeners in coastal areas where ship jamming is experienced, with a broadcast transmission free from interference. The working of the station was described in the previous issue.

BROADCASTING has certainly brought about rapid developments in the design of telephony transmitting apparatus employing moderate power. The transmitting equipments installed at the main and

relay stations of the British Broadcasting Company were rapidly developed, and for most of the stations a standard type of transmitter has been drawn up which has functioned efficiently without modification.

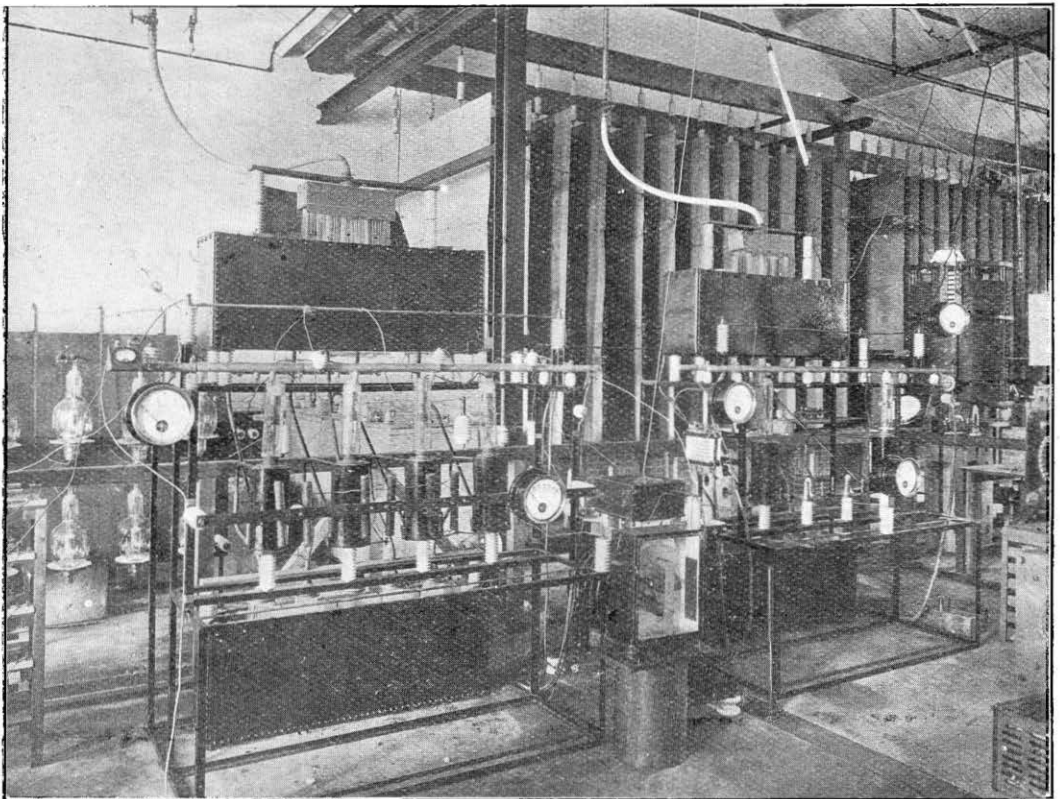


Fig. 1. Water-cooled modulator and oscillator valves. The closed circuit condenser is seen suspended from beams in the background.

The idea of setting up a central broadcasting station of such high power that crystal reception can be obtained at almost any part of the country presented many new problems, and one stage in the advancement has been the adoption for the first time in this country of high power water-cooled valves for telephony transmission. The provisional design for a high-power telephony transmitting station is now complete.

The aerial system at **5 XX**, which is situated at the Marconi Works, Chelmsford, makes use of the two 450 ft. steel masts which have been in use there for some time for experimental work. A single cage aerial

tension supply was obtained from a large direct current generator, whilst the "studio" from which Dame Nellie Melba sang consisted of nothing more than a table near the machines with a small hand microphone.

Power at high voltage is now obtained by stepping up alternating current and rectifying with a bank of valves.

In Fig. 2 can be seen on the extreme left the oil immersed step-up transformers with output fed to the rectifying valves. The four large valves in the centre of the picture are in the master oscillator circuit and operate at a potential of 9,000 volts. The air-spaced plates immediately

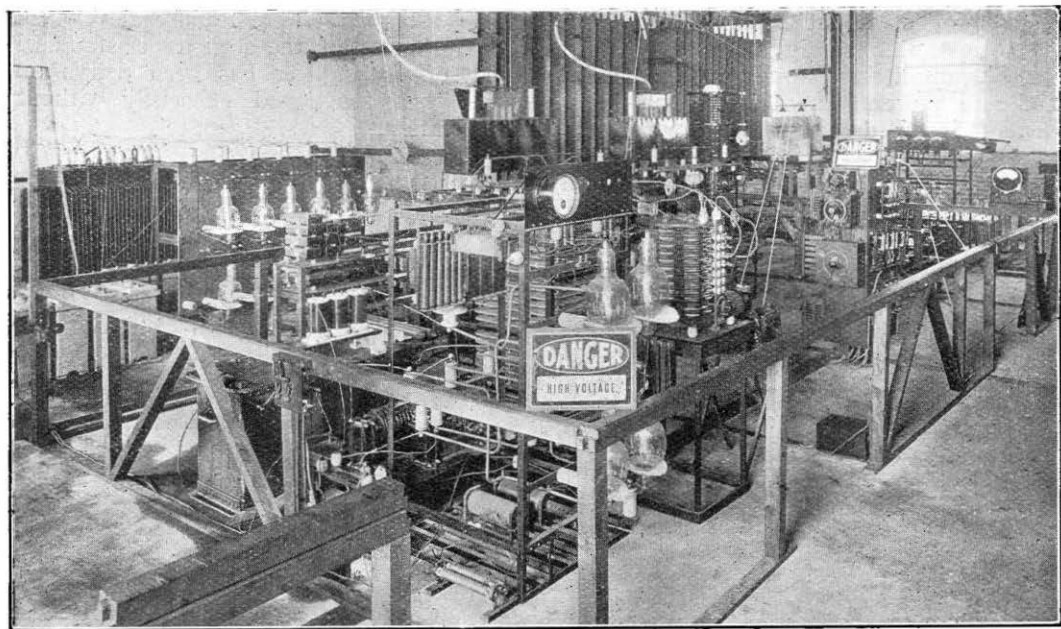


Fig. 2. The H.T. supply at 9,000 volts is derived from the bank of rectifier valves, which are fed by the step-up transformers seen behind the wooden barrier. The master oscillator equipment is in the foreground.

is employed of "L" formation, having a natural wavelength of between 1,300 and 1,400 metres.

Referring to the accompanying illustrations, a good idea of the construction of the installation can be obtained for most of the component instruments can be readily identified. It will be noticed that the entire station is housed in one workshop, and it was in this room that the first broadcast installation was set up in 1921, even before the days of **2 MT** at Writtle. At that time the high

behind the valves form the condensers for the oscillatory circuit, whilst the tuning inductance is on the immediate right of the valves. The main oscillator valves can be seen on the right-hand side in Figs. 1 and 3, and it will be noticed that they are fitted with metal jackets for the purpose of water cooling.

The valves pass a total current of 1,700 milliamperes at a potential of 9,000 volts, representing a power of 15.3 kW. and an aerial current as high as 40 amperes is

obtained. In Fig. 3 can be seen the modulation choke which is situated to the left of the panel which carries the oscillator valves, and to the left of the choke can be seen the frame carrying the four modulator valves. These can be better seen in Fig. 1. It will be noticed that these valves are also of the water-cooled type. They handle a current of 1,650 milliamperes and also operate at a potential of 9,000 volts. The resistances which are connected in their anode leads can be seen supported along the front of the rack.

water-cooled valves. The master oscillator high tension supply is derived from a full wave rectifier, the two valves of which are immediately below the oscillator valves in the foreground in Fig. 2. Modulation is carried out by the well-known choke control arrangement, the high tension supply being fed through a highly inductive winding on an iron core and distributed between modulator and oscillation amplifier valves.

The aerial is loosely coupled to a closed oscillatory circuit and a very interesting form of high tension condenser with air dielectric

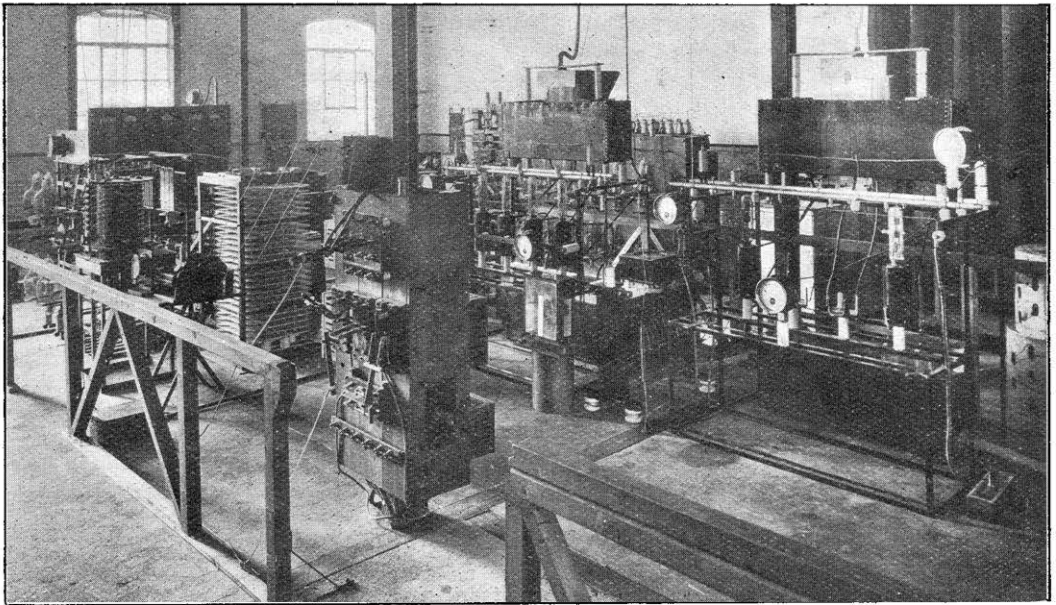


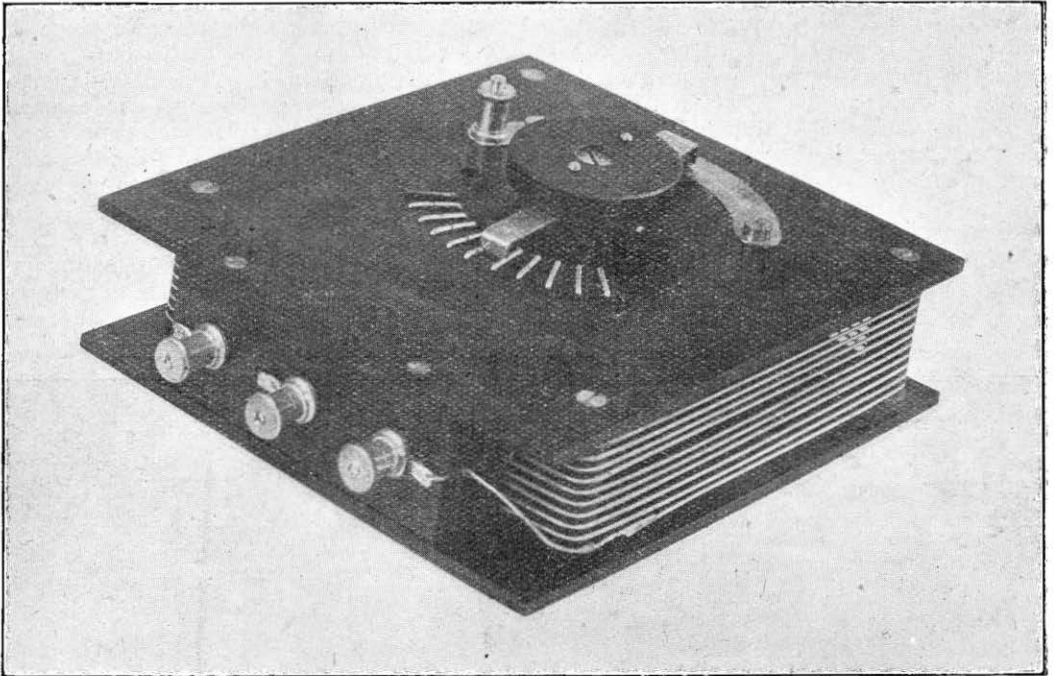
Fig. 3. The master oscillator with its oscillator and rectifier valves, inductances and air plate condensers can be seen on the left. The modulator choke is between the racks carrying the high power valves.

Referring again to Fig. 2, a battery of dry cells can be seen immediately in front of the rectifying valves. This battery has a potential of 1,150 volts and is connected in the grid circuit of the modulator valves, to produce the necessary negative bias.

The circuit is similar to that employed at 2 LO. A master oscillator, or as it is sometimes called, a drive circuit, consisting of two valves connected in parallel, is used to set up oscillations of the required wavelength which are amplified by the two

is shown in Fig. 1, in which a number of large metal plates are suspended by means of insulators from a rack.

The layout of the equipment is still in an experimental stage, though it is probable that the design of the high power station which is to be built will be based upon the arrangement here described, which has been developed by the research staff of Marconi's Wireless Telegraph Company, in co-operation with the engineers of the British Broadcasting Company.



Tapped inductance of efficient design. The method of making the contacts is unique and a minimum of capacity is created between them.

COIL DESIGN FOR CRYSTAL RECEPTION

The construction of tuning inductance units for efficient crystal reception having been described, the method of drilling a tapped unit is here dealt with. These units should prove of general utility to the experimenter, to whom the novel design will make a special appeal.

By F. M. COLEBROOK, B.Sc.

(Concluded from page 505, July 30th, 1924.)

IF it is desired to tune by inductance only, one of the coils must be fitted with some arrangement by means of which the aerial can be tapped to any one of the ten turns. This could, of course, be done by means of some form of light wandering clip, but a simpler method from the point of view of manipulation is to mount on the top side

plate of the coil some form of switch. The details of any such switch are of importance, since a wrong design may add considerably to the self capacity of the coil. The type of construction adopted by the writer is exceedingly simple and reduces to a minimum the extra self-capacity added by the switch gear.

The side plate of the coil (in $\frac{1}{8}$ in. ebonite)

must first be marked out and drilled as shown in Fig. 5. In addition the parts illustrated in Fig. 6 will be required. The switch knob is shaped from a piece of $\frac{3}{8}$ in. ebonite sheet, and the switch lever is made from hard rolled brass or bronze strip of about 26 or 28 S.W.G. The spindle may consist of a 2 B.A. screw with head recessed into the knob and with nuts on the face and underside of the panel so that the switch revolves on the stationary screw. Instead of contact studs, which are unnecessarily large, small staples of No. 16 copper wire are used. These must be bent so that the distance between the legs is exactly equal to that between corresponding holes of the double ring of holes shown in Fig. 5. They are fixed as shown in Fig. 7. On to the ends of the staples nearest the terminal block end of the side plate are soldered short straight lengths of No. 22 copper wire, the ends being left projecting over the top edge of the side plate.

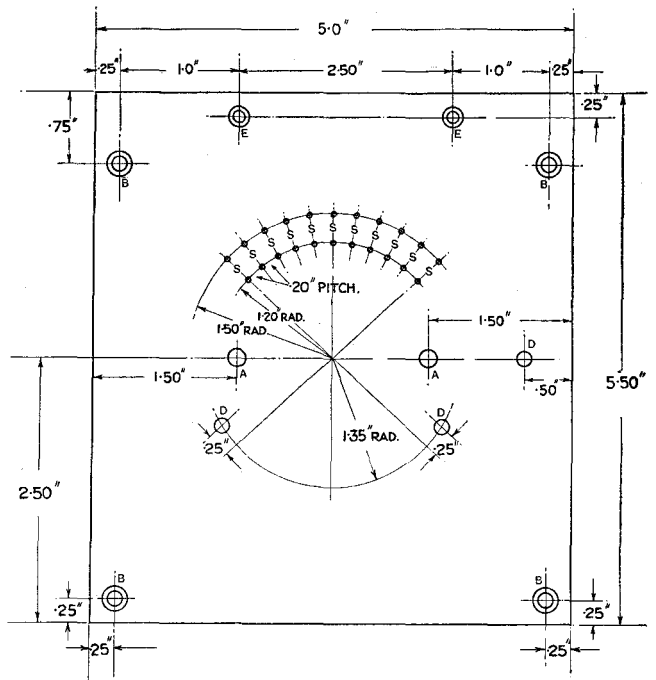


Fig. 5. Drilling of ebonite end plates for switch contacts. Size of holes: A, $7/32$ " ; B, $3/16$ " and countersunk on topside for 3 B.A. screws ; D, $5/32$ " ; E, $1/8$ " and countersunk on topside for 6 B.A. screws.

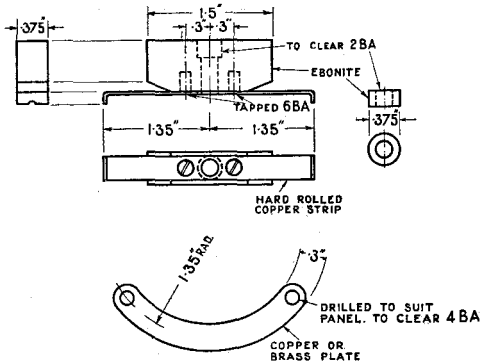


Fig. 6. Details of switch arm and contact piece.

one to each turn, the end wires going to the extreme ends of the winding. The complete unit is as shown in Fig. 8.

For pure inductance tuning, only about three or four units will be required. The aerial is, of course, connected to the back contact of the switch, the other connections being as usual.

The coil frame can now be assembled and the coil wound in exactly the same way as before, except that, as each turn is put on, one of the contact wires from the switch is pulled forward so as to lie under its respective turn, as shown in Fig. 7. When all the turns have been put on these projecting contact wires are cut short and soldered,

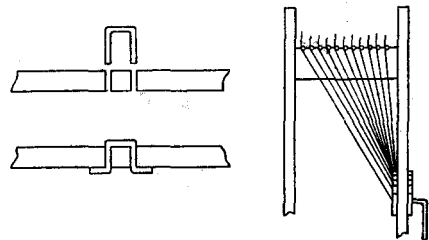


Fig. 7. Contacts and tapping connections.

There is very little to choose between the results obtained when tuning by variable condenser or tapped inductance. The tapped inductance method is the simpler, and

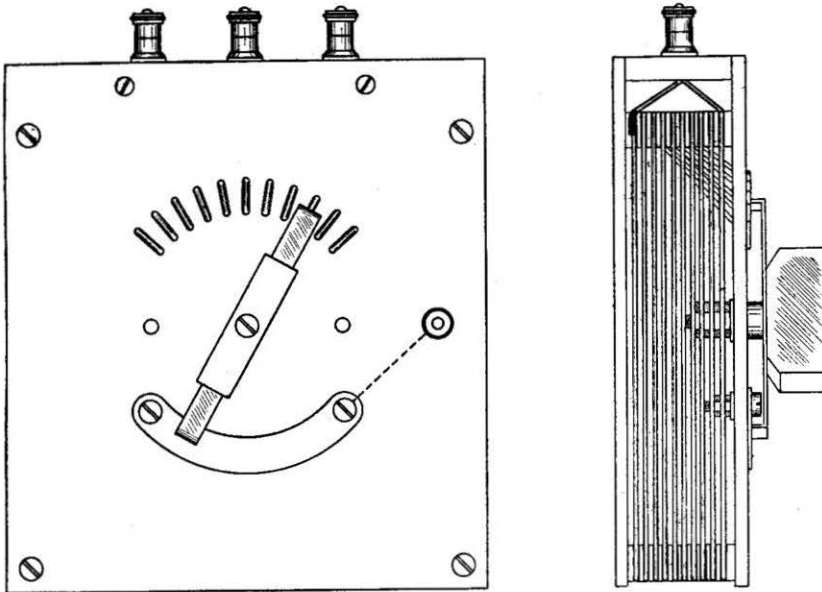
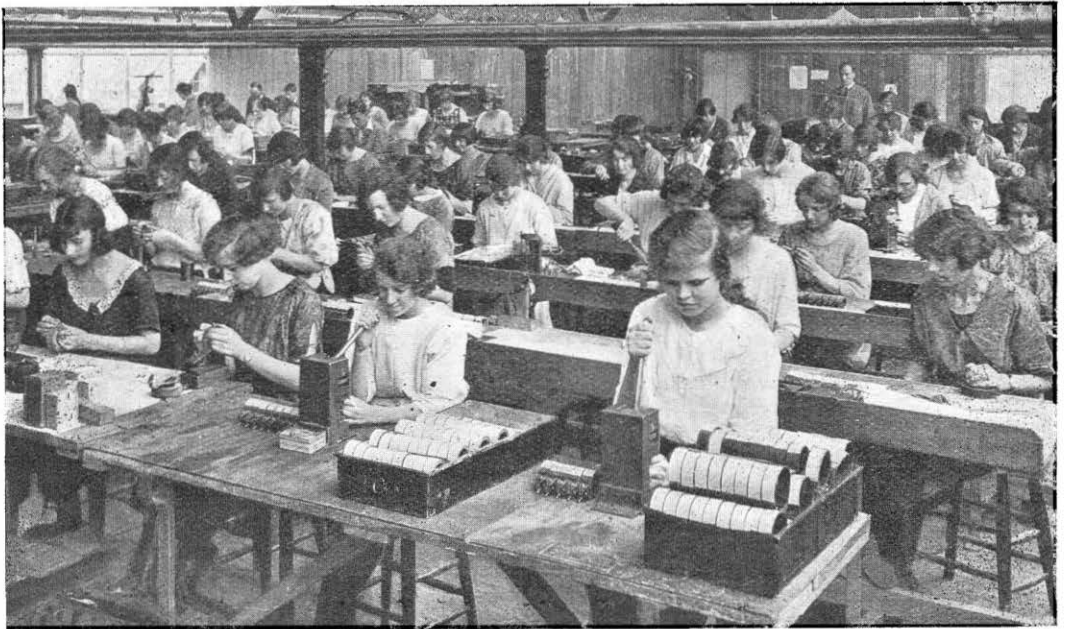


Fig. 8. Front and side views of the tapped unit.

perhaps slightly more efficient. The first is more convenient, however, and is more adaptable to varying conditions. It is also the better circuit for use with an exceptionally high resistance detector since it can provide, if required, a very much greater signal electromotive force for the operation of the detector.

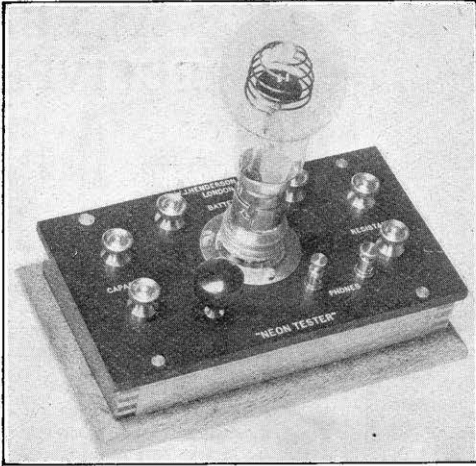


The assembly of tuning coils in progress at the works of the Igranic Electric Co., Ltd.

PRODUCTS OF THE MANUFACTURERS.

Neon Tube Tester.

When a neon gas-filled lamp with a condenser joined across it is connected up to a suitable high voltage such as the supply mains, through a high resistance possibly



Neon tube panel for resistance, capacity and insulation measurements.

of the order of half a megohm, it will be found that intermitting flashing on the electrodes of the lamp will be set up. This is due to the fact that a certain initial voltage is required before the lamp will glow and the high resistance in the supply circuit causes the voltage of the condenser to build up slowly, whilst, as soon as the flash occurs in the lamp, its resistance drops and the condenser becomes almost completely discharged.

The time taken between one flash on the lamp and the next is dependent upon the capacity of the condenser and the value of the resistance, and thus a neon tube can be used for making both comparative resistance and capacity tests, and one special application is the measuring of the value of resistances such as are used for grid leaks. As it will operate through very high resistances it can also be used for testing insulation.

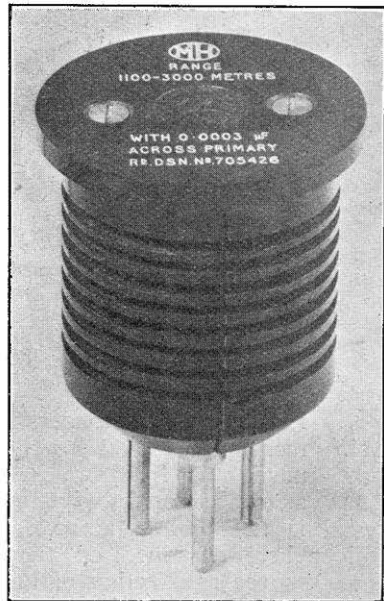
Messrs. W. J. Henderson & Co., 351 Fulham Road, London, S.W.10.

Interchangeable H.F. Transformers.

High frequency transformer construction presents many difficulties, not least of which is the importance of uniform capacity coupling between the primary and secondary windings on any pair of transformers intended to cover corresponding wavelength ranges.

In the transformer shown it will be noticed that primary and secondary are wound in alternate grooves on an ebonite former which makes the primary to secondary capacity constant, and at the same time ensures perfect insulation and produces tight inductive coupling with a minimum of capacity coupling.

A point in favour of the use of a transformer as compared with the tuned anode arrangement is that rectification may be



Interchangeable type of H.F. transformer. The primary winding is tuned with a 0.0002 μ F variable condenser.

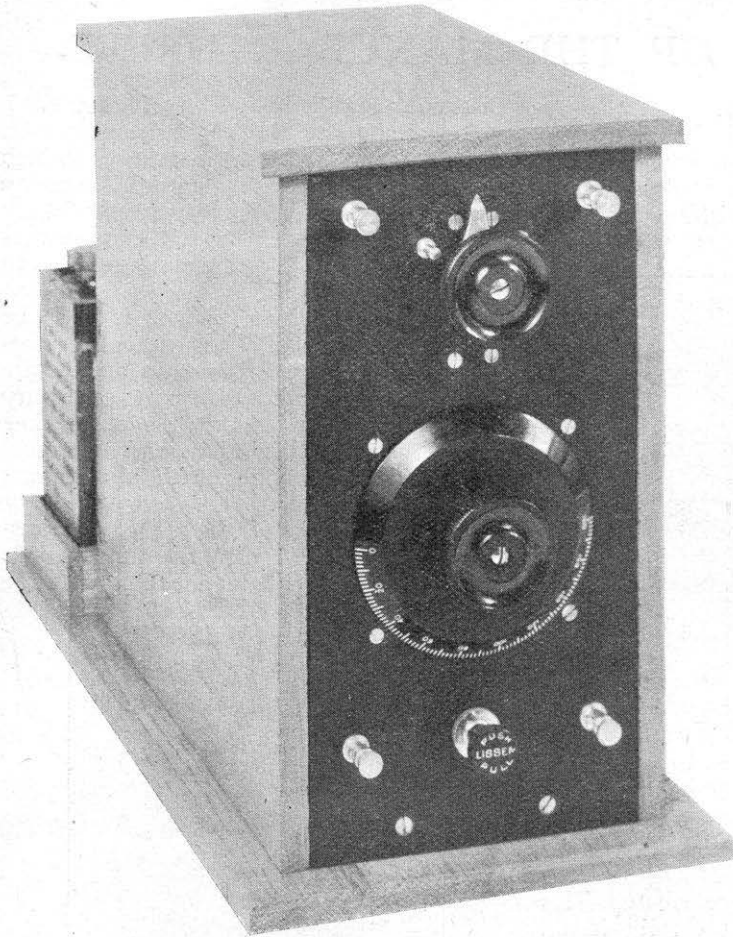
obtained by the use of a special detector valve such as a Q or QX, instead of employing the leaky condenser method of rectification with a general purpose valve.

Messrs. Leslie McMichael, Ltd., Hastings House, Norfolk Street, Strand, W.C.

DESIGN FOR A SINGLE- VALVE RECEIVER

The receiver described below does not employ reaction and its tuning may therefore be carried out without fear of causing interference. It is silent in operation and will give months of service between each charge of the batteries.

The aim in the design has been to produce an instrument possessing easy operation. A valve is therefore used as a detector and tuning is carried out essentially on a single dial. The wavelength range includes reception of 5XX.



By F. L. DEVEREUX, B.Sc.

WHEN receiving broadcasting by means of a crystal set one is never quite free from the doubt as to whether the adjustment of the crystal is the best obtainable. With the receiver here described, on the other hand, one has the satisfaction of knowing that so long as the valve is switched on nothing can be done to improve signal strength and instead of making adjustments every few minutes the programme may be enjoyed in peace of mind.

No reaction is employed, so that the range of the set is only slightly greater than that of a crystal receiver, but the adjustment of the set can be left to any member of the household as it is impossible to cause interference

with other receivers by oscillation. The selectivity of this receiver is higher than that of a crystal receiver and it is, therefore, easier to tune out the local station when listening to the high-powered station at Chelmsford.

COMPONENTS.

The receiver is tuned by means of a Sterling variometer, which gives a wavelength range of 250 to 2,750 metres in three stages when used in conjunction with a 0.0005 μ F. fixed condenser and the Sterling barrel type switch. This switch has three positions, in the first of which the two variometer windings are connected in parallel and the fixed condenser is connected in series with the aerial. In the second position the condenser

is disconnected and the windings are connected in series, while in the third position the condenser is in parallel with the windings which are still connected in series.

A 0.06 type valve is used and is supplied with filament current from two Exide DTG cells. One has to be careful in

out the discharge. A fixed filament resistance can, therefore, be used instead of the variable resistance necessary in the case of dry batteries and the adjustment of the instrument is simplified. The maintenance costs are much lower when these cells are used as it is possible to listen for 290 hours

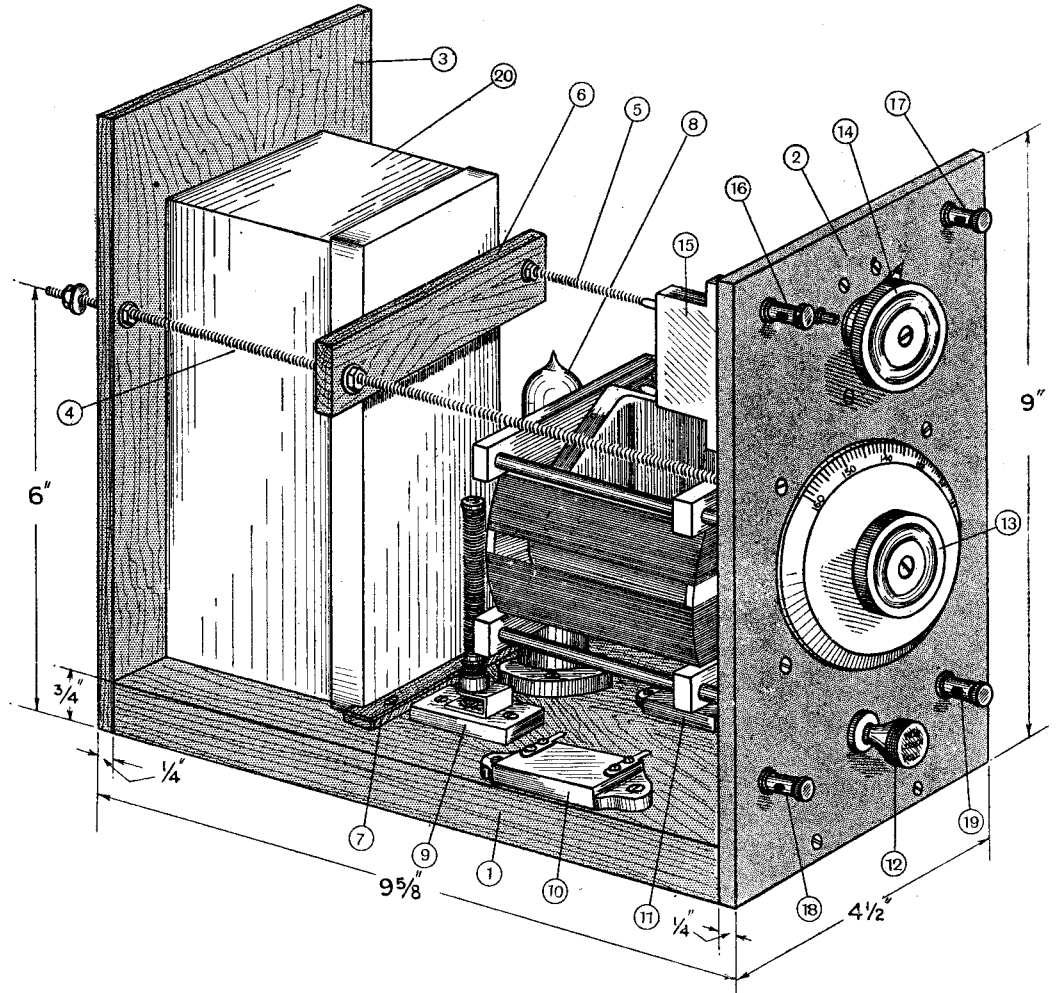


Fig.1. The receiver unit showing arrangement of components. The parts indicated by numbers are as follows:—1, base; 2, ebonite front panel; 3, back panel; 4 and 5, rods screwed 4 B.A.; 6, battery clamp; 7, battery stop; 8, valve; 9, filament resistance; 10, telephone condenser 0.002 μ F; 11, grid condenser and leak; 12, filament switch; 13, variometer dial; 14, rotary switch; 15, fixed aerial condenser, 0.0005 μ F; 16, aerial terminal; 17, earth terminal; 18 and 19, telephone terminals; 20, H.T. battery. Most of the leading dimensions are given. The spindle of the variometer passes through the point of intersection of the diagonals of the front panel. The centres of the rotary switch 14, and filament switch 12, are $1\frac{1}{2}$ ins. from the top and bottom of the panel respectively.

handling these cells on account of the acid, but they have been chosen because the voltage remains practically constant through-

on one charge, which should cost not more than a shilling. If the set is used for about four hours each day the batteries will not

need attention for a period of two months.

A list of the components actually used is given below:—

- Sterling variometer, type R 2674.
- Sterling rotary switch, type R 2838.
- Lissen two-way switch.
- Fixed mica condenser, 0.0005 μ F (Dubilier).

ASSEMBLY.

The components, with the exception of the DTG cells, are all mounted in one unit, which may be removed from the container after the removal of two screws at the back. The basis of the unit, which is illustrated in

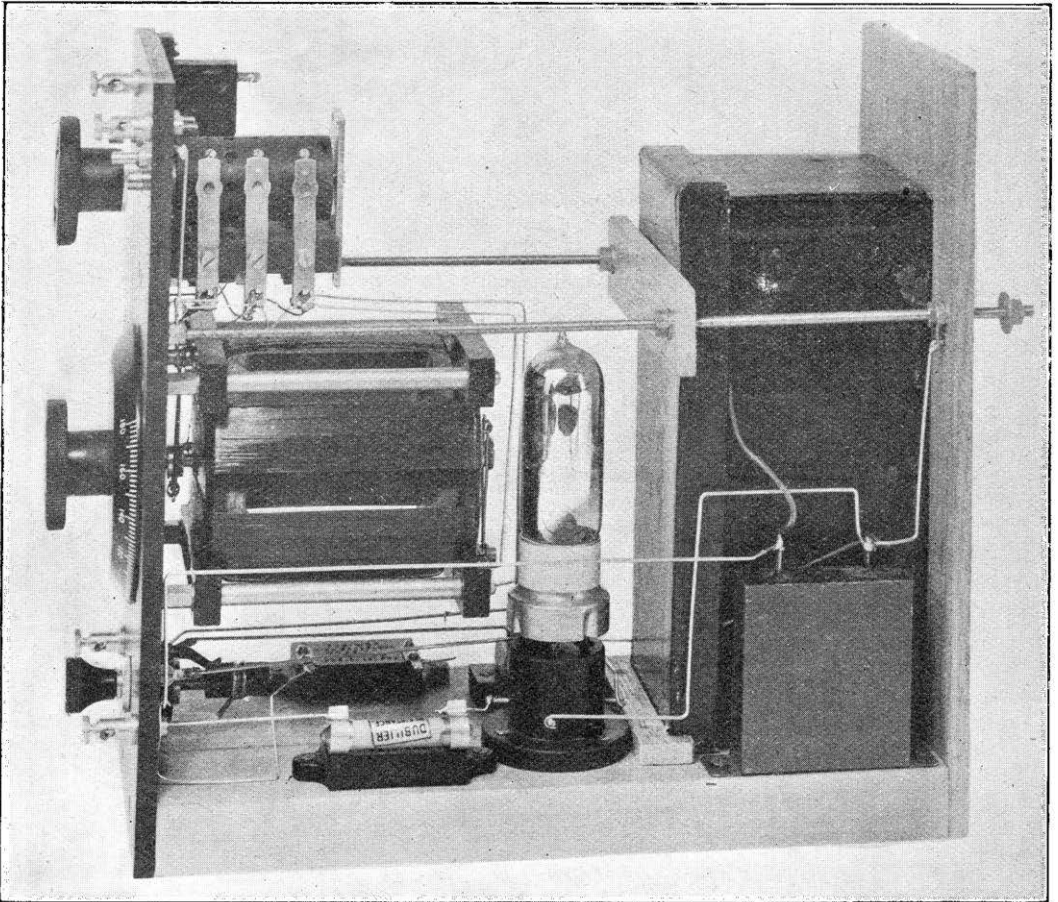


Fig. 2. The unit as seen from side opposite to that in Fig. 1. In addition to the components visible in the previous figure, the H.T. condenser at the side of the battery and the rotary switch on the front panel are clearly shown.

- Fixed mica condenser, 0.0003 μ F. with 2 megohm grid leak attached.
- Fixed mica condenser, 0.002 μ F. (connected across telephones).
- T.C.C. Mansbridge type condenser, 1 μ F.
- Valveholder.
- Fixed resistance, 20 ohms (Burndept No. 729).
- Holder for resistance (Burndept No. 718).
- H.T. battery (Siemens 36 volt, No. 827).
- Two Exide DTG type cells.
- Terminals, wire, etc.

Fig. 1, is formed by the base (1), the ebonite front panel (2) and the wooden back panel (3). The front and back panels are the same size and are held together by two 4 B.A. rods (4) and (5), each 10½ ins. in length. Full use is made of these rods, for they not only give rigidity to the vertical panels but also serve to hold the unit in position in the containing case, to clamp the H.T. battery

in position and to conduct the filament current from the exterior to the interior of the set. The insulation of the wood at the back of the panel is perfectly satisfactory for the comparatively low filament voltage. The wooden cleat (6) clamps the H.T. battery (20) to the back panel and the bottom of the battery is prevented from moving by the wooden stop (7). The valve and valveholder (8) and the fixed filament resistance (9) are mounted vertically on the base immediately in front of the H.T. battery. The telephone condenser (10) and the grid condenser and leak (11) are screwed

when the battery is approaching the end of its useful life. In passing it may be mentioned that there is absolutely no trace of any hissing noise when the valve is switched on; if reaction were used there would almost certainly be a certain amount of extraneous noise.

WIRING.

It is rather difficult to show the wiring clearly on an actual plan and elevation of the instrument and a diagrammatic wiring scheme has been prepared in Fig. 3. The wiring of the variometer and rotary switch

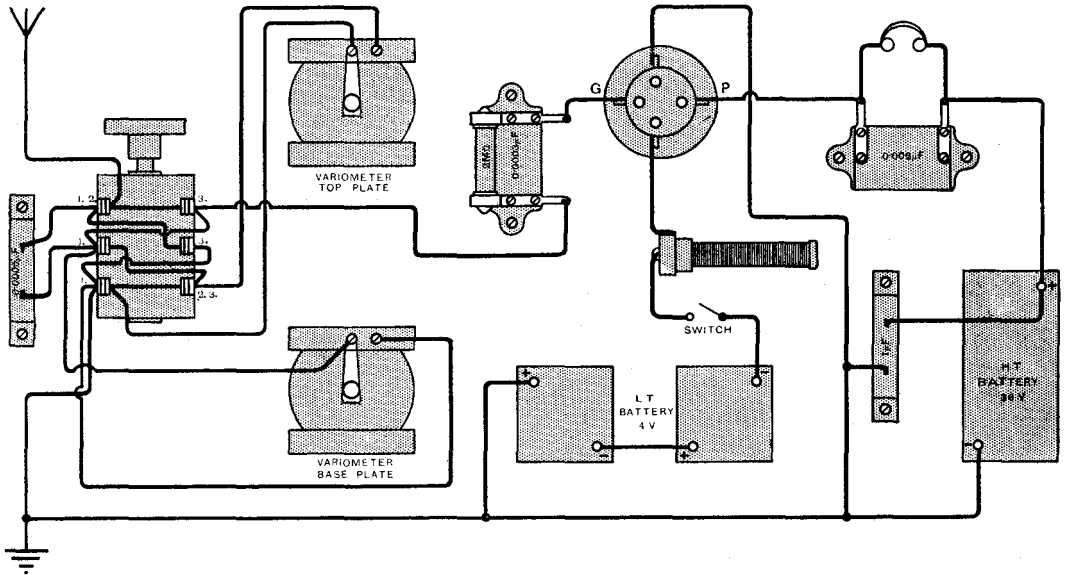


Fig. 3. Wiring Diagram. The base plate of the variometer is the plate nearest to the dial. The figures at the side of the rotary switch indicate the positions of the screws on the revolving drum; thus, in position 1, giving the lowest range of wavelengths, all the pairs of contacts on the left of the switch are pressed together. In the second position, the top left hand and bottom right hand contacts are closed, while in the third position all the right hand contacts are closed.

to opposite sides of the base underneath the variometer. The ebonite front panel carries the filament current switch (12), the variometer (13), the three-way wavelength range switch (14), the fixed aerial tuning condenser (15), the aerial and earth terminals (16) and (17) respectively, and the telephone terminals (18) and (19). The H.T. condenser is not visible in this drawing but may be seen at the side of the H.T. battery in the photograph in Fig. 2, which also gives a better view of the three-way barrel switch on the front panel. The H.T. condenser is included in order to ensure silent operation

will be found the most difficult part of this operation. There is not much space between the top of the variometer and the under side of the switch and the writer found it best to cut down the length of the inside soldering tags on the switch and to wire up as much of the switch as possible before assembling the panel. Contrary to the usual practice, the minus side of the H.T. battery has been connected to + L.T. This was done in order to shorten the wiring. If the screwed rod (5) is made the positive L.T. lead the wire to the earth terminal (17) is considerably shortened. The positive side of the L.T.

battery is connected to earth in order to obtain a slight positive grid bias ; the 0.06 type valve rectifies better under these conditions. In order that the positive bias may not be excessive, the filament resistance is connected in the negative L.T. lead.

container is painted inside with anti-sulphuric paint in case the batteries should come back from charge with acid on the bottom or outside of the glass cells.

The dimensioned drawing of the box in Fig. 4 does not show the two 4 B.A. clearance

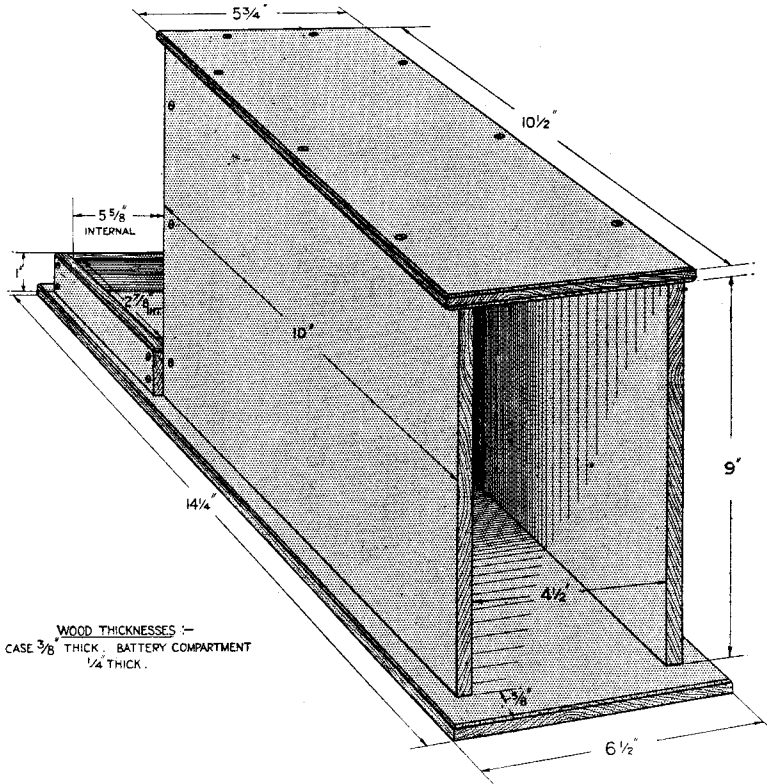


Fig. 4. Dimensions of the containing case. Two holes are drilled in the back through which the ends of the screwed rods 4 and 5 pass.

THE CONTAINER.

This was made from 3/8-in. and 1/4-in. oak and finished with several coatings of shellac varnish. No elaborate jointing has been attempted, the various pieces of wood being simply screwed together with 3/8-in. No. 4 countersunk brass wood screws. The strength of the joints will be much greater if the edges of the wood are given a coating of glue before being screwed together. The battery

holes at the back through which the ends of the rods (4) and (5) pass to hold the unit in position. There should be no difficulty, however, in marking their position when the unit is made and ready for insertion in the case.

Having connected the terminals of the L.T. battery to the ends of the projecting rods at the back, the receiver will be ready for use after connecting up the aerial, earth and telephones.

IDEAS IN PRACTICE.

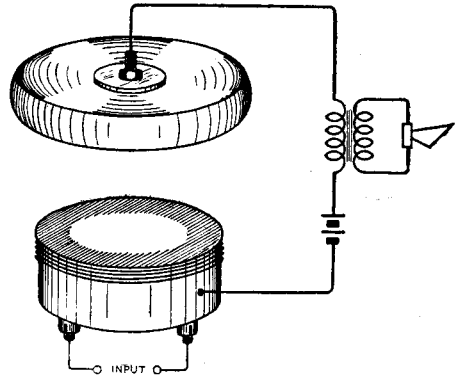
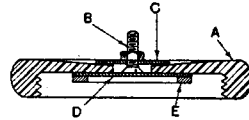
Doing Away with the Leading-in Wire.

The difficulty so often encountered of bringing in the connection to the aerial can be overcome by constructing the aerial tuning inductance on a frame out-of-doors and inductively coupling the closed circuit to it.

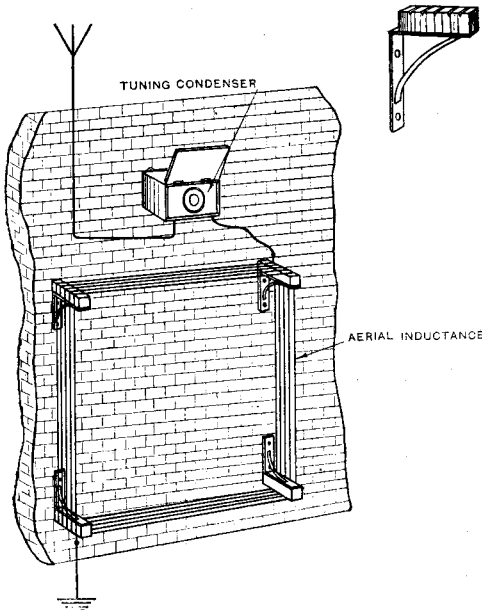
The aerial tuning inductance should be of large size in order to produce a distributed field, so that moderately tight coupling can be obtained at relatively great distances. The receiving set must make use of the connections normally adopted for frame aerial reception, and the frame will need to lie parallel to the turns of the aerial inductance, which are attached to the outer face of the wall. A simple method of fixing is shown, and the turns of wire may consist of electric light cable with heavy insulation made to withstand the action of the weather.

One great advantage of this arrangement is that a complete cabinet enclosed set containing the necessary batteries may be operated almost anywhere in an adjoining

room without trailing aerial or earth wires, whilst the range of reception will be much greater than that obtained by employing a frame aerial without this external aerial collector circuit.



A simple microphone amplifier. A, ear-cap; B, 4 B.A. screw; C, brass plate; D, copper plate soldered to screw-head; E, felt ring.



Out-of-doors frame inductance for coupling up to receiving set.

Making a Microphone Relay.

For the purpose of amplifying weak telephony signals, amateurs sometimes make use of a telephone receiver to the diaphragm of which is attached a microphone button.

Although this arrangement does not produce even amplification of sounds of various intensities and does in consequence produce distortion, it may function tolerably well provided that a good signal strength is provided by the telephone receiver.

An easy method of building a microphone relay of this sort consists of removing the enamel from the centre of the diaphragm and pasting to it a small felt ring which will hold a quantity of carbon granules at its centre. Brought up against this felt ring is the metal or carbon plate and the apparatus is joined up in circuit as shown in the accompanying diagram.

MARCONI SHORT-WAVE TESTS

RECORDS OF SIGNAL INTENSITY IN AMERICA

IN view of the widespread interest at the present time in long distance transmissions on short wavelengths the accompanying photographs of records taken in America on the Poldhu transmissions are of special value.

Short wave experimental communication, it will be remembered, has been conducted during the past few months between Poldhu and Senatore Marconi's yacht, "Elettra." The results of these experiments were described by Senatore Marconi recently before the Royal Society of Arts and a report appeared on page 441 of the issue of this Journal for July 9th, 1924.

These records have been forwarded to *The Wireless World and Radio Review* by Greenleaf W. Pickard, consulting engineer to the Wireless Speciality Apparatus Company of Boston, Mass., who had devoted a great deal of time and research to observations of this nature. In a paper read by him before the Institute of Radio Engineers,* much of the work done by Mr. Pickard was published, and a description was given of the apparatus used for obtaining the records.

states that Poldhu reception in America has a diurnal variation which may be represented in a general way by the graph, Fig. 1. The shorter period fluctuations in the electric field at the receiving point are fairly represented by the records in the accompanying photographs, but in addition he states that large variations with periods of one second and frequently at audio frequency are nearly always present. Mr. Pickard suggests that this ultra-rapid fading effect is probably responsible for the severe distortion of speech and music which so generally occurs with short wave telephony over very great distances.

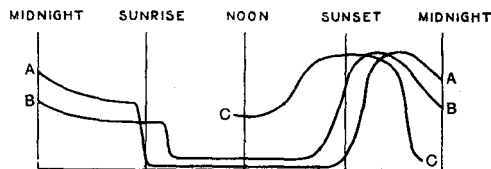


Fig. 2. Showing variations of overland reception on different wavelengths. AA 1,000 kilocycles, BB 3,000 kilocycles, and CC 6,000 kilocycles.

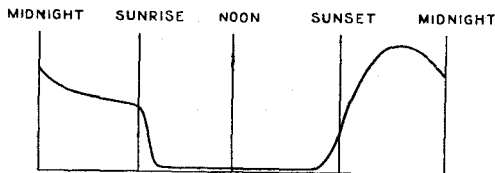


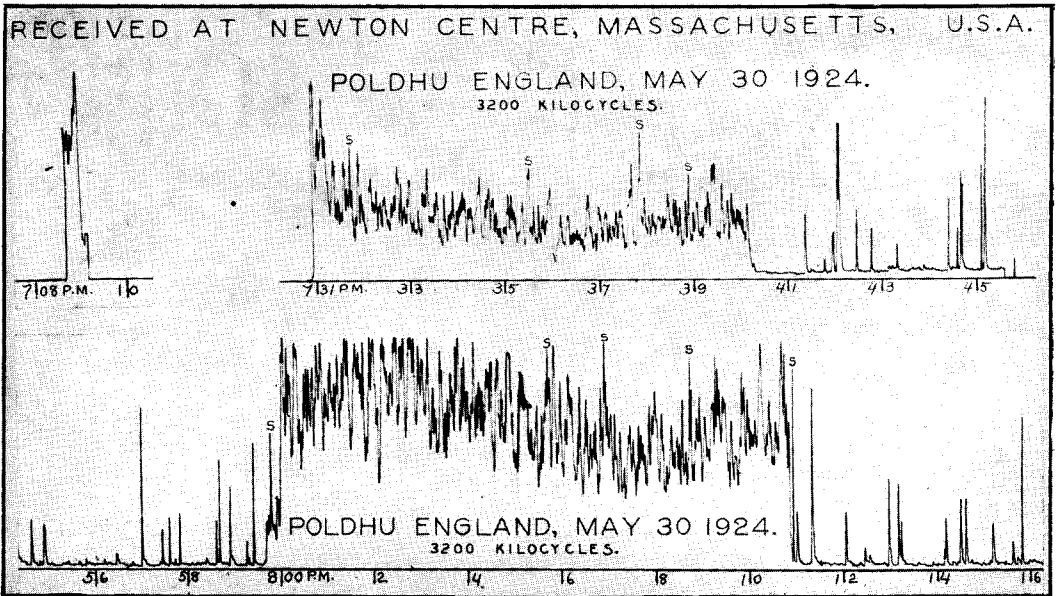
Fig. 1. Showing variation of signal strength of Poldhu.

The observations on Poldhu short wave transmissions were made subsequently to the reading of that paper, and in a communication to *The Wireless World and Radio Review* regarding them, Mr. Pickard

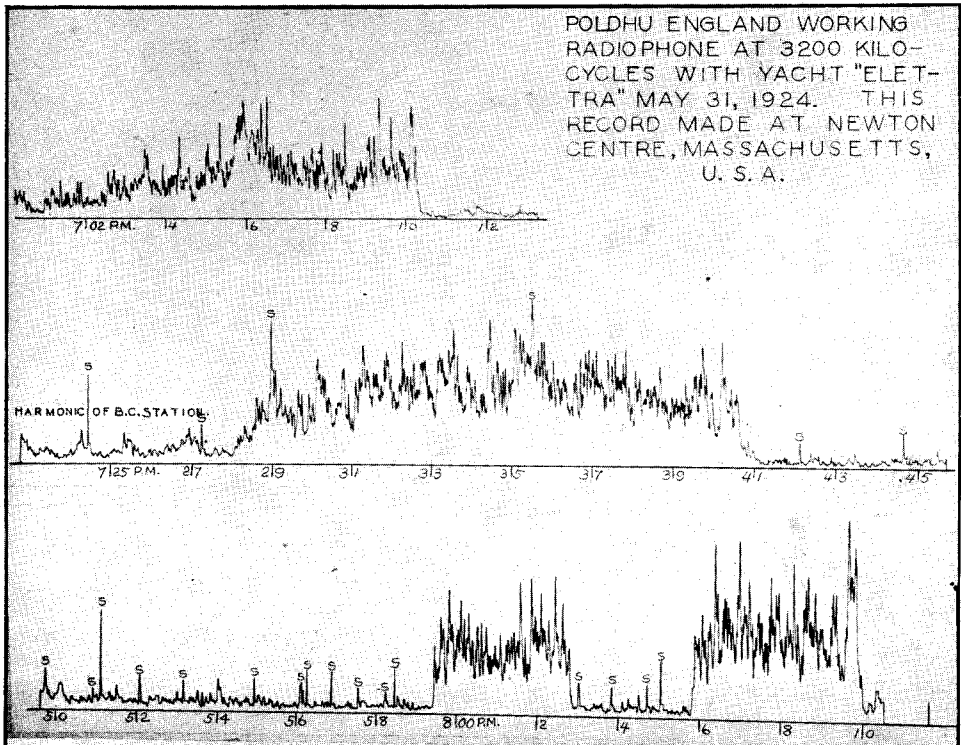
The importance of employing multi-reception points and combining the individual receptions is emphasised.

Fig. 2 gives another graph illustrating in a general way the effect of short wave overland reception at distances of the order of 800 kilometres. In both this and in Fig. 1 the time is that at the point of reception. This graph must not be interpreted too literally on account of the great differences which occur on successive days and nights. It will be noted that the sunrise influence at 1,000 kilocycles AA (300 metres approximately), is much more pronounced than at 3,000 kilocycles BB (100 metres approximately), where in the latter case little if any immediate effect is produced.

* See Proc. I.R.E. Vol. 12, No. 2.



Record of Poldhu field strength at the point of reception. The letter "S" indicates where static interference occurred.



Poldhu working to the yacht "Elettra." The letter "S" indicates where static interference occurred.

BUILDING A RECTIFIER.

TAKING ADVANTAGE OF THE A.C. MAINS FOR H.T. SUPPLY.

The need for a higher voltage H.T. supply and one capable of giving a liberal current has come about owing to the more general use of specially designed power amplifier valves. A rectifier of easy construction is here described for operation from A.C. supply mains.

THE small H.T. battery of from 30 to 60 volts is, in spite of the recent boom in "new" devices for its elimination, a comparatively inexpensive and satisfactory article. If subjected to fair treatment, it will supply the modest needs of one or two H.F. valves and a detector for many months.

and freedom from the ills to which overloaded dry cells are subject.

It is not claimed that any novelty of principle is involved. The object of this article is merely to indicate how a system extensively used in valve transmission may be applied with equal success to reception purposes.

As regards the transformer, this need not be bulky, as the current taken from it is not likely to exceed 50 milliamperes; 36 S.W.G. wire should therefore be adequate for the windings. To simplify the rectifier, a centre tapping should be provided on the secondary winding, the transformer should be designed to give the required output across each half of the secondary. No further useful data can be given, as the supply voltage and frequency will vary in different cases.* Most

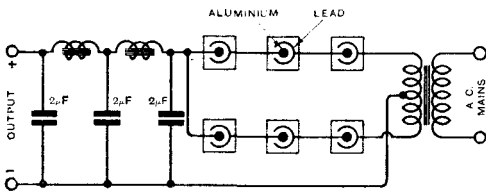


Fig. 1. Transformer with rectifying and smoothing circuit.

But where high potentials and heavy currents are required, as in the case of power amplifiers, then dry cell batteries are neither inexpensive nor entirely satisfactory. Batteries of small secondary cells are of course satisfactory but are only applicable when a high voltage is available for charging purposes. Rotary generators are satisfactory, but expensive.

For those who are blessed with A.C. supply mains, there exists an alternative which can be installed at a cost little exceeding that of one large dry-cell battery. It consists in transforming the current from the mains up or down to the required value, rectifying it, and finally smoothing it out by means of a filter circuit. Fig. 1 shows a suitable arrangement of apparatus.

This may sound complicated in comparison with the simplicity of dry batteries, but it has the advantage of negligible upkeep costs,

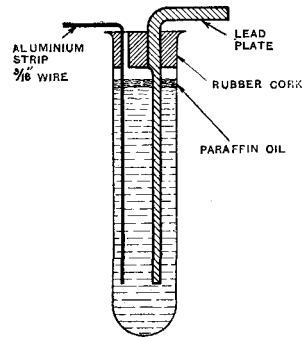


Fig. 2. Rectifier cell.

firms manufacturing transformers would supply an instrument suited to individual requirements at a reasonable cost. The one

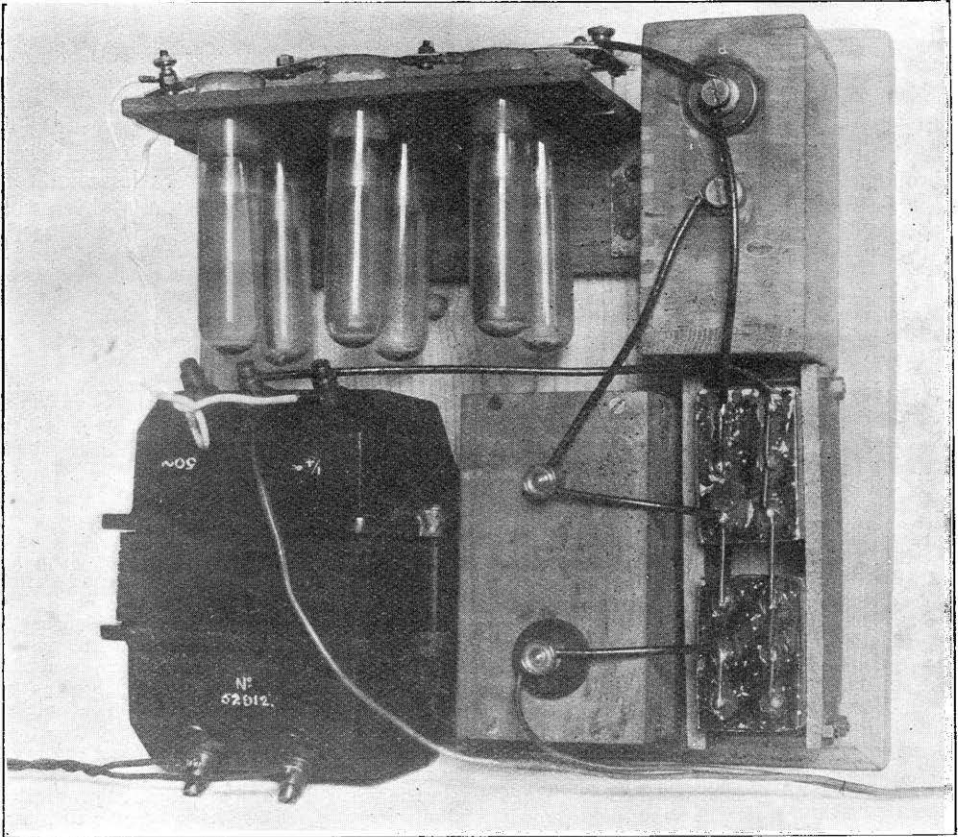
* The Wireless Press Information Department will advise on the design of transformers for particular requirements. The query should be accompanied by the usual coupons.

illustrated operates on a 220 volt 50 cycle supply and gives 150 volts—a very useful figure—across the two halves of the secondary.

For rectification, small electrolytic cells are very satisfactory if a little care is used in their construction and maintenance. As a single cell will not rectify efficiently if the voltage exceeds about 70, several cells must be connected in series. One cell for every

paraffin oil. The detailed construction will be apparent from the illustrations.

The smoothing unit consists of two choke coils and three condensers. Suitable chokes can be made by winding about $\frac{1}{2}$ lb. of 36 S.W.G. D.C.C. copper wire upon an iron wire core $\frac{3}{4}$ ins. by 6 ins. The secondary coils of old motor ignition coils, however, answer admirably, and coils such as the "Ford" can be picked up for a trifling sum. The



The complete H.T. supply set, with transformer, rectifying cells, smoothing chokes and condensers.

50 volts is a reasonable allowance. The rectifier illustrated is designed to operate on 150 volts and consists of two groups of three series-connected cells. The cells are test-tubes about 1 in. by 4 ins., fitted with rubber corks; each tube contains a lead plate and a strip of aluminium in a nearly saturated solution of ammonium phosphate, on the surface of which floats a thin layer of

condensers should be of about 2 mfd. capacity, and if the rectified voltage does not exceed about 200, they may be of the Mansbridge type with paper dielectric.

The H.T. supply derived from this source is perfectly steady, and gives clear signals upon a very quiet background with a periodicity of 50 cycles, and no A.C. hum can be detected in the output.

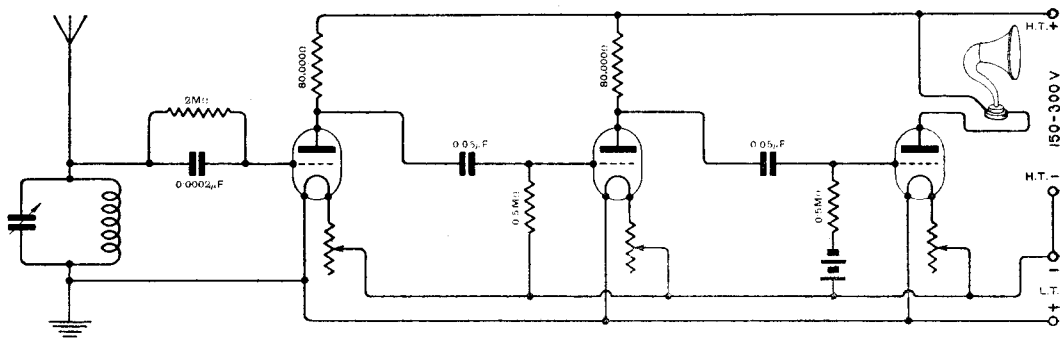


Fig. 3. Broadcast receiving circuit, which gives amplification without distortion and is simple to tune.

Finally, in Fig. 3 is given a circuit which is in constant use for the reception of the local broadcasting station upon a loud-speaker. Full volume with quiet operation and entire freedom from distortion is ob-

tained. This set derives its entire high tension supply from the apparatus described above, and the cost of operation is materially reduced by the elimination of high voltage dry cell batteries. J. E. B.

A RÉSUMÉ OF MODERN METHODS OF SIGNAL MEASUREMENT.

By J. HOLLINGWORTH.

(Continued from page 520 of previous issue.)

DISCUSSION.

Dr. R. L. Smith Rose.

I am sure we are all greatly indebted to Mr. Hollingworth for giving us such an extremely valuable résumé of all the most important work that has been done on the great problem of measuring the signal strength of a radio transmitting station. I do not think it was realised formerly how limited in accuracy were the methods used in the old days. Tremendous progress has, of course, been made, and really it is most marvellous that wireless communication has reached a stage when we are in such a really alarming predicament in the way of making measurements. One of the troubles in wireless is that when you have made a measurement you have to be careful to make sure you have measured what you think you have. That is particularly true in the question of current reading. In determining the law of propagation the question arises as to how to measure the radiation from the transmitting station. You get hold of the best ammeter you can find and put it on the aerial, and make a measurement, and you think you are measuring radiation. Next you bring forward a method of measuring signal strength, and measure the radiation a short distance away. Then you use a formula and calculate the effective height of the aerial, and find this to be greater than the actual height, and wonder what has gone wrong. If you alter anything you find you can fit

in almost any result; the effective height is a variable quantity, and is easily adjusted to fit your observations. At the same time, in criticising the accuracy of previous methods of measuring signal strength, it must be realised that the variations that are taking place, and which have been hitherto alleged to be due to atmosphere, are not small variations. It is not a question of measuring something which varies 10 per cent, but in the ratio of 1 to 200 in some experiments, and one begins to doubt very much whether the apparatus can be so variable in its accuracy as all that. I think it is only recently that we have become familiar with amplifiers and have begun to realise over what a considerable range an amplifier can vary in its application; for quantitative work you cannot trust an amplifier for five minutes.

One point that impressed me during the reading of the paper was that Mr. Hollingworth was modest in describing his own system for making intensity measurements. Although he avoids any comparison with others, this method is one of the most accurate in existence. It is a method not dependent on the physiological effect on the human ear, but a scientific measurement on a galvanometer. One important advantage of his method is that the necessity for screening various portions of the apparatus is done away with entirely. There is a little point I should like to mention in connection with the shunted telephone method of measuring

signal strength, in which intensity is measured by shunting the telephone. Telephones are connected in the receiving circuit, and then shunted by a non-inductive resistance, which is adjusted until one can either just read the signals or cannot hear them. The impedance of the telephones unshunted will be something of the order of 20,000 ohms, and if the signal is very loud, the impedance of the telephones when shunted is probably only 2 or 3 ohms. It is necessary to connect some resistance in series with the shunted telephone circuit in order to maintain the total impedance practically constant with various values of shunts. In more elaborate arrangements the shunting is carried out by a dual arrangement, so that one puts in some resistance in the circuit to maintain the constancy of the total impedance in the circuit. Regarding the propagation of waves over the earth's surface, the measurement of signal strength is one of the methods of attacking that problem, and we await with great hope the results which may be obtained from some accurate method. In conjunction with that it is necessary to work with theory, and the time has come when we want somebody to form a link between the mathematician on the one hand and the practical man on the other. I think the mathematicians and the practical men are so far apart that they do not understand each other's formulae. I do not propose to start a discussion on the theoretical aspect of the propagation of waves. There is no doubt that we are beginning to realise that, although the Heaviside layer has been, in the past, "a very present help in time of trouble," all the anomalies met with in wireless are not due to the Heaviside layer, but to something much nearer the earth than that. I will conclude by congratulating Mr. Hollingworth on his excellent lecture.

Mr. E. H. Robinson.

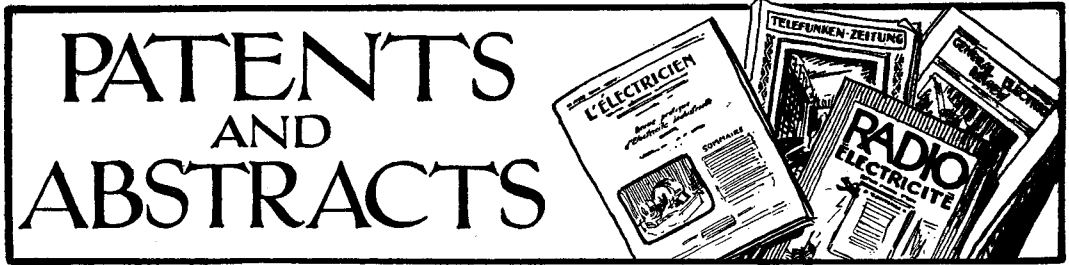
There is only one thing I really want to say, though I am afraid I have not anything very substantial to add to what has already been said. In the methods which involve the comparison by ear of two successive signal strengths, one presumably from a spark station and the other a buzzer, it occurred to me that it would be rather difficult to compare two notes if they were not of the same pitch and the same internal quality. For instance, you may have a buzzer with a pitch of about 1,000 per second, and the spark station may be 600 or 12,000. The ear is not equally responsive to all notes, and if there were a sudden change-over, one signal might appear weaker than it should be, because that particular note does not excite such a response in the ear as the other. Therefore, it seems to me that you require to get both notes exactly the same in pitch and quality. The method of changing over quickly from one sound to another, and getting a comparison to make sure there is absolutely no change at all, ought to give very good results. I believe Dr. Erskine Murray patented a device like that, having two frames equally inclined, one either side of the zero point, and he obtained the setting accurately by changing over rapidly from one to the other. Of course, that was on the same signal, and there was no change in quality or pitch. It occurred to me that you might get over the difficulty by destroying the quality and pitch

of the note you are receiving altogether by passing out the rectified signal currents, not straight into the 'phones, but into a big smoothing condenser, and then inserting a ticker device or buzzer on the same contact, so that the pitch is always the same as that given by the buzzer, and the only other variable is intensity. I have used this method considerably in calibrating condensers, so that I am independent of the pitch of my source altogether, and I think that might eliminate the trouble due to different quality. Again, I should like to know if the Moullin voltmeter can be successfully applied to signal strength measurement. It seems that it would be a useful apparatus, although Mr. Hollingworth, in his method, uses what is virtually a Moullin voltmeter.

Mr. R. E. H. Carpenter.

I should like to ask the lecturer a question on one point. In his own method, and in most of those he described, a frame antenna is used entirely for reception purposes. He made a very interesting observation that any explanation of transmission phenomena seems to call for at least two separate radiations, and it has frequently been suggested that a transmitting station radiates not only a true Hertzian wave, but that a potential wave travels out through the outer crust of the earth at the same time. If that is the case, it is by no means certain that those two forms of radiation would travel at the same velocity. If there is a potential wave travelling out through the crust of the earth at a different velocity from the Hertzian radiation travelling out through the air, it seems possible that an aerial would give different values from those which you would get from a frame, and I should be interested to know if a comparison of relative strengths obtained with an open grounded antenna showed any variations as compared with a comparison of relative strengths obtained with a frame antenna; further, whether the distance of the frame from the surface of the ground has been found to have a material bearing on the results. This interference between two classes of radiation seems to be probable, in view of an observation I found in the last annual report of the Bureau of Standards, Washington. The Bureau has been collecting statistical information from broadcast listeners, and has found that at a distance roughly proportional to the wavelength there is a distinct minimum of reception, and for the wavelengths about the middle of the broadcast band this distance is about 100 miles. Beyond that there is a distinct increase of the signal strength. If there is dual radiation going on, that would explain this minimum nicely, and one would suppose that the 100-mile minimum ring was the first place where the earth wave was of the same order of strength as, and in opposite phase to, the true Hertzian wave. Opposition of phase would not, of course, produce a marked minimum unless the effective amplitudes were of the same order of magnitude, and one would expect to find variations in the relative amplitude of these two types of radiation—if indeed they exist—at different distances from the source.

(The conclusion of the discussion and the Lecturer's reply will be included in our next issue.)



Receiving Circuits.

In receiving apparatus it is sometimes desirable to switch the valves off or on, and also to control the signal strength in such a manner that the main adjustments are not interfered with. While it is possible to employ a variable filament resistance which is common to all valves, this method is not desirable on account of the distortion introduced when the filament current of the L.F. valves is reduced below a certain value.

According to the present invention,* a control resistance is employed in series with the filament of one of the valves, which will not introduce distortion when its filament temperature is reduced, this control resistance also energising the relay which switches in the filaments of the other valves in the receiver. By this means it is possible to arrange that the controlling resistance shall be remote from the receiver.

One example of the invention may be explained by referring to Fig. 1, which

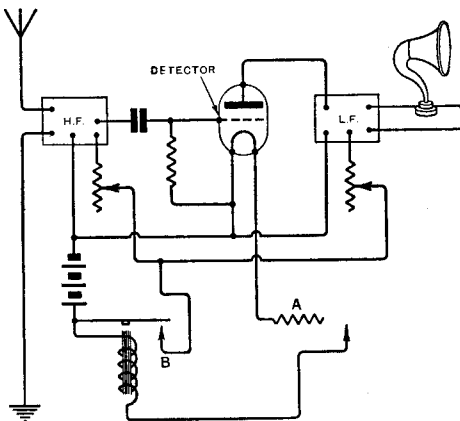


Fig. 1.

* British Patent No. 216,651, by N. Lea and The Radio Communication Company, Ltd.

shows a receiver comprising H.F., detector and L.F. stages, a control resistance A, and a relay B. When the slider of resistance A makes contact with the resistance wire, the current which then flows through the relay is sufficient to energise it, but not sufficient to heat the filament of the detector valve to its working temperature. When the relay contacts close, the filaments of the remaining valves are heated to a degree determined by their own filament resistances.

The temperature of the filament of the detector valve may then be adjusted by resistance A to such a value that the signals have the desired strength.

Improvements in Wireless Apparatus.

It is usual to mount the component parts of a wireless receiver upon the under side of a sheet of ebonite, which closes the mouth of a box or cabinet. Sensitive apparatus so mounted is liable to be affected by the movement of conductors in its neighbourhood, and to guard against such influence the parts are sometimes shielded, for instance, by a metal lining to the box.

According to the present invention* the ebonite panel in such a set is replaced by a metal panel, which may be of iron, especially if magnetic shielding is desired, or of brass.

If desired, tuning devices or other components may be attached beneath this panel, but preferably they are carried on one or both sides of a sheet of insulating material, which is fastened at right angles to the deck by a pair of brackets. The panel, instead of being screwed to the box, may slide in grooves, more particularly where it is intended to remain in a vertical or inclined position.

* British Patent No. 216,246, by the Sterling Telephone & Electric Company, Ltd., and T. D. Ward-Miller.

An example of the construction referred to is given in Fig. 2, where (1) is the metal panel, which preferably is made of brass, with its surface oxydised, so that indications such as aerial tuning may be engraved through the oxidised layer, exposing the metal. This panel may readily be stamped with all necessary openings in it for fastening screws, for the passage of control handles, etc.

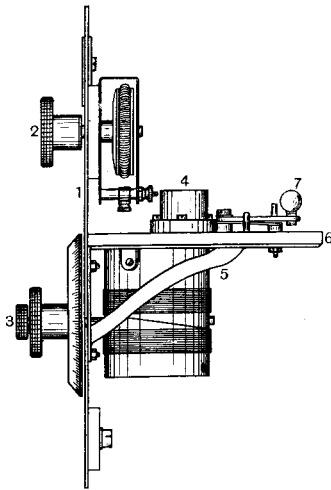


Fig. 2.

The figure shows the assembly of a filament resistance (2), variometer (3), valve-holder (4), supported by a bracket (5), panel (6), and switch (7).

Improvements in Valves.

The disadvantage of employing valves in wireless receivers is, of course, the filament current taken by them, particularly when accumulators are employed, and their charging presents difficulties.

It is often more convenient to take advantage of a local supply of current, but when this is alternating, the results are not always satisfactory, because unless somewhat elaborate precautions are taken, the changes of temperature of the filament, and any intensity of the magnetic field produced about the filament, causes noises to be heard in the receivers. This invention* describes the construction of a valve which may be heated with alternating current, whilst avoiding the above disadvantages.

The valve described has a cathode which is heated by conduction or radiation of heat from heating units, which are in contact with the cathode. It is, of course, obvious that it is not possible to heat the cathode by heat conduction to such a temperature as would be necessary for a sufficient emission of electrons, if the cathode were of tungsten. The cathode is therefore composed of a material which easily emits electrons at a low temperature.

Referring to Fig. 3, A is a side view, and B an end view. The valve contains an anode (3), grid (4), and cathode (5). Along the axis of the electrodes 3 and 4, which are arranged concentrically, is the cathode (5), which is carried at its ends by the two pieces (6) and (7), consisting of a material having a high resistance.

The sketches show that the cathode (5) makes contact with those points of the supporting wires that have practically the same potential, so that no current flows through the cathode. In addition, the cathode is provided with a separate leading-in wire.

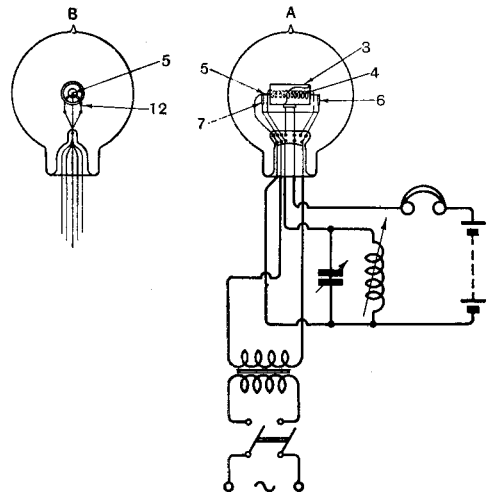


Fig. 3.

From the method of connecting a valve to a receiver, it will be seen that the cathode is heated from the secondary winding of a transformer. The grid circuit is connected between grid and cathode, and the anode circuit between the anode and cathode.

* British Patent No. 213,605, by N. V. Phillips, Gloeilampenfabrieken, Holland.

NOTES & CLUB NEWS



CHURCH SERVICE BROADCAST BY AMATEURS.

Two Blackpool amateurs, Mr. L. Pollard and Mr. W. A. Reed, on the evening of July 27th, broadcast the service at the Blackpool Parish Church. A temporary aerial was attached to the Church tower and power was obtained from accumulators and batteries in the vestry. Three microphones were used.

The whole of the service, with the exception of the sermon, was heard distinctly over a radius of 50 miles. Poor reception of the sermon was due to misplacing of the microphones.

FIRST PORTUGUESE AMATEUR TRANSMITTER.

The first amateur to install a transmitting station in Portugal is Mr. E. Mussche, of Lisbon, who has been granted permission by the Government to carry out transmission tests. Mr. Mussche has constructed a transmitter with which he has communicated over a distance of 125 miles. The power of the station is now being increased.

IMPROVEMENTS AT LEAFIELD.

A great improvement is noticeable in the transmissions from Leafield and, according to reports, much has been done to eliminate the "mush" which has proved such a general nuisance to amateurs in the South of England. The Post Office, recognising the justice of complaints on this score, carried out a number of experiments at Northolt with very satisfactory results, and the experience gained has been taken advantage of at the Leafield station.

BEAM STATION FOR S. AFRICA.

Work is to begin immediately on a new beam station for communication between S. Africa and Britain. The site chosen is at Klipheuvell, near Capetown.

FRENCH SHORT WAVE WORK.

Readers may be interested to learn that several French amateurs now work regularly on waves of 40 to 50 metres.

Mr. V. A. G. Brown (6 JZ) of Reading, reports that within the last few days he has heard transmissions from 8 AG, 8 AL, 8 BF, 8 DA, 8 DP, 8 DS, 8 LO, 8 RO, 8 SCZ and 8 TV, reception being good in all cases when using three valves. 8 BF employed a wavelength of 43 metres.

A WIRELESS MENU.

A strange menu was presented at a recent radio dinner, held by wireless amateurs at Dreux, France.

Among the items calculated to whet the appetites of radio hams were the following:—Petits Patés Radio, Poulets à la Franklin, Gigot de Pré-Salé Marconi, Fromage Galvani, Fruits Dynamiques Variés, Cidre Magnétique, and Cognac Branly.

R.S.G.B. BROADCAST TALKS.

The British Broadcasting Company has been asked by the Radio Society of Great Britain to endeavour to arrange for the weekly talks by the Society to be broadcast at a later hour in the evening, when it is felt that they would reach the ears of a great number of interested persons who are unable to take advantage of the talks at the present hour.

TESTS FROM NAUEN.

Mr. Vivian A. G. Brown (6 JZ) reports that after having received the test signals from the Eiffel Tower on 115 metres at 11.35 p.m. on July 5th, signals (V's) were heard from Nauen (POZ), working on 125 metres. Using two valves our correspondent obtained loud speaker strength.

SOUTH AFRICAN BROADCASTING.

Preliminary tests from the new broadcasting station at Johannesburg have been heard in all parts of the Union, and also in Bulawayo. It is interesting to note that the announcements from the station are made in two languages, English and Dutch.

THE CROWDED ETHER.

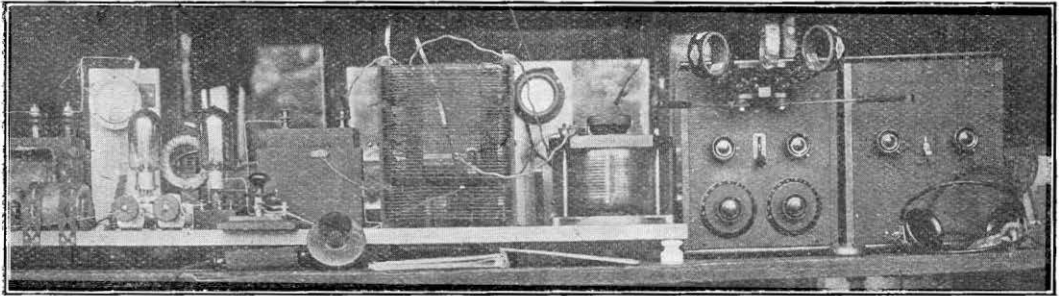
From a recent wireless census taken in the United States of America, it was found that there were 21,967 transmitting stations in operation. This number includes stations of all categories.

It is hardly surprising that the allocation of suitable wavelengths has given rise to some difficulty.

TWO-WAY WORKING WITH CENTRAL SWEDEN.

Two-way working was established on July 2nd between 2 XG, operated by Mr. A. G. Turville, of Northampton, and SMZZ, the station of Mr. Fant at Norrviken, near Stockholm. This is claimed to be the first occasion on which an amateur in Middle Sweden has succeeded in carrying on two-way communication with a British amateur.

2 XG employed a power of 10 watts and was received at good strength on a three-valve (1-v-1) set. The distance covered is approximately 1,000 miles.



The transmitting equipment and one of the receiving outfits of 2 DZ, the mobile station of the Hampstead and St. Pancras Radio Society, used in their recent short wave tests.

BROADCASTING IN PERU.

Final arrangements are now being made for the establishment of a broadcasting organisation in Peru, under the control of the Peruvian Broadcasting Company. It is hoped to install a station in the roof of a new hotel now under construction at Lima. The Broadcasting Company holds an exclusive concession from the Government for broadcasting.

FL AND THE PARIS AMATEUR.

The principal handicap to French amateur wireless in the Paris area appears to be the spark transmissions from the Eiffel Tower. FL has employed the spark system so long that the Frenchman seems to have become inured to an inconvenience which would arouse the keenest objections on the part of his British neighbour. Quite 50 per cent. of the reception cards sent out from Paris register the same complaint, but no determined effort has been made to approach the authorities and seek a way out of the trouble.

BROADCASTING AND PRISONS.

In the House of Commons on July 24th, the Home Secretary stated that the Prison Commissioners have not thought it desirable to make use of broadcast programmes in prison.

INDIA AND THE IMPERIAL WIRELESS CHAIN.

According to a Bombay message four beam wireless stations are to be erected by a company which has been formed for the purpose of connecting up wireless stations in India with the Imperial Wireless Chain.

SHORT WAVE TESTS FROM FL.

The following is the programme of short wave test transmissions from the Eiffel Tower during August and September.

AUGUST.				
Monday	Tuesday	Friday	Saturday	Wavelength
4	5	8	9	115 metres
11	12	15	16	115 "
18	19	22	23	75 "
25	26	29	30	75 "
SEPTEMBER				
1	2	5	6	115 metres
8	9	12	13	115 "
15	16	19	20	75 "
22	23	26	27	75 "
Times (G.M.T.)		Times (G.M.T.)		Identification Signal
0530 to 0533		1520 to 1523		a
0534 to 0537		1524 to 1527		b
0538 to 0541		1528 to 1531		c
0542 to 0545		1532 to 1535		d
0546 to 0549		2120 to 2123		a
0550 to 0553		2124 to 2127		b
0554 to 0556		2128 to 2131		c
		2132 to 2135		d

As hitherto, reports should be forwarded to *Chef du Centre Radiotélégraphique de Paris, poste de la Tour Eiffel.*

Information is particularly requested regarding the relative intensity of each transmission and atmospheric conditions obtaining at the time of reception.

VALVES FOR IDEAS.

Somewhere in his apparatus almost every amateur experimenter has embodied an original device, an idea of his own, with the object of obtaining increased efficiency.

In order that others may benefit by individual experience, *The Wireless World and Radio Review* now includes a special section devoted to useful ideas and "gadgets." To every reader whose suggestion is accepted for publication on this page, a receiving valve of one of the standard makes will be forwarded.

Send in your suggestion now, together with a sketch, if necessary, marking your envelope "Ideas."

CLUB ACTIVITIES.

DURING the summer months a falling off in the number of indoor club meetings is inevitable, but it is a healthy sign that many societies are resorting to Field Days with encouraging results. It is fairly certain, in fact, that this year there has been a record number of Field Days and no proof is wanted that the amateur can enjoy himself as much in the open as in the club-room.

The Golders Green and Hendon Radio Societies, supported by Hounslow and the Hampstead and St. Pancras Societies, have organised a Radio Field Day for Sunday, August 10th. The Golders Green and Hendon Societies are operating a joint station in the neighbourhood of Mill Hill, under the call sign **2 JB**. Hounslow are also erecting a field station in their district and it is hoped that Hampstead and St. Pancras will be able to operate a mobile station on a motor car.

Tests to be carried out will include (a) beam transmission and reception, (b) working with the Beverage antenna, (c) DX with **2 QN** and several fixed stations in Great Britain.

Control station **2 JB** will operate on a power of about 4 watts; wavelength, 175-200 metres. It is expected that all stations will be operating by midday and will carry on until the evening.

Schedule of working and full details can be obtained by anyone interested who desires to co-operate from Mr. W. J. T. Crewe, Hon. Secretary, Golders Green Radio Society, "The Dawn," 111 Princes Park Avenue, Golders Green, N.W.11.

A visit to the wireless installation at Croydon Aerodrome on Saturday, August 9th, features on the programme of the Hounslow and District Wireless Society, permission having been kindly granted by the Air Ministry. Through the courtesy of the General Electric Company, a number of members visited the Company's Research Laboratory at Wembley on Wednesday, July 16th, and much instructive information was obtained.

A five-valve receiver constructed by himself was exhibited by Mr. J. Bray at a meeting of the North Middlesex Wireless Club on July 23rd. The next meeting of the Society on August 6th will be devoted to solving "doubts and difficulties."

GENERAL COMMITTEE OF AFFILIATED SOCIETIES.

(REPORT OF THE FIRST MEETING.)

The first meeting of the General Committee of Societies affiliated to the Radio Society of Gt. Britain was held at the Institute of Electrical Engineers, London, on Saturday, July 26th, at 3 o'clock, the chair being taken by Dr. Eccles, President of the Radio Society. There was a very full attendance.

In opening the meeting the Chairman expressed the view that for some two or three years the work of the Committee and organisation would be of an experimental nature, because it was impossible to foresee whether the present details of organisation would meet all requirements.

The Hon. Secretary, Mr. J. F. Stanley, then reported progress made in the constitution of the General Committee and also in the organisation of the Groups of Societies which appoint representatives on the Committee. Reference was made to

the difficulty in many instances of inducing Societies to amalgamate into group formation. A number of societies are still not grouped, and consequently it has been found necessary to map out groups arbitrarily so as to divide the country into definite areas.

To foster a more democratic spirit between societies and the parent body, it was suggested that arrangements could be made for prominent men from London to pay periodical visits to group centres for the purpose of lecturing. While some societies were always ready to pay the travelling expenses of such lecturers, others were not, but it was thought that if the visits were made to group centres, sufficient funds to cover the travelling expenses could be raised. One suggestion, failing this, was to promote a Travelling Expenses Fund, to be controlled by the General Committee.

As Dr. Eccles had to leave early in the afternoon, Mr. Halliwell, of Manchester, was invited to take the chair.

The Committee was acquainted with the progress of negotiations between the Post Office and the Radio Society, on the subject of experimental transmitting licences and the following resolution, to be submitted to the Council of the Radio Society, was passed unanimously:—

"This Committee takes note of the steps which the Council of the Radio Society of Great Britain has taken, with a view to remedying the ambiguity and unfairness of the present regulations for the granting of transmitting licences, and expresses its wish that the Council should continue on the lines adopted with special reference to the following points:—

- "1. That stricter supervision be exercised on non-radiating licences and a distinctive call sign be allotted to such licences.
- "2. That an attempt be made to arrange with the P.M.G. that before granting licences the Radio Society of Great Britain should be consulted."

The question arose as to whether local authorities were entitled to make a charge for an aerial erected over a highway and it was thought that whilst this was not generally the case, some local authorities could do so under special local powers.

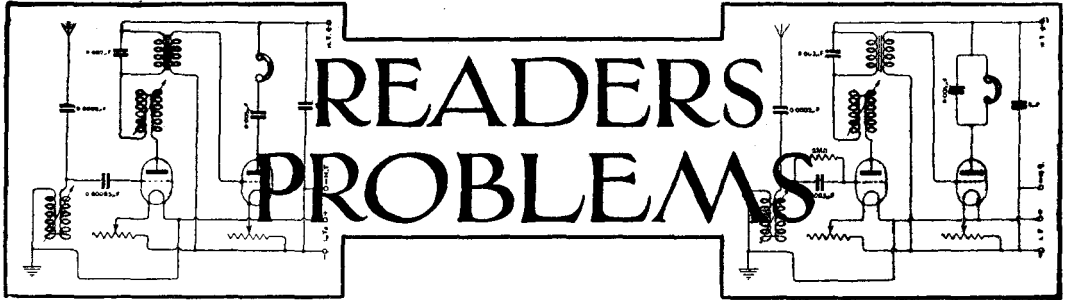
The election of three members of the General Committee to serve on the Council of the Radio Society was next proceeded with. It was decided to ballot for these after nominations had been made and that one representative for London and two for the provinces should be elected.

Mr. Halliwell, of Manchester, Mr. Hodge, of Bristol, and Mr. Haynes, East Metropolitan, were duly elected.

The Hon. Secretary of the General Committee emphasised the necessity for all affiliated societies to keep headquarters fully advised of any changes of address which might occur from time to time, as a number of letters which he had forwarded to addresses supplied to him had been returned through the post.

WIRELESS ON NEW ZEPPELIN.

A very effective wireless installation is being fitted on the new Zeppelin which has recently been constructed for America. The apparatus has a telegraph radius of over 1,500 miles, while telephonic communication is possible over 300 miles. The antennae are fan-shaped and the three suspension wires have a length of 400 ft. Power is derived from a $1\frac{1}{2}$ kW. generator driven by a screw propeller.



1. All questions are answered through the post. A selection of those of general interest is published. 2. Not more than four questions may be sent in at any one time. 3. Every question should be accompanied by a postal order for 1/-, or 3/6 for four questions, and by a coupon taken from the current issue. 4. A free coupon appears in the first issue of each month, and if this is sent in together with coupons from the three previous issues, the reader is entitled to have one question answered free of charge.

THE CONNECTIONS OF A BUZZER WAVE-METER.

A READER wishes to assemble a buzzer wavemeter from parts already at his disposal, but is not quite sure how the connections of the buzzer should be made. It is proposed to use plug-in coils tuned by a 0.0005 μ F variable condenser for the oscillatory circuit.

Referring to Fig. 1, it will be seen that the oscillatory circuit is connected in series with the battery and buzzer. Experience has shown that this is the best method of energising the oscillating circuit. On short wavelengths, when a plug-in coil having only a few turns is in use, there will be no difficulty in passing the current required by the buzzer, but it may be found when operating on higher wavelengths that the resistance of the tuning coil is too high. In this case it will be necessary to augment the number of cells used in the buzzer battery. The wavemeter will operate satisfactorily only if there is no sparking at the buzzer contacts. In order to prevent sparking, a non-inductive resistance (R) is connected across the buzzer windings. For most of the types of buzzer in common use, a resistance of approximately 25 ohms will be satisfactory. This may consist of a piece of No. 32 D.S.C. Eureka resistance wire 10 ft. in length. The wire may be bent to form a 5 ft. double length, which should be wound on to a small bobbin, leaving the two ends free for connection to the buzzer winding.

When using the wavemeter the degree of coupling with the receiver is of great importance. If the wavemeter is placed too near to the receiving apparatus a considerable amount of energy will be picked up by direct electro-magnetic coupling, so that it will be difficult to judge when the note produced by the radio-frequency radiation reaches a maximum. By changing the relative positions

of the wavemeter and the receiver, a position will be found where no sound is picked up from the wavemeter unless it is tuned to resonance with the receiver.

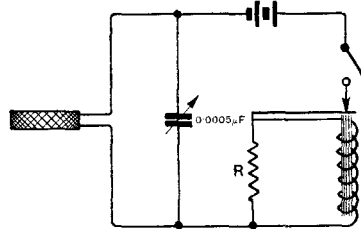


Fig. 1.

The point of maximum signal strength is not very clearly defined in the case of the buzzer wavemeter, and some little practice is necessary before accurate readings can be taken. For purposes of accurate calibration, the valve heterodyne type of wavemeter is to be preferred.

THE EXTENSION OF TELEPHONE LEADS.

IT is often desirable to operate a loud speaker for several pairs of telephones in a part of the house remote from the point where the aerial lead-in enters the house. The receiver should always be situated as close as possible to the aerial, and on no account must the lead-in be taken through the house along picture rails and through the door hinges like electric bell wiring. The signals should be amplified and rectified on the spot, so to speak, as soon as they enter the house. After rectification and L.F. amplification, it is a comparatively simple matter to convey the telephonic currents to any

The WIRELESS WORLD AND RADIO — REVIEW



RADIO TOPICS.

OVERSEAS AMATEUR TRANSMISSIONS.

WHEN in our issue of June 18th we commented editorially on the new regulations governing the issue of amateur transmitting licences, we drew attention, in particular, to the clause which read:—

“Messages shall be transmitted only to stations in Great Britain or Northern Ireland which are actually co-operating in the licensee’s experiments and shall relate solely to such experiments.”

We then expressed the opinion that we did not believe it to be the intention of the Postmaster-General that any interpretation should be put to this clause which would indicate that overseas amateur transmissions would be prohibited. We expressed confidence that responsible bodies of amateurs or individual amateurs would still be authorised, as in the past, to conduct experimental tests with places abroad.

Very naturally, as soon as these regulations came out, the Council of the Radio Society of Great Britain got into communication with the Post Office on the subject, objecting to certain clauses. The Post Office has replied in a communication stating that it has been the recognised practice in the past for licensees to apply for special permission when they wished to carry out experiments to places abroad and the Post Office doubted whether any application of the kind had been refused. They state further that the new regulations do not constitute any alteration in the practice adopted in the past, but they admit that a more fortunate wording might have been found for clause 7, which could have been expressed as:—

“Except with the special permission of the Postmaster-General, messages shall only be transmitted to places in Great Britain, etc., etc.”

It is also pointed out that this permission has been granted in many cases with largely increased power as in the case of the Transatlantic tests.

So far this statement by the Post Office would seem to meet the immediate objections raised to the new regulations, but there still remains one problem outstanding. We refer to the position which arises when a British amateur is called by a foreign station which wishes to conduct a test. Under the present regulations the British station may not reply unless the calling station happens to be one of those with whom he is specifically authorised to work. Had such a regulation as this been taken seriously by the amateur in the past, then we doubt if amateur two-way working across the Atlantic would ever have been achieved. Certainly, on the occasion of establishing communication for the first time last winter, any such regulation which may have been in force at the time did not damp the enthusiasm and enterprise of those pioneer amateurs.

A LOST OPPORTUNITY.

A NUMBER of people have asked us what happened to the B.B.C. on August Bank Holiday. One might very naturally have expected that such an occasion would have been an opportunity for the B.B.C. to run special programmes almost throughout the day for the benefit of those who were holiday making. Instead, we find that the broadcasting stations curtailed their programme rather than extended it to the extent of omitting the usual mid-day

transmissions. The fact that the weather was uncertain made it even more an opportunity for broadcasting to show its possibilities as a source of entertainment and we believe much might have been done to extend the popularity of broadcasting if advance announcements had been made of special programmes organised for that day.

It has been suggested that the B.B.C., recognising the fact that amateur transmitters would probably wish to operate during that day, withheld broadcast transmissions out of consideration for their interests, but we think that this is rather a doubtful reason for the silence of the broadcasting stations.

This point raises again the question of what is the true function and policy of the B.B.C. If you put this question to a number of people, you will get quite varied replies. A large number will say that it is a public service of entertainment and education and that its functions do not go beyond this. If you ask a manufacturer he will very likely say that the whole purpose of the B.B.C. is to stimulate public interest in broadcasting for the purpose of inducing the public to buy broadcast sets and components and so assist the progress of the industry.

Considering that the constitution of the B.B.C. brands it as a trade directed concern at first one would be inclined to agree that the manufacturer's point of view controls the policy of the Company, but the activities of the Company are, on the other hand, sufficient evidence to assure us that the officials of the Company, at any rate, take into account first of all the interests of the listening public.

We have often felt sympathy with those officials who at times must be in a difficult position where a decision has to be made which would affect adversely one or other of these two interests which they serve.

THE NEED FOR GUIDANCE IN EXPERIMENTAL AMATEUR WORK.

THERE is quite a distinct difference between experimental work and research work. In conducting experimental work an amateur may be merely

repeating experiments which have been carried out hundreds of times before, but they are instructive to him when he conducts them for himself and observes the effects which are obtained.

In research work the object is to investigate little known phenomena in the endeavour to discover something which has not previously been known.

Unfortunately, the amateur who has time for serious experimental or research work is usually at a loss to know in what direction to direct his energy.

It is quite impossible for the average amateur, however interested he may be, to search through records of all that has been done in the way of research work in one particular direction in order to see from what point he should start his own investigations. It would be enormously helpful both to the amateur and the professional wireless worker if it were possible to obtain from some central organisation, information regarding work done in the way of research or experimental discoveries in any particular branch.

In America, we believe, from the host of publications of the Bureau of Standards, it is almost always possible to obtain a fairly accurate idea of just how far research work has been carried in any particular subject, but if one wants to obtain such information in this country, one is doubtful where to turn to obtain it, and almost certainly it would be necessary to make application to a number of different organisations before any complete guidance could be obtained.

We do not know whether the National Physical Laboratory or any other institution of a similar nature in this country would be prepared to advise an amateur as to the extent of research work which has been carried on in any particular line, but if any such guidance were forthcoming, we feel sure that it would be of immense value, not only to amateurs, but to professional wireless workers as well. The amateur would no doubt benefit to a greater extent than the professional because the latter is usually in a position to obtain more readily the information of this nature which he requires.

THE EDITOR.

MICROPHONES WITHOUT DIAPHRAGMS.

Diaphragm inertia is one of the greatest problems engaging the attention of designers of both microphones for broadcast transmission and loud speakers. The aim in design is to produce a weightless diaphragm, with a frictionless movement which will set up fluctuating currents proportional in amplitude to the sound vibrations.

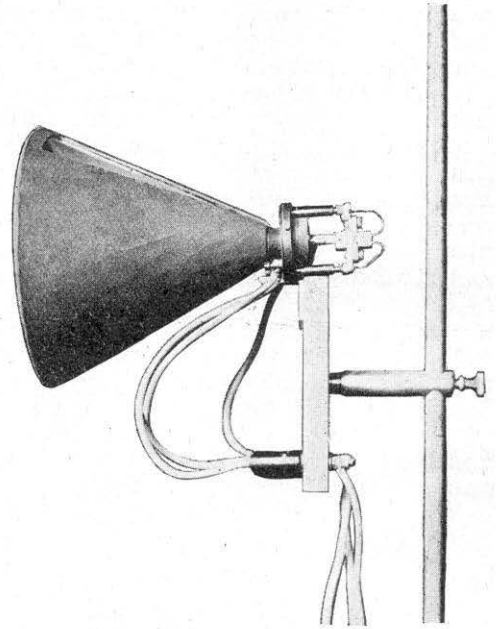


Fig. 2. The "Kathodophon." It is a microphone in which the sound waves influence an electron stream occurring across a minute gap.

IN the process of reproduction of speech and broadcast transmissions, it is of the utmost importance that the microphone should not contribute any distorting effects to the wave form, and it is to over-

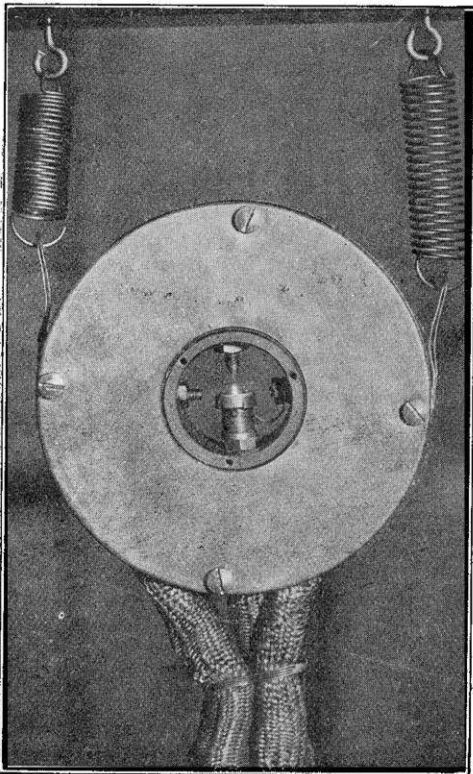


Fig. 1. The glow discharge microphone, in which the sound waves cause the spark discharge taking place between the electrodes to change its path, producing variations in the resistance of the circuit.

come such defects in existing types of microphones that so much research work has been done in microphone design since the introduction of broadcasting. It is well known that the diaphragm is, in many types of microphone, one of the principal causes of distortion, due largely to the inherent inertia resonances of the diaphragm itself. The practical solution of the problem seems to lie in two possible directions, either to produce a diaphragm of such a construction that these disadvantages can be got rid of, or to endeavour to develop a microphone on some other principle where the diaphragm can be dispensed with. There are many engineers who are of the opinion that the perfect microphone will be developed along the latter lines.

A microphone which has been developed in America by Dr. Phillips Thomas and known as the "Glow Discharge Microphone" operates on this principle. An illustration of this type of microphone is given in Fig. 1, and a description appeared in the issue of this journal for March 24th, 1923. In this instrument an electric discharge takes place between the two electrodes which are adjusted to very close proximity. The

sound waves influence the electric discharge, and by varying the resistance of the path control the current in the microphone circuit.

Another microphone which may be classed under the same category was produced in 1919 by H. Vogt, Dr. J. Engl, and J. Masolle. This was before broadcasting had become of importance and the instrument was designed for use with speaking films. Later it was taken up by the Lorenz Company and applied to broadcast purposes and termed the "Kathodophon" for the reason that it made use of the increased conductivity of air in the neighbourhood of an incandescent cathode. The "Kathodophon" which is here illustrated in Figs. 2 and 3, consists essentially of a small perforated metal tube which constitutes the anode and a heat resisting material which, until it comes near the anode, is cylindrical in form. Near the anode it is made flat like a chisel

and is grooved. A thin platinum wire spiral filament is accommodated in this groove and this is heated to incandescence by a battery. A potential of 500 volts is applied between the cathode

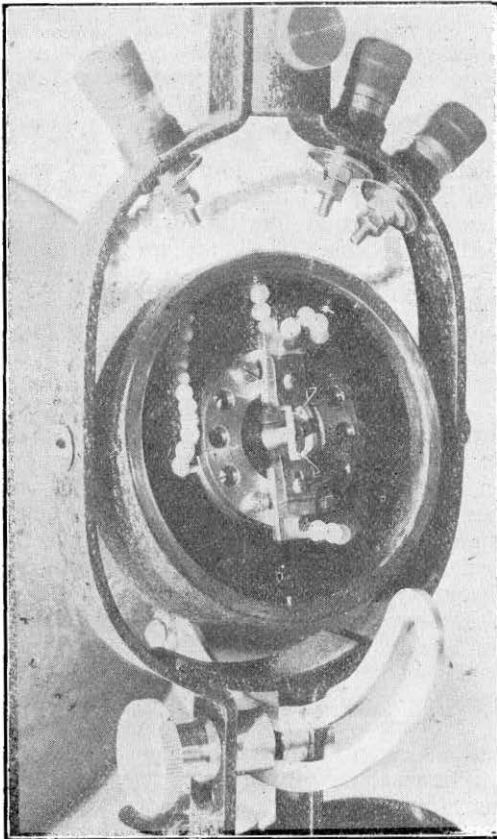


Fig. 3. The construction of the Kathodophon.

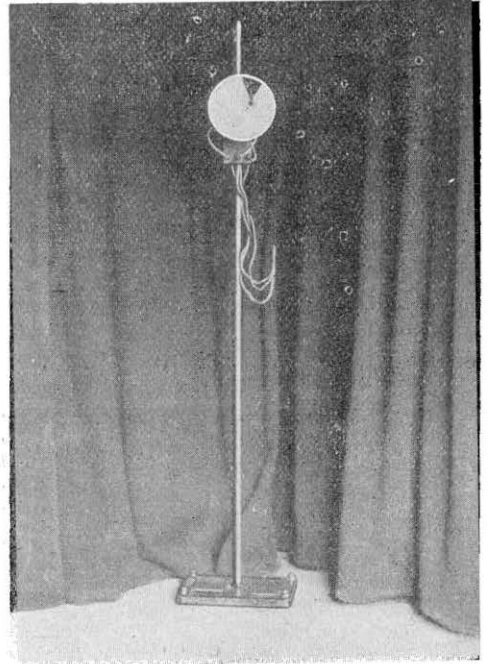
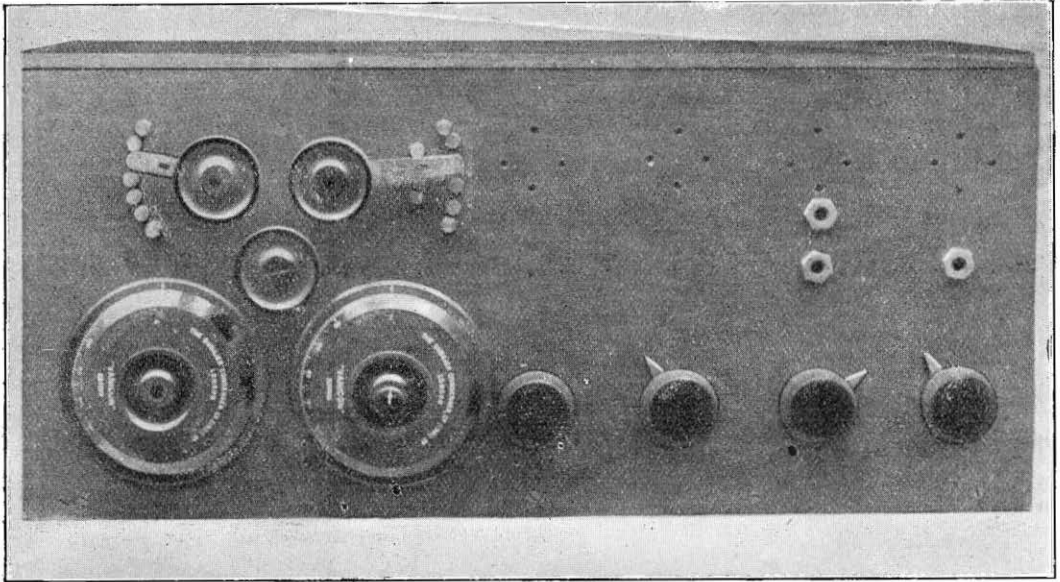


Fig. 4. The Kathodophon as used in a German broadcasting studio.

and the anode, the anode consisting, as we have already seen, of a small perforated metal tube which surrounds the incandescent cathode. The distance between the cathode and anode can be varied by means of a micrometer adjustment and the fluctuation of potential which is obtainable from the sound waves is in the neighbourhood of 50 millivolts. In practice it has been found desirable to shunt the ionised air path between the cathode and the anode with a resistance of 500,000 ohms.

Fig. 4 shows the "Kathodophon" installed in a broadcasting studio in Germany. A resistance coupled amplifier is used in conjunction with the installation, and it is claimed that the quality of speech and music reproduction from stations employing this microphone is exceedingly good.



Mr. Andrewes' short wave receiver. Though not seriously influenced by mechanical vibration, the intermittent earth connection to the railway track rendered reception difficult at times.

RECEPTION UNDER DIFFICULTIES

LISTENING-IN AT 70 MILES PER HOUR.

Some further details are given here of the interesting experiments recently carried out by the Radio Society of Great Britain on the Scotch express. The transmitting equipment has been described, and in this article will be found details of one of the receiving sets which gave good results under most severe operating conditions on the train. As an article on the design of a short wave set it should prove most valuable at the present time when transmitters are exploiting and receivers exploring the waveband between 100 and 200 metres.

By H. ANDREWES, B.Sc., A.C.G.I.

THE following is a short account of the experiences of the writer while receiving short wave transmissions on the Radio Coach 6ZZ, and also a description of the short wave receiver which was chiefly used on the journey.

As has already been described, the coach used by the Radio Society in the experiments on July 5th, was fitted with two short wave receivers. The first, lent by Mr. F. H. Haynes, has already been fully described in *The Wireless World and Radio Review*. The second was designed and constructed by the writer. It is by no means the last

word in receivers, having been designed chiefly to facilitate rapid searching over a large band of wavelengths with simplest controls. In the preliminary tests in King's Cross station, the two receivers were tested on 2 LO's second harmonic (183 metres) and Mr. Haynes' set was found to give slightly louder signals, the same number of valves (1—v—1) being used in each case. Owing, however, to excessive vibration, it was found practically impossible to use the former set, and except when the train was stationary, the second set was used.

In this set Myers valves were used for the H.F. detector, and 1st L.F. and a French

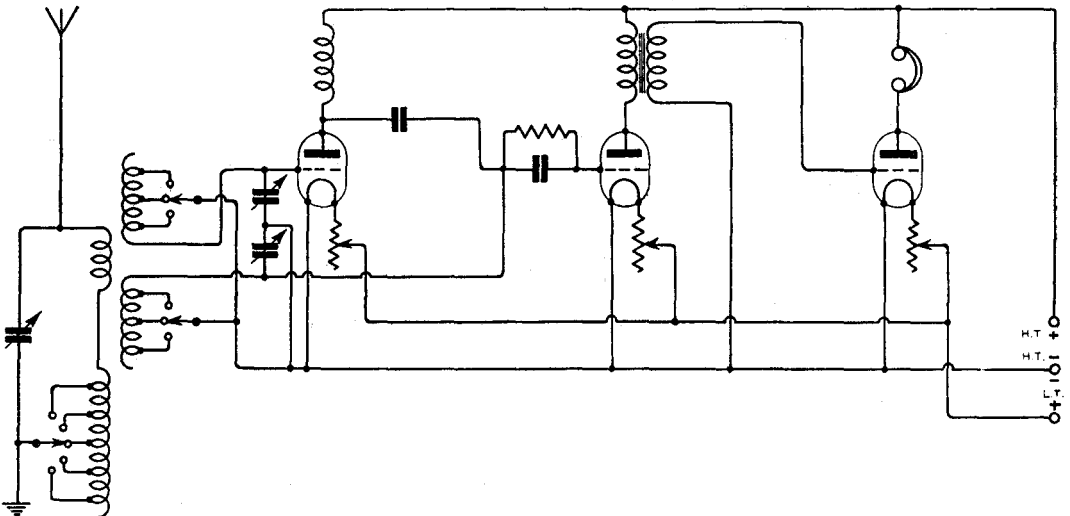
double-filament Junot was used for the 2nd L.F. The only novel feature is that the H.F. stage and the detector circuits are tuned simultaneously by means of a double condenser. This condenser is fitted with a special balancing vernier so that a final adjustment may be made to get both circuits exactly in tune. The coupling from the H.F. grid circuit to the aerial is kept very loose, giving a high degree of selectivity.

In fact the writer thinks that part of the trouble encountered on the train was due to the receiver being too selective! The regeneration is controlled on this set partly by the temperature of the H.F. valve filament, but mainly by damping the H.F.

set to faint, wobbly C.W. signals with a bad intermittent "dis" in the 'phone circuit and a jazz band in the room below!

Our chief trouble was no doubt attributable to the variable earth connection.

On one occasion when 6 XX was very strong this was removed, and although the signal strength went down enormously, all interfering noises were removed. Owing to the great difficulty in holding the signals, even when fairly strong, a separate heterodyne, constructed by Mr. Maurice Child, was used. Then by one operator gripping the knobs of the receiver rigidly, and another the heterodyne lever, the signal could be held. A remarkable improvement in reception was noticed when the brakes of the coach were



The circuit employed. The loose-coupled aerial circuit gives good selectivity and provides a control of self-oscillation. The choke feed to the H.F. valve circuit operates well on short wavelengths and also permits of the two tuning condensers being built on a common spindle.

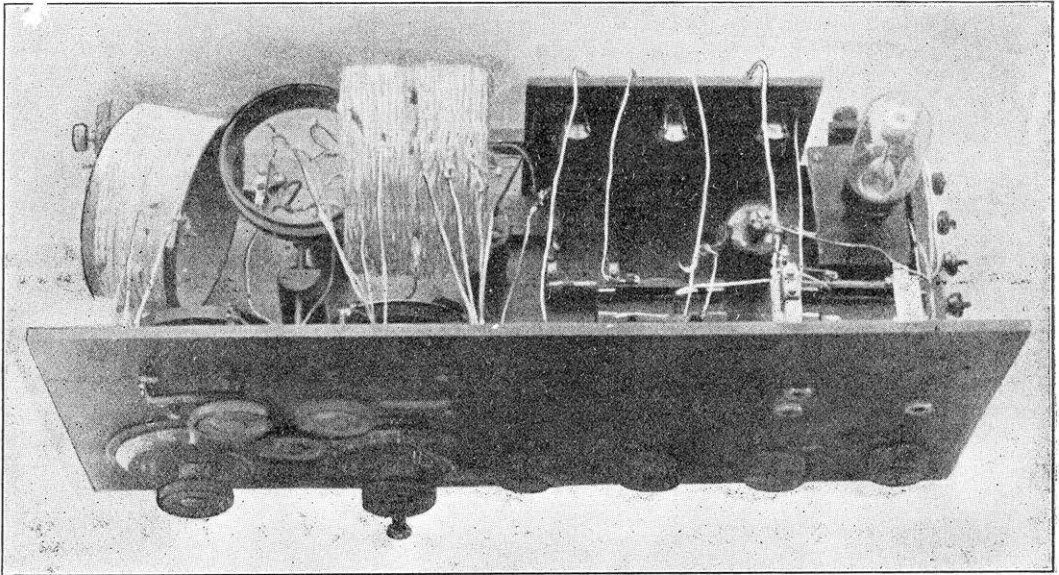
grid circuit by increasing the coupling to the aerial circuit.

In this way the receiver may be kept just oscillating over a wide wavelength range, and a rapid search may be made. A double switch is used to tap the two grid circuit coils which are, of course, wound to be as nearly identical as possible. These coils are lattice wound and self supporting to reduce losses. Plugs and jacks are used so that two, three or four valves may be used and a separate terminal allows the H.T. of the H.F. valve to be controlled independently.

As regards reception in the railway coach, the reader can gain a good idea of the conditions by listening in on a three-valve

applied, owing, presumably, to the improvement in earth connection. With Mr. Haynes' set, when used in King's Cross and in York stations, very excellent signals were received.

As regards signal strength, it was found necessary to use the four valves practically the whole time. The chief points that struck the writer during the tests were, first, the number of signals received considering the conditions; secondly, that best reception seemed to be southwards, presumably owing to the screening of the train, and thirdly the fact that the signals from 6 XX seemed to increase in strength as we got further away, as in the final tests with him when



The interior. The inductance in the centre is lattice wound.

he reduced his power to a minimum, no appreciable reduction in signal strength was really noticed.

In conclusion, the writer would like to

point out that the success of the reception part of the tests was largely due to Mr. Child's Morse reading under great difficulties.



6ZZ's equipment. The operating staff from left to right :—Mr. Leslie McMichael, Mr. Philip R. Coursey, Mr. Maurice Child, Mr. H. Andrewes, and Mr. F. H. Haynes.

PRODUCTS OF THE MANUFACTURERS.

Moulded Leading-in Insulator.

Insulators made of moulded material possess the advantage that they can be free from seams and joints, which defects are likely to cause low insulation. Too much attention cannot be paid to the leading-in insulator, which must not only possess good



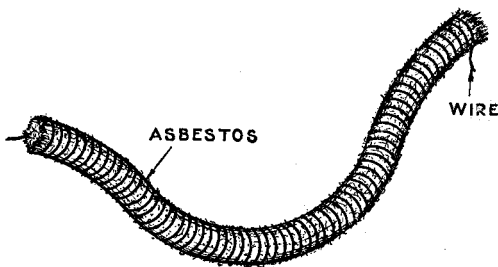
A useful lead-in.

insulating properties, but should also present a reasonably low capacity to earth. The insulator shown here is adaptable to the thickness of the material in which it is inserted and a very efficient lead-in can be made by fixing it through a hole in a window frame.

(Messrs. Ebonestos, Ltd.)

Filament Resistance.

When converting a receiving set to use dull emitter valves of the .06 type, it is necessary to join a length of resistance wire in series in the filament circuit. This wire may be wound in the form of a small spool, but a very convenient arrangement is that shown here, in which the resistance



Supported filament resistance wire for D.E. valves.

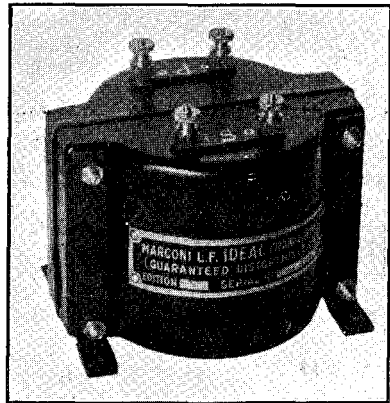
wire is wound on an asbestos core. A length representing a suitable resistance can be cut off and substituted for a portion of one of the leads in the filament circuit.

(Messrs. Ward and Goldstone.)

New Features in Transformers.

Most experimenters must by now appreciate how difficult it is to design an intervalve transformer that will respond equally to note frequencies over a wide band of audibility.

In designing an intervalve transformer it is not merely a matter of running on an approximately suitable number of turns on to a bobbin, provided with a closed core. Most careful consideration has to be given to the dimensions and shape of the core, the ratio of primary to secondary turns, the impedance of both primary and secondary



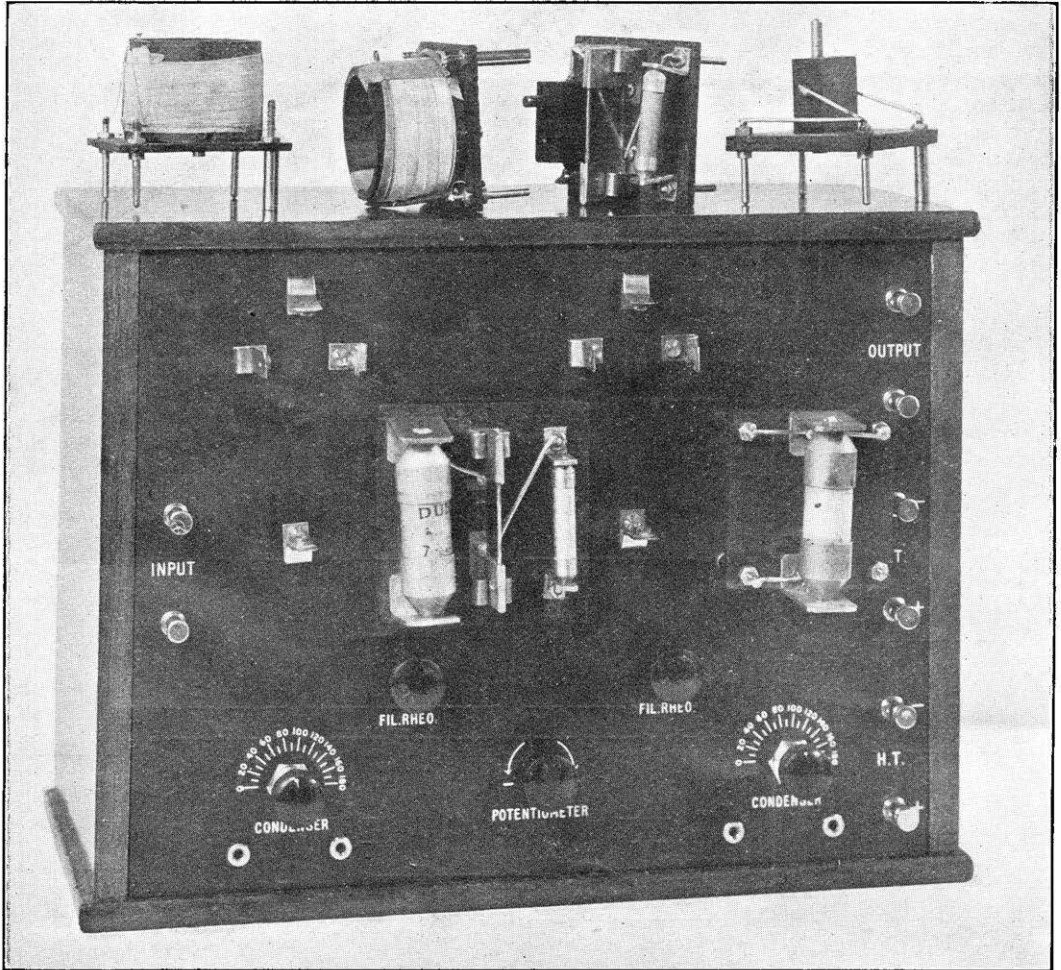
The Marconiphone transformer.

windings in reference to the class of valve to be employed, and in particular the method of winding must receive careful consideration. The transformer shown here has a ratio as high as 6 to 1, for it is normally used with a low impedance valve such as the LS 5.

The manufacturers claim that the mean amplification when using this transformer with the LS 5 is approximately 31, whilst the voltage step-up at a frequency of 4,300 is 31.8 and at 300, is 28.6, while the highest intermediate value of 32.6 is obtained at a frequency of 1,700.

Transformers with other windings are also supplied, having ratios of 2.7 to 1, 4 to 1 and 7 to 1 and suitable for use with V. 24, D.E.Q., D.E.V., D.E.R. and "R" type valves.

(The Marconiphone Co., Ltd.)



A receiver with two stages of H.F. amplification with interchangeable range units.

TWO STAGES OF HIGH FREQUENCY AMPLIFICATION.

A constructional article describing how to make a useful high frequency amplifier. The design is quite straightforward and embodies no difficult features. It is as a result of frequent requests for details of such an instrument that this article has been compiled.

By R. H. COOK.

ALTHOUGH multi-stage high frequency amplifiers are not in general use, circumstances sometimes necessitate the adoption of more than one stage. For instance, when a

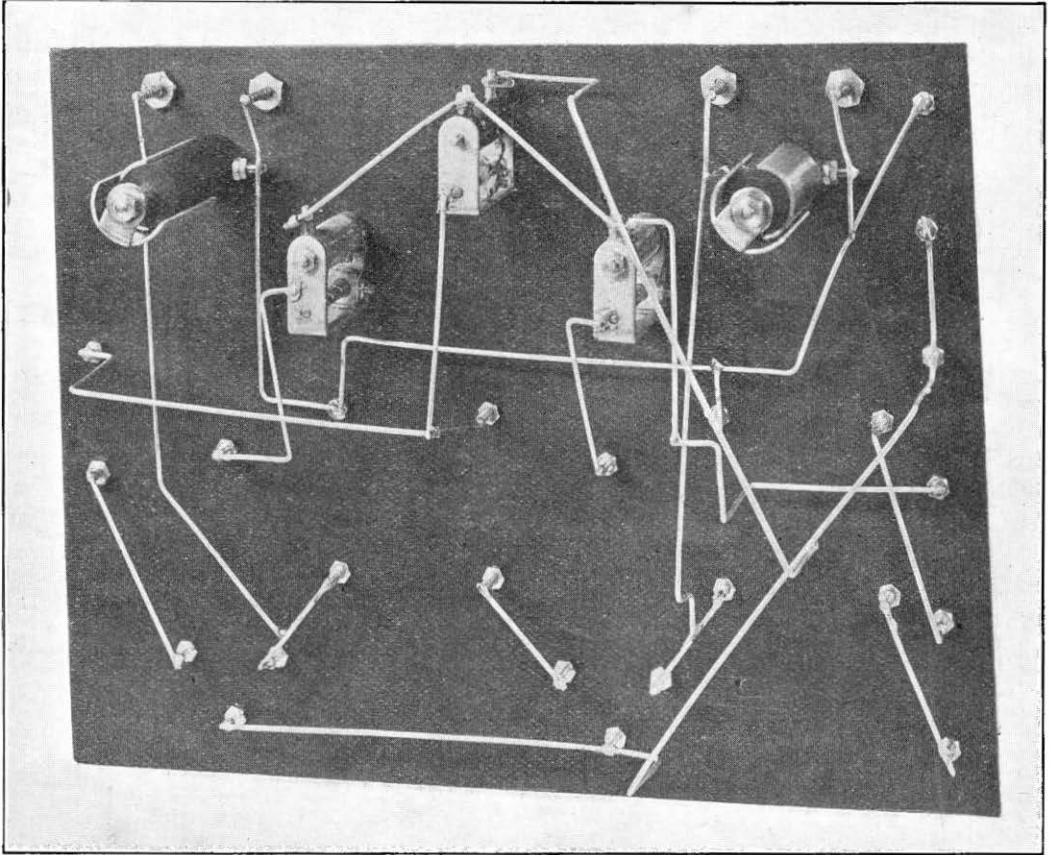
frame aerial is used for directive reception it is usually best to employ more than one stage of high frequency amplification. Whilst appreciating that two tuned stages may be difficult to manage, there are occasions when

critically controlled by moving the slider towards the positive end of this potentiometer.

Another feature is the use of plug-in units, by which it is possible to interchange tuned transformer, tuned anode or resistance-capacity methods of high frequency amplification. On reference to the

components employed and the liberal spacing provided on the panel. The list of parts required is as follows:—

- 1 Ebonite panel, 9" × 12" × $\frac{1}{4}$ ".
- 13 Ebonite panels, $2\frac{1}{2}$ " × $2\frac{1}{2}$ " × $\frac{3}{16}$ " or $\frac{1}{4}$ ".
- 1 Ebonite panel, 3" × 3" × $\frac{3}{16}$ " or $\frac{1}{4}$ " for the resistance unit.
- 1 Ebonite tube, 2' of 2" diameter.



The assembly of the components and the wiring.

circuit diagram it will be seen that the tuning condensers must have a very low zero capacity, so as not to form a shunt circuit when the anode resistances are connected across the H.T. + and plate leads. The particular variable condensers used are small and are designed to present very low capacity indeed across their terminals when set in a zero position.

The construction of the amplifier is really quite simple in view of the small number of

- 8 Terminals.
- 2 Sets of valve clips.
- 20 Valve sockets.
- 44 Valve pins.
- 4 Clix sockets.
- 2 Filament rheostats.
- 1 Potentiometer.
- 2 Micro-condensers.
- 2 Coil plugs.
- 2 0.0003 mfd. fixed condensers with clips.

2 Grid leaks (2 megohms).

2 Anode resistances.

Some $\frac{3}{8}$ " \times 16 S.W.G. brass strip.

Some $\frac{5}{16}$ " \times 16 S.W.G. brass strip.

$\frac{1}{2}$ lb. 16 S.W.G. tinned copper wire.

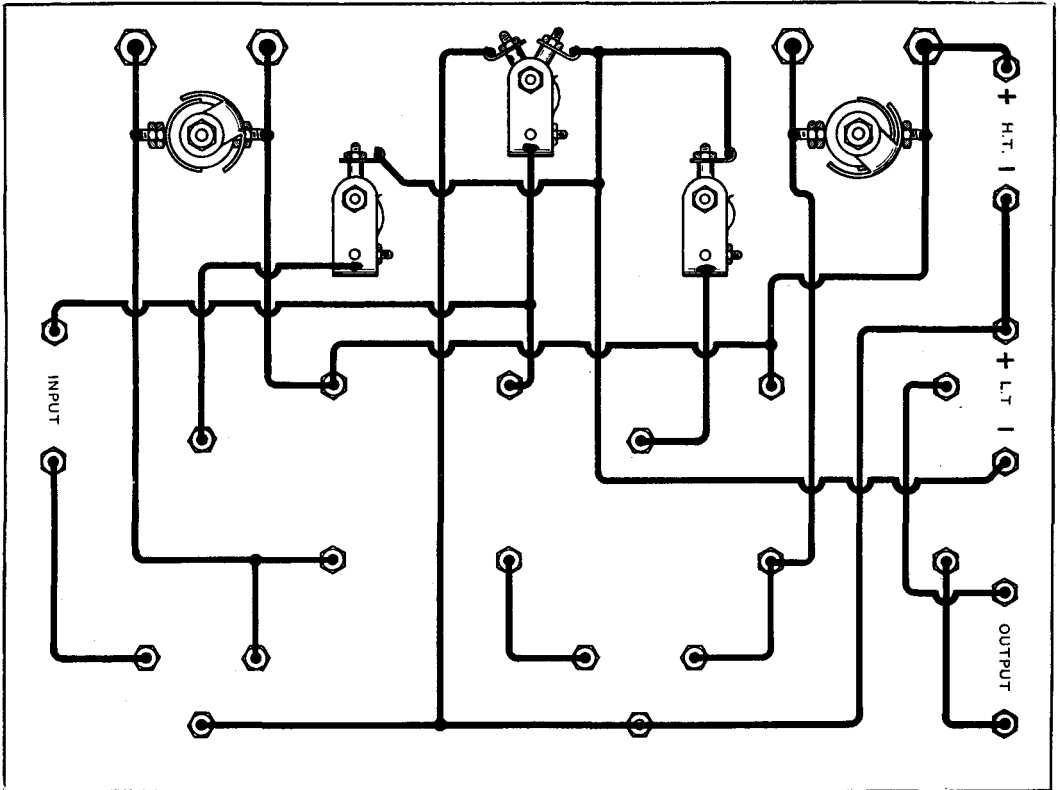
Case 9" \times 12" \times 6" deep.

Various nuts and screws.

A detailed drawing is given of the panel, showing the positions for all holes and the comparative few parts which are

which are exactly at right angles to the panel surface, and should by accident a portion of the panel break away as the drill passes through, the jagged edge will appear in front of the instrument.

Suitable engraving can be seen in the illustration showing the front of the instrument, which can be either machine done quite cheaply or transfers may be made use of and produce quite a pleasing appearance.



Practical wiring diagram. Right-angle wiring gives a good appearance, but is not essential, as the leads are not numerous.

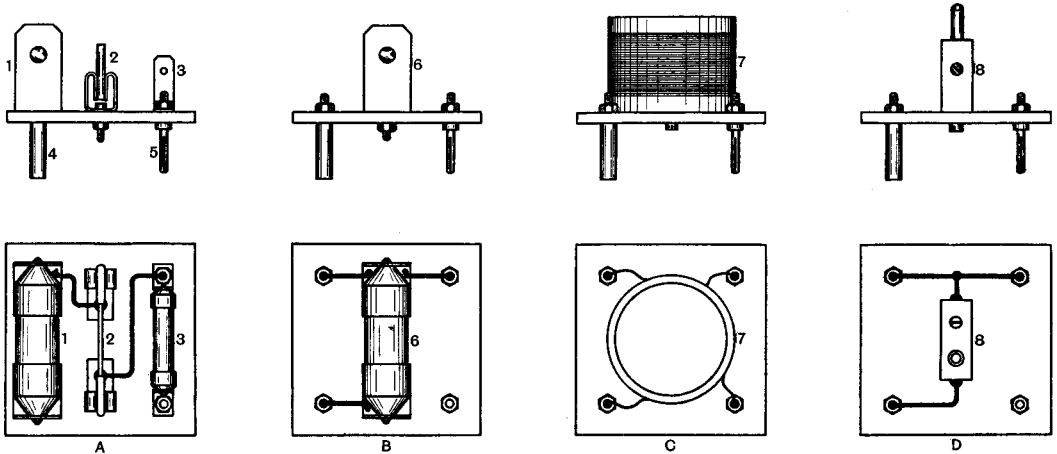
carried on the panel, makes the setting out of these holes quite easy. The detailed drawing is a view from the front, for although many experimenters prefer to set out the positions for holes on the back of an instrument panel, it is not a practice to be generally recommended, as holes made from the back of a panel may not appear in the correct position on the front. It is very difficult indeed to make holes with a handbrace

Little need be said concerning the attachment of the components to the panel, while the wiring also will be found quite simple and can be followed from the drawing, showing the back of the panel after assembly.

To turn now to the construction of the units which plug on to the face of the instrument, it need only be mentioned that every care should be taken in the setting out of the positions of the holes for the connector pins.

Owing to the length of these pins a bad fit will result if the holes are not perfectly square through the ebonite and precisely in the

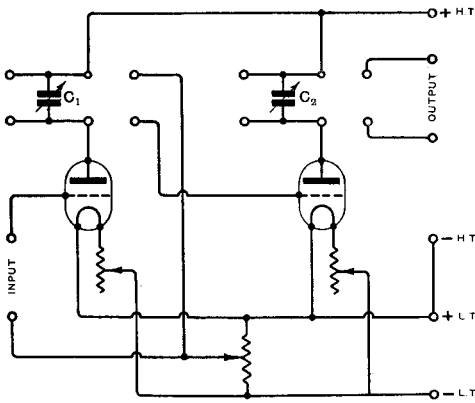
template, the chance of a bad fit when interchanging the units is very remote. The construction of each of the units is shown in an



Details of the interchangeable units.

correct position. A good method to follow in cases where a number of holes have to be set out in this manner is to construct a small

accompanying drawing and it is not thought necessary in this instance to give the actual dimensions.



The additional terminals across C₁ and C₂ are for connecting up condensers externally.

brass template about $\frac{1}{8}$ in. in thickness with edges filed square and holes of the correct size and precise location. Using such a

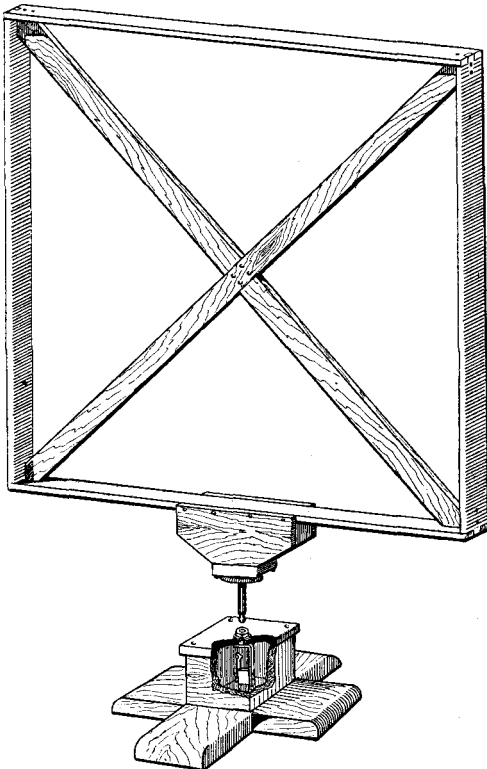
The transformer units are wound on ebonite formers which may be attached to the panel with 6 B.A. screws tapped into the edge of the former. The primary winding is put on as a single layer and is covered with empire cloth with edges slightly overlapping the ends of the primary winding. The secondary is wound also as a single layer and owing to the tight coupling thus produced, may consist of an equal number of turns to the primary. A number of these transformers will have to be constructed as the maximum capacity of the two tuning condensers is so small that the tuning range for any individual transformer is somewhat limited. To provide greater tuning ranges and particularly when using a tuned anode unit, sockets are fitted just beneath the condensers so that external tuning condensers may be connected across those fitted in the set.

IDEAS IN PRACTICE.

Picking up contact with Frame Aerial.

In rotating a frame aerial to determine that critical position which gives greatest signal strength, some difficulty is experienced in preventing the trailing leads from becoming entangled. It is very desirable to arrange the frame so that it will freely rotate, for when searching for the correct adjustment, it is often a matter of determining a midway position in the setting to obtain the best signal strength.

One of the best methods of providing a good bearing for rotating a small frame and also for picking up contact with the ends of the wire is to use a plug and jack, terminating the wire on the plug and supporting the jack on a raised base piece.



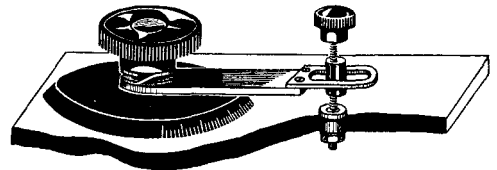
Plug and jack for making contact with frame winding.

VALVES FOR READERS.

Somewhere in his apparatus almost every amateur experimenter has embodied an original device, an idea of his own, with the object of obtaining efficiency. Readers are invited to send in a description, and a sketch if necessary, of any such "gadget" or idea. To the readers whose suggestions are accepted for publication, a receiving valve of standard make will be forwarded. Suggestions should be forwarded to the Editor of the *Wireless World and Radio Review* in envelopes marked "Ideas."

A Useful Fine Adjustment.

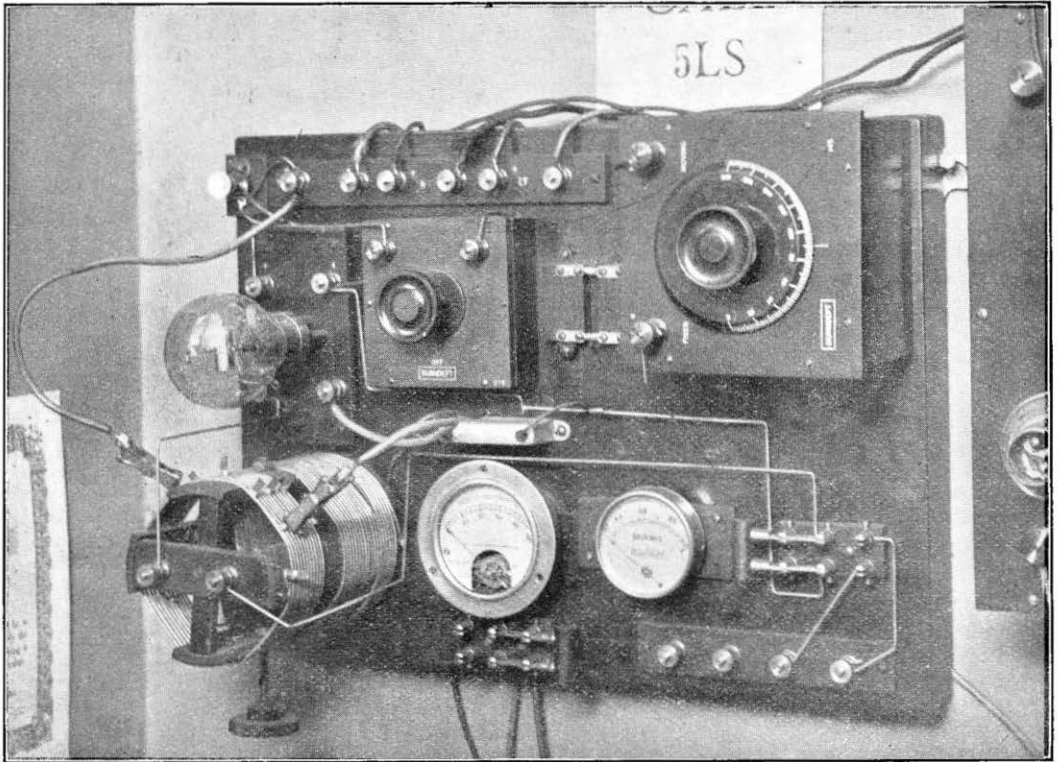
It is essential when tuning to short wavelengths or when adjusting a receiver near the point of oscillation to be able to produce very critical settings with tuning condensers, variometers or coupling.



The eccentric roller on the small spindle gives a minute movement to instrument dial.

The use of a vernier plate complicates very much the construction of the condenser and it is only necessary to fit a device that will provide for rotating the spindle through a fraction of a degree on the engraved scale to give the required fine adjustment.

In the arrangement shown here a thin piece of ebonite is held down under a spring washer, making only friction contact with the knob and dial. Thus the condenser can be turned with the ebonite strip remaining in position. A slotted brass plate on the end of the ebonite strip engages on an ebonite roller which is set up eccentrically on its spindle. By revolving the small ebonite cylinder the condenser dial can be propelled to a very small extent in either direction.



An efficient transmitter of simple and inexpensive construction.

A LOW POWER TRANSMITTER.

It would appear that there is some misconception amongst many amateurs who are about to start transmitting. In the first place it is thought by many that in order to secure good results and range it is necessary to employ an expensive and complicated transmitter and secure a high tension supply of something in the neighbourhood of 500-1,000 volts. This is quite an erroneous view of things as will be seen from the details and results of the station here described.

By RALPH W. H. BLOXAM.

THE main idea is to secure the utmost efficiency possible, with a minimum expenditure of power. Continual experiments were made in order to get the maximum radiation possible on a given high tension voltage. It is easy to get more by increasing the H.T. but this is the course of action to avoid. The writer does not claim any record figures, and is well aware of possible improvements which could be made, but which it is beyond his power to effect by force of circumstances. And now a description of the station.

AERIAL.

The aerial consists of a two-wire inverted "L" with spreaders 9 ft. long. The far end is fixed to a pole erected on the chimney stack of a building and is about 35 ft. above ground level. The lead-in end is secured under the eaves of the house, but with a make-up rope inserted to keep the down lead some 5 ft. from the wall. At this end the aerial is about 28 ft. above ground. Even with the lead-in so close to the wall, the aerial top is very short really, being only about 50 ft. long. Circumstances do not permit the

counterpoise being more than 16 ft. long. It consists of four wires arranged in a fan shape. The width between the two outer wires at the far end is 9 ft. 6 ins. Aerial and counterpoise are carefully insulated with porcelain shell pattern insulators.

Of course, this arrangement is not the most ideal. For instance, the counterpoise should be at least as long as the aerial, if possible extending beyond it. In addition the site is rather badly screened by buildings and trees on all sides and a group of telephone wires crosses 3 or 4 ft. above the aerial.

AERIAL TUNING INDUCTANCE.

The A.T.I. at present used (not that shown) was constructed by winding 35 turns of aerial wire (7/22 copper) on to a 5 in. cardboard tube, the turns being spaced approximately $\frac{1}{4}$ in. Prior to winding, the tube was given two coats of shellac varnish. The ends of the wire are secured through holes in the tube, but are insulated at these points by systoflex. The grid coil is arranged

way for the terminal ends. The valve holder is arranged on a raised ebonite base with four terminals.

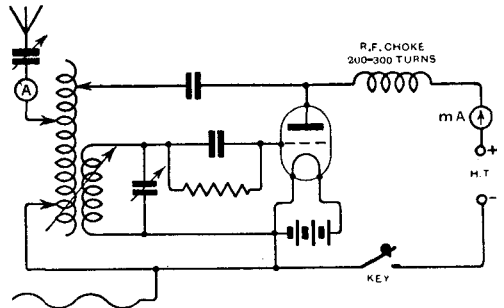


Fig. 2.

The plate milliammeter is a Weston instrument reading to 100 milliamperes. The aerial ammeter is of usual pattern, reading 0 to 1.0 amp. The grid leak came out of an ex-army transmitter and is of 6,000 ohms resistance, wire-wound on a small bobbin.

Fig. 1 shows the exact circuit arrangement, by which it will be seen that the so-called "reversed feedback" circuit is used, with series feed. Reversed feedback with parallel feed is shown in Fig. 2, and is sometimes used. Series or parallel feed may be distinguished by noting whether the power feed to the plate also carries the oscillatory H.F. current or not. In using parallel feed it is essential to employ a radio frequency choke where shown, in order to prevent H.F. currents from straying into the power supply. In the case of series feed the currents are by-passed by the condenser C_3 , which also by-passes the milliammeter which might otherwise offer considerable impedance to H.F. currents.

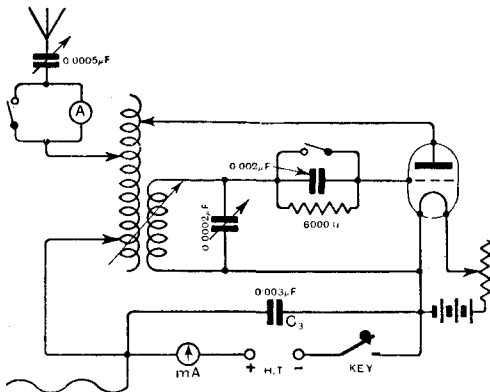


Fig. 1.

to rotate inside the large tube and is situated at one end. It consists of 16 turns of 18 gauge D.C.C. wire on a $3\frac{1}{2}$ in. tube mounted on a 2 B.A. spindle which carries an insulating knob at one end for adjustments.

TRANSMITTER BOARD.

For convenience and cheapness the panel was built up on a wooden base board which measures 15 ins. by 9 ins. and has battens at either end. Terminals are fitted to matted ebonite strips which are screwed to the board, clearance holes being drilled to make

HIGH TENSION SUPPLY.

No electric mains being available, the problem of H.T. supply presented some difficulty. However, it was decided finally to employ 240 volts, consisting of four 60-volt H.T. batteries joined in series, and strive to make the most of the limitations that would appear to ensue. The writer had previously used an ex-army T.V.T. unit but it was found very difficult to keep the note steady; accumulator charging became a problem, as the T.V.T. unit takes about 2 amps. at least and finally the I.C.W. produced is

hardly desirable in the cause of reducing interference to a minimum, which it is up to all amateurs to champion. As H.T. batteries do not present an unlimited source of supply, especially when called upon to provide 20 to 30 milliamps., it was decided to key the H.T. lead, in order to prevent any current flow except when the key is pressed. This arrangement also facilitates the making of rapid adjustments, as, provided the key is not pressed, the A.T.I., etc., are "dead" and there is no risk of shock or burn when adjusting anode tap, etc. It is not, however, desirable when very high H.T. voltages are employed.

The double pole switch below the milliammeter is arranged to short the grid leak and condenser, if this is required. In the other position it shorts out the aerial ammeter. This is always desirable once adjustments have been made, as the ammeter presents appreciable resistance in the aerial circuit, so that the true radiation will be a little more than that indicated, if the meter is shorted out.

And now a few remarks as to setting up and experience of the instrument's operation.

It is essential to keep the aerial and counterpoise leads as short as possible and away from walls, etc.

When first constructed the grid coil had 35 turns. All efforts to increase the radiation beyond 0.25 amps. at 125 metres were fruitless. Nineteen of the grid turns were then removed and—gee! up jumped the needle to 0.45 amps. first go! Sixteen turns was found to be just right, as maximum coupling is needed at 180 metres and nearly minimum at 80 metres. Watch the value of your grid coil carefully—it may be the reason why you can't get more "amps. in the aerial." The valve used at present is an L.S.2. At less than 120 volts H.T. the grid leak and condenser make no difference, but with higher H.T. than that, a slight saving in plate current is effected by having them in circuit.

It should be obvious to all, that to obtain economical results the aim should be to obtain maximum current with minimum plate current consumption. It will be found that when maximum radiation is secured the grid

coil can be adjusted so that this radiation is maintained, but at the same time the plate current drops slightly. The variable condenser is useful in securing this fine adjustment. In this connection also, it has been found advantageous to impress a negative bias on the grid, and a 15 volt unit is used with a wander plug so that by experiment a suitable value may be found for the valve in use.

RESULTS.

At 125 metres wavelength the apparent aerial current is 0.56 amps. with 240 volts H.T. and plate current 27 milliamps. The power input to the valve is thus 6.48 watts. Continental stations can be easily worked in daylight. Signals have been reported by **8 BN** in Paris, strength R 7, on one-valve Reinartz receiver.

A report from **8 RO** in Department Moselle, France, gives strength R.4. This is 583 miles distant, so that the range is probably 700-800 miles at least. At 125 metres the aerial tap comes at the 11th turn with series condenser half "in." The anode tap is at the 14th turn.

The station was first operated with six turns only in the aerial circuit and the writer could not understand why no one replied to his signals. Subsequently it was discovered that with this adjustment the wavelength was 85 metres! These settings are given as a rough guide. They will, of course, vary with individual aerials.

A final word on checking your wave. The writer has no wavemeter available. An approximate check may be obtained by listening on the receiver with aerial disconnected, provided the settings of the receiver can be identified with wavelength fairly accurately. It will be found that several settings of the condenser will produce a note. *All these are harmonics* and *not* the true wave. The true wave will produce only strong clicks in the telephones as the key is depressed and released. The reason for this is that the transmission is so powerful as to cause a complete "wipe-out" on the receiving valve at such close range, so that it is prevented from oscillating.

MOUNTING HOME-MADE COILS.

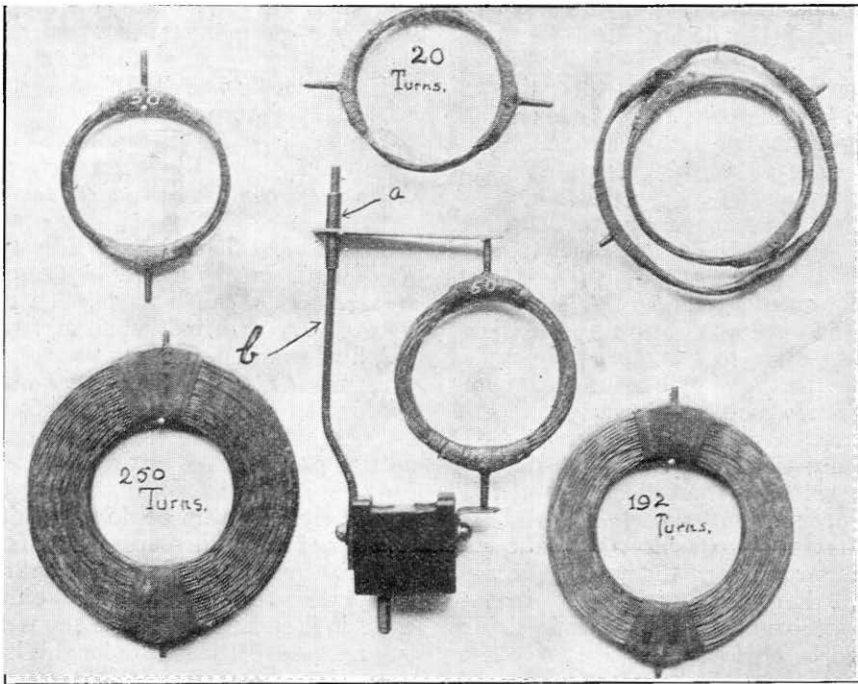
AN EASY METHOD OF FITTING UP GIMBAL CONTACTS.

This simple method of mounting saves the use of a number of coil sockets and provides reversible coupling.

By W. P. VAUGHAN-PRICE.

IT is hoped that this short description of a quick and simple method of making gimbal mountings for "Lokap," "Zodal" and other coils may be of interest to amateurs who, like myself, have tired of loose ends of wire and the consequent trouble of changing coils.

it is not an easy matter to mount coils of narrow cross section really rigidly on them. The materials required are a number of copper rivets of different lengths, about $\frac{3}{32}$ nds in. diameter with flat heads about $\frac{1}{4}$ in. across (these can be procured at most ironmongers for a few pence per dozen), a



The gimbal adapter with various mounted coils and a variometer.

The use of standard plugs in any number entails considerable expense if bought and a lot of trouble and time if made at home, and, even if a supply of plugs is available,

few square inches of paper ebonite or fibre and a length of narrow tape (the narrow green variety sold on cards by most stationers is very satisfactory).

The two ends of the coil are cut to about $1\frac{1}{2}$ ins. long, bared for about $\frac{1}{2}$ in. and each soldered to the head of a rivet. Two short strips of the paper ebonite are then cut about 1 in. long and the same width as the finished coil, and a hole large enough for the rivet to push in tightly is made in the middle of each. A prepared strip is now put over each rivet and bound in place with the tape on opposite sides of the coils, one or two thicknesses of thick paper being first put under the rivet head to protect the outside layers of the coil. Fig. 1 is a sketch of fitting assembled ready to bind, and also shows the shape of the strip which holds the rivet in place.

In order to avoid being compelled to use only coils with gimbal mounting a standard plug was adapted for holding these coils and this can be plugged into any standard coil holder. The details of this can be seen from the photograph which also shows some finished coils.

In Fig. 2 the tube "A" on which the top contact is fastened has saw cuts at each end and is a tight sliding fit on the piece of $\frac{1}{8}$ in. brass rod "B" to accommodate various sized coils.

The variometer in the top right-hand corner is made up by the same method and easily covers the broadcasting band of wavelengths.

the former. The wire in the first layer does not slip if this is done and it is therefore unnecessary to unwind this. When the

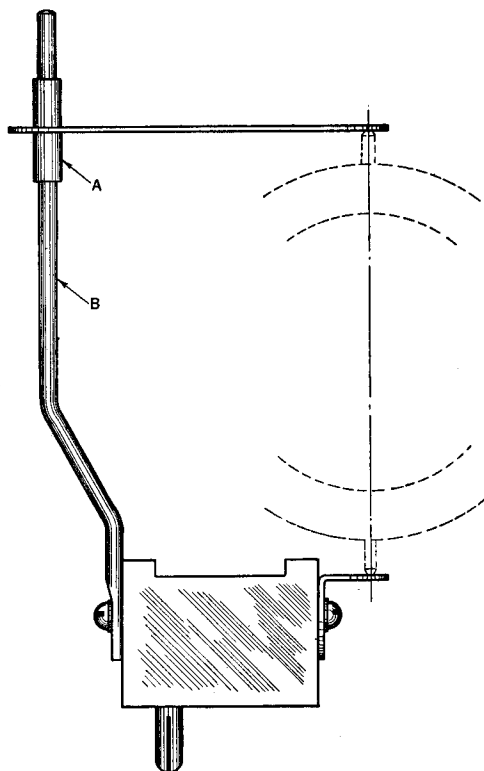


Fig. 2. Details of the gimbal mounting.

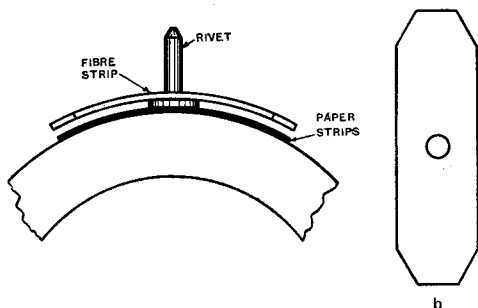


Fig. 1. Rivet and insulating strips ready for binding to the coil.

A good tip when using the "Lokap" coil winder is to wrap one layer of coarse sandpaper round the former, which can be held in place by a rubber band and is prevented from slipping by bending over a strip at one end which lies in one of the saw cuts on

requisite number of turns have been put on, a spot of paraffin wax secures the end and prevents the coil unwinding. The sandpaper with the coil on it can then be easily slipped off the former and carefully removed from the coil, when another spot of wax secures the inner end. The loose ends of the winding are threaded through the middle of the coil so that they come out at opposite points on the periphery and the whole given a not too liberal dressing of shellac and thoroughly dried. The coils are then quite hard and ready for mounting and even the smallest, of 20 turns, is quite rigid and does not buckle when gripped in the holder although no support is fitted inside.

ADMIRAL SIR HENRY B. JACKSON.

RETIREMENT FROM THE ADMIRALTY.

THE close of July saw the retirement from the Navy of Admiral of the Fleet, Sir Henry Bradwardine Jackson, G.C.B., K.C.V.O., F.R.S., D.Sc., M.I.E.E., after a long and varied career. Although Sir Henry's association with the Navy, culminating in his appointment to the highest rank before the end of the War, would provide ample material for the biographer, it is his active and unflagging interest in the development

ceived the idea of employing Hertzian waves for naval signalling purposes, especially in connection with torpedo boat work. The experiments consisted, in the main, in exciting a circuit which included a filings coherer tapped by the hammer of a high resistance trembling bell.

From this time onward Sir Henry Jackson's name has been closely associated with naval wireless telegraphy, and great credit is due to him for many improvements effected



Photo : Barratts.

Admiral of the Fleet Sir Henry B. Jackson, G.C.B., K.C.V.O., F.R.S., B.Sc., M.I.E.E., experimenting with his wireless apparatus.

of wireless telegraphy and telephony, which must appeal to every amateur and experimenter.

Born in 1855, Admiral Sir Henry Jackson entered the Royal Navy in 1868. In 1906 he had attained the rank of Rear-Admiral and by 1912 was Chief of Naval War Staff. The year 1915 saw his appointment as First Sea Lord.

It was in 1893 that Sir Henry, whilst in command of H.M.S. "Edinburgh," con-

in its use. In 1920 Sir Henry Jackson became Chairman of the Radio Research Board.

The retiring Admiral has invariably shown a deep interest in amateur experimental research, and in 1922 occupied the Presidential Chair of the then Wireless Society of London. As a Past President, Sir Henry Jackson is a frequent figure at the meetings of the Radio Society of Great Britain.

CORRESPONDENCE

Radio Coach 6 ZZ.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—With reference to the article appearing in your issue of July 16th, on Radio Coach 6 ZZ, I notice a paragraph on page 450 which may possibly be misunderstood. I refer to the reference made to the incorrect functioning of the relay key. As I was responsible for the construction of this key I do not want it to be thought that there was any defect in this particular piece of apparatus; the actual fault developed in the hand key which was of Post Office pattern and was due to a somewhat unreliable contact in the send-receive switch, fitted to this piece of apparatus. When this had been overcome the relay key operated with perfect reliability throughout the test.

In another part of the article, I noticed that it was mentioned that the signal strength fell off sharply as the coach reached the centre of King's Cross Station, and the explanation suggested was that the waves were penetrating into the station through the two open ends. Whilst there may be something to be said for this theory, I would point out, however, that it is far more probable that the diminution of strength in the centre of the station, which I observed at the time was exceedingly pronounced, was due to the fact that the coach was passing directly under a steel foot-bridge connecting the various platforms, and therefore it would appear that the cause was mainly due to the absorption of wave energy by this particular bridge.

MAURICE CHILD.

London.

An International Language.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—A brother electrical engineer writes in your issue of July 9th on the question of an international language, and pushes the claims of "Ido" or "Ilo."

I have always been a keen internationalist, and in 1903 took up Esperanto. To be brief, I have since then found it suitable for all the requirements of everyday life, for technical and for mathematical work, and so I am satisfied. The fundamentals of Esperanto are fixed, and changes, if they are ever possible, must be of slow growth, a point that some think wrong, but which seems necessary owing to the many changes that we see in the case of Ido, or are we now to say, Ilo. I do not mind what the language is as long as it fulfils the purpose of an international tongue, and I would readily adopt "Ido" or "Ilo" if it was more suitable and could become a little more stable. Certainly a few years ago it had become complicated as compared with its parent, Esperanto, but your correspondent says that it is now simplified.

To avoid any misunderstanding I may add that my experience is that I have never heard "Ido" or "Ilo" broadcast, nor have I heard of its being

broadcast, but I have four times heard Esperanto broadcast and on many more occasions have I seen that it was to be broadcast from the general press and not from Esperanto journals.

There is a British Esperanto Radio Club, and the Internacia Radio-Revuo. "Radio-Servo," is a monthly journal published half in Esperanto and half in national languages that vary from month to month.

I am aware that the *Wireless World and Radio Review* is not the place to discuss the question of an international language, but trust that you will allow me to correct a wrong impression that may have been given by your previous correspondent.

F. PEAKE SEXTON, A.R.C.S., A.M.I.E.E.

London, S.W.1.

The ARRL and International Language.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—Referring to the letter of Mr. E. H. Turle appearing under "Correspondence" in your July 9th issue of *The Wireless World and Radio Review*, I wish you would correct a statement made that "The Widespread American Radio Relay League recommend and are organising the adoption of Ido for all transoceanic work."

This is quite incorrect; the League has been considering Ido, Esperanto and other neutral auxiliary languages for some time, and has solicited the opinions and criticisms of individuals and organisations, in radio circles and otherwise, in an effort to determine which system would be the most acceptable to all concerned. The consensus of opinion has been overwhelmingly in favour of Esperanto, and while our Board of Direction has not taken definite action in espousing Esperanto, this will nevertheless be its choice when it is presented for consideration. I will not go into the various reasons why Esperanto is considered preferable to Ido, this letter merely being to correct any misinformation your readers have gathered from the letter of Mr. Turle. Thank you for giving this what publicity you can.

CHARLES SERVICE, JR.,

Assistant Secretary.

The American Radio Relay League.



A RÉSUMÉ OF MODERN METHODS OF SIGNAL MEASUREMENT

By J. HOLLINGWORTH.

DISCUSSION.

(Concluded from page 549 of previous issue.)

Captain A. G. St. Clair Finlay.

After the extremely interesting things we have heard from Mr. Hollingworth and Dr. Smith-Rose, I do not feel that I can contribute very much of interest, except, possibly, from the point of view of the amateur who does not require measurements of signal strength to a laboratory accuracy. It is not very easy to do even that. The old shunted telephone method was one of the worst traps. Everybody's ear is different in sensitivity from day to day and from minute to minute. There is the additional trouble that telephones are more responsive to one frequency than to another. If we have still to depend upon the human factor, we should choose something more reliable than the ear, and I have chosen the eye. I devised a simple apparatus for this purpose using a tuned reed, which was made to displace a small armature, communicating its movement, almost exactly like an ordinary hot-wire meter, to a small spindle, on which was mounted a very light needle. There was a spring at the end of it by which it returned itself and it was given a lag by means of being immersed in oil or glycerine. It measured the displacement on the diaphragm. If there was a very big movement in signal strength, occupying a few seconds, then the pointer would mark it. If not, it marked the maximum signal strength attained, but it depended on the lag how sensitive it was to actual movement of that sort. That did give me a considerable degree of accuracy. Thus if you are measuring the strength of another station on a visible meter of this sort, and the other man makes an alteration, you can, if you leave everything absolutely constant, immediately give him the measurement on your meter. Another method, which I devised subsequently, and which was very much more accurate, makes use of a neon tube. Amongst the peculiarities of the neon tube is the fact that the colour changes with the brilliancy, with the passage of current through the tube; the colour is not constant throughout the range, there being very much more yellow towards the upper range, when more current is passing, than when it is just alight. A neon tube, with almost pure neon, will give you pure orange red, which is one of the two colours in the two-colour process, and if you arranged a screen with a complementary colour, that is to say, blue-green, it is possible so to adjust the two that when the neon tube remains at the colour and intensity which represents the mean point on the valve characteristic, the result will be black on the screen. It is not really a screen, but a long scale, about 7 ins. or 1 ft. long, and I illuminated the screen by a shielded neon tube, a mirror exactly registering with the little screen, which was only about $\frac{1}{8}$ -in.

wide. What happens is that the greater the signal strength, the more the tube is illuminated at the peaks, and the more it departs from the combination which gives black, and as the screen is graduated in colour it ceases to be black at the bottom, and goes up rather like the spirit bulb in a thermometer, and appears to become fluorescent. It is evident that you can measure signal strength directly in that way, because the greater the signal strength the higher up the screen it goes, and you can mark out the scale in any way you like, either in absolute scale or a percentage scale or any other sort. Another thing is the difficulty of allowing for atmospheric variation from time to time. Even in the morning and afternoon of the same day the conditions might be entirely different. You may take readings on the same station which will vary owing to extraordinary conditions.

I have, however, observed in connection with directional reception under certain conditions that the definition of the minimum tends to vary in sort with that of the maximum, and have even attempted, with a certain limited success, to apply this effect practically to obtain a species of automatic compensation for such errors. Under favourable reception conditions both maximum and minimum effects may be strongly marked, whereas as the conditions deteriorate and the maximum becomes weaker, the minimum may become less weak in proportion and differential readings on the two observations exhibit less variation than direct readings on the maxima, or no variation at all, if the change is due to natural causes affecting propagation, whereas if it is due to actual reduction of output at the transmitting end, for example, both will become weaker and the variation will be shown. It would appear that the causes of attenuation in the former case cause also diffusion, as is, of course, also known to occur in other cases of waves in different media, and if the two effects can be subjected to measurement and their relationship be determined—if indeed they can be supposed to possess any definite relationship—then, perhaps, we may have a means of discounting the one type of error which may on the face of it appear beyond elimination. It is difficult to see how the widely different effects of deflection and absorption proper can permit of any constant relationship such as to provide a reliable working basis; but the effect, nevertheless, exists and appears capable of practical application up to a point at present indeterminate. It is an effect which I am investigating; but perhaps Mr. Hollingworth, or Dr. Smith-Rose with his experience in directional work, may have observed it and may have some information on the subject. I should like to congratulate our lecturer

upon the great deal that he has contributed and is contributing to the subject of signal measurement. It is one which, despite its ultimate importance and really great interest, few have the patience to pursue, yet in which, I think, given the necessary encouragement and co-ordination, the work of the amateur might be of the greatest value to Science.

Capt. Plugge.

I would like to add my thanks to those already expressed, to our lecturer this evening.

Measurement has always been a landmark in the mastering of a new science. Measurement in itself seems a very simple matter. It merely consists, one might say, in comparing an unknown quantity with one that is known. In practice, however, a considerable amount of difficulties arise.

It is very satisfactory indeed to know that this problem is being attacked at the N.P.L. The N.P.L., under the able leadership of Prof. Petavel, has always been our national home of measurement and calibration.

The problem is in the hands of our lecturer tonight and we may feel confident that the great strides that are necessary in this direction will be made and this to the great benefit of civilisation and mankind.

Mr. G. G. Blake.

We have all very much enjoyed the paper. One thought has occurred to me. I have been interesting myself of late a good deal with Major Tucker's gun microphone. That consists of a very fine piece of wire kept at a low state of incandescence in one arm of the Wheatstone bridge, and it has been shown to be so sensitive that an explosion in Holland, which could not be heard by ear in this country, was heard by this gun microphone, and recorded on a siphon recorder. I wonder whether, if the sound from a telephone ear-piece were allowed to act on such a hot wire microphone, readings could be obtained direct, either with a siphon recorder or some form of galvanometer. Could the lecturer say whether there is any possibility of development on those lines?

Mr. Hollingworth, replying to the discussion, said:

I fully agree with Dr. Smith-Rose in emphasising the importance of measurements in general and the importance of making sure that one is really obtaining what one set out to measure.

In fact the extreme difficulty of checking results in work of this nature is one of the chief causes of the apparently slow progress.

I was very interested in Capt. Finlay's description of his apparatus, as I have always strongly held the opinion that there are so many different purposes to be served by signal measurements that there is room for many different methods each designed for its specific purpose. Important as absolute methods may be for certain investigations, there is very great scope for a system like this which gives a reliable relative comparison, and I am all the more impressed with it in that the author has had the courage to break away from the use of telephones.

With regard to the directional effect, that is more a problem for Dr. Smith-Rose. Is it on short waves?

Capt. Finlay.

It is down to about 50 metres and not on broadcast waves. The highest has been 200 metres and the lowest 50 metres.

Mr. Hollingworth.

I do not know that either of us will be prepared to offer much opinion. We are about to commence work on wavelengths of this order, but are at present only in the preliminary stages.

The point raised by Mr. Robinson about pitch and quality is of importance, but with the exception of Dr. Austin's original work in which shunted telephones were only used as an auxiliary to a crystal measurement all the systems discussed are designed for use on C.W. Here, of course, the pitch is under control and also one object of the various intermediate circuits is to filter out the harmonics of the local source so as to keep its tone pure. The Moullin voltmeter has been used by its inventor for signal measuring purposes. In it, however, sensitivity has had to be slightly sacrificed to constancy of calibration and as in signal measurement work immediate calibration of the whole amplifying system is necessary there is no particular gain except when dealing with signals of such strength that it can be used directly in the aerial.

Mr. Blake's description of the hot wire arrangement is very interesting. In signal work, you have to deal with currents of a few micro-amperes, and I do not know if that is within the range of sensitivity of that apparatus. The only other possible difficulty is that it involves metallic contact with the measuring instrument, and that is liable to introduce capacity effects; but if that can be got over it sounds a very hopeful method.

Mr. Carpenter's remarks about the frame and aerial receiving the same signal were very interesting, and it is a problem we have often discussed. The difficulty is, when actually making the experiments, to abolish the aerial and get the frame there so quickly that you can be quite sure the signal has not altered in the interval. We have also an arrangement in one of the laboratories by which I could be hoisted about 30 ft. in the air with the signal measuring apparatus, but there again there is still the problem of whether, by the time you have done it, the signal has or has not changed, but I am shortly hoping to obtain information as to whether the changes are very rapid or not. I will plead great cowardice in that for the present I am deliberately avoiding all night effect. I have enough trouble as it is to keep me going for many years, and all the remarks I have made this evening are confined purely to effects when I am quite sure there is no night effect coming in anywhere.

The Chairman (Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S.).

It devolves upon me now—and a very pleasant duty it is—to ask you to pass a very hearty vote of thanks to the lecturer for what we all feel—and I am sure I am expressing the views of the whole audience—has been a very interesting and instructive lecture, and has led to a discussion well worthy of it. I ask you to pass a hearty vote of thanks to the lecturer, in the usual way, by acclamation.

The vote of thanks was carried with acclamation.

NOTES & CLUB NEWS



DISSOLUTION OF FAMOUS FRENCH CLUB.

The last fortnight has seen the breaking up of the famous French "Club des 8," its charter having been returned to the authorities.

The "Club des 8" numbered among its members some of the first amateur transmitters in France.

GERMANS TO RELAY BRITISH BROADCASTING ?

A proposal to employ a broadcasting station in Berlin to relay British wireless programmes is contained in an article in the *Vossische Zeitung*, according to a correspondent of *The Times*. A new and powerful station having recently been erected the original Berlin station has now become superfluous, hence the suggestion referred to.

To carry on such a service it is suggested that the relaying station should work on 200 metres, thus avoiding interference with the ordinary broadcasting programmes.

5XX AND THE FRENCHMEN.

The Chelmsford broadcasting station is making itself heard in France, and M. Level, of Etretat, reports regular reception on a crystal set.

M. Thomassin, in Paris, is now able to eliminate the Radio Paris station, on 1,780 metres, and to pick up Chelmsford on a loud speaker.

TEST TRANSMISSIONS FROM FL.

Many amateurs report reception of the test signals now being transmitted from the Eiffel Tower, in accordance with the programmes published in this Journal from time to time.

Although we are always glad to receive particulars of the reception of these signals, the full reports should be forwarded to Chef du Centre, Radiotélégraphique de Paris, poste de la Tour Eiffel.

FRENCH TACKLE FADING PROBLEM.

The problem of fading has suddenly aroused keen interest in France, as a result of a definite move on the part of the French Committee of Scientific Radio Telegraphy, who are making a special effort to tackle the problem from all angles. With this object in view special weekly Morse transmissions on 450 metres are to be made from the Ecole Supérieure Station, Paris, at 11 p.m. on Saturdays, for the purpose of obtaining details regarding signal strength.

The officials of the station and the Committee are asking all amateurs to co-operate in this work. According to an official announcement, observations "by ear" will be in most cases very interesting, but for more precise work the shunt telephone

method is recommended, and the Committee offers to send full information to anyone wishing to employ this system. All reports should be sent to M. Waddington, Vert-en-Drouais (Eure-et-Loire) from whom, no doubt, English amateurs may also obtain further particulars.

ANOTHER POACHER.

The call signs 2BC and 2AY are, it is suspected, being misused. The owner, Mr. Dudley F. Owen, of Limehurst, Sale, nr. Manchester, hopes that the publication of this note will cause this practice to stop.

U.S.-SWEDEN WIRELESS SERVICE.

A direct wireless communication service between America and Sweden is to be opened on October 6th, when the new wireless station at Gremeton, Sweden will come into operation.

DUTCH PCII.

As the result of our recent report concerning the suspension of Dutch PCII by the authorities, on a charge of unauthorised transmission, we have been advised by our Dutch contemporary the *Radio Wereld*, that it is unlikely that the station will be again operating in the near future. It will be remembered that according to the previous report the case was dismissed, but we now understand that the Open Ministry applied for a trial in a higher Court, and pending these proceedings PCII must remain silent, his apparatus being confiscated.

We trust that this active Dutch transmitter will be equally successful in this new legal contest.

NATIONAL PHYSICAL LABORATORY CALIBRATION SIGNALS.

In the announcement of the new series of calibration waves transmitted from 5 HW, the wireless station of the National Physical Laboratory of Teddington, we regret that the days of transmission were omitted, although it was stated that transmissions take place fortnightly on Tuesdays. The latest transmission was made on Tuesday, August 5th, and the service will continue fortnightly as before.

Other particulars of these signals were given in the July 16th issue of this Journal, page 460.

2UV's SUCCESS.

Mr. W. E. F. Corsham (2 UV), of London, N.W., has been heard by the operator of an American ship, the s.s. "Delaware Sun," Mr. G. R. Lenhart (3 BMJ). Steady signals were received, without

fading, while passing through the Panama Canal. At the time of this reception 2 UV believes that he was employing a power of 10 watts.

AMATEUR TRANSMISSIONS FROM FINLAND.

Mr. Erkki Heino, of Suomi, Finland, writes stating that his call sign is 2 NB, not 1 NA, as given in a recent issue. The latter call sign is allocated to Mr. Leo Lindell, whose station is situated at Turku II Rantakatu 46, Suomi.

The following call signs are allocated thus:—

- 2 NM Karl Sainio, Helsinki, Merikatu 3, Suomi.
- 3 NB K. A. Hauvonen, Tampere, Sakko-laitos, Suomi.
- 2 NC Ilman Jaamaa, Porvoo, Suomi.

SHORT WAVES FROM ITALY.

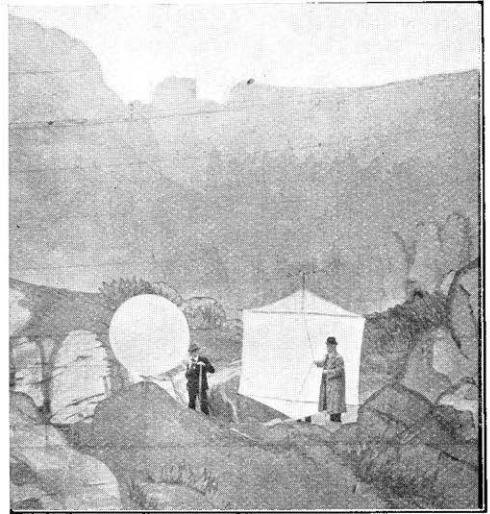
Readers may be interested to know that the following schedule of short-wave working is operating in Italy:—

- IDO to IHT, on 117 metres 10 p.m. (G.M.T.)
- IHT to IDO, on 106 metres 11 p.m. (G.M.T.)
- IDO to IHT, on 117 metres Midnight.

A well-known Italian amateur transmitter now beginning work on short waves is 1 MT, who has come down to 100 metres.

BROADCASTING IN SWEDEN.

Broadcasting regulations in Sweden are being fixed in a very short time, according to a Swedish correspondent, Mr. Walter Hermanson. The licence fee is not yet decided upon, but construction is in progress of five broadcasting stations in Stockholm, Gothenburg, Malmo, Sundsvaal or Hernösand,



The wireless scene in the Empire Pageant, depicting the reception at Newfoundland of the first wireless signals across the Atlantic in December, 1901. Mr. G. S. Kemp, who was Senatore Marconi's assistant on the actual occasion, is seen on the right.

and Boden, under the auspices of the Telegraph authorities. It is expected that the stations will



The original apparatus employed by Senatore Marconi in 1901, with which to receive signals across the Atlantic. When not in use in the Pageant the apparatus is on view in the Newfoundland pavilion at the British Empire Exhibition.

be in operation at the beginning of next year. The broadcast programmes will, it is understood, be provided by the more important newspapers.

WIRELESS AND THE BLIND.

In the July issue of the *St. Dunstan's Review* there appears the first of a series of articles on "Wireless for the Blind." These articles, written by Captain Ian Fraser and Mr. Oswald Carpenter, are specially prepared with the object of helping blind people to understand and enjoy the theory and practice of radio. As the authors remark: "Wireless is the only hobby, the results of which are measured and appreciated by the sense of hearing alone; it might almost have been invented for the blind."

A singularity of the articles will, of course, be the absence of diagrams, which will be replaced by full explanations of circuits, connections, etc., it being felt that an embossed diagram of even the simplest circuit would feel so complicated as to be of little value.

DUTCH TRANSMITTERS.

According to the *Radio Wereld*, there are at present no "licensed" amateur transmitters in Holland. Readers need not be astonished, however, if they receive Dutch amateur signals. At present there are more than one hundred short-wave amateur stations, while ten are working on 800 metres.

A FIELD DAY.

A field day on Ranmoor Common was held by members of the Lewisham and Catford Radio Society on Sunday, July 6th. Some interesting experiments were carried out with "straight" and "reflex" receivers, and to the surprise of most, every set worked well!

"H.T.-less Circuits" will form the subject of a debate between members of the Society on August 21st.

SHORT WAVE TESTS FROM WASHINGTON.

NKF, the Washington Station, is conducting a series of daily tests on waves of 52 and 61 metres. Times of transmission (Sundays excepted), are:—

3.30 to 3.45 a.m. (B.S.T.).

5.15 to 5.50 a.m. (B.S.T.).

9.30 to 9.45 p.m. (B.S.T.).

Reports on the reception of NKF should be sent to the United States Naval Research Laboratories Radio Division, Anacostia, D.C.

SWEDISH TRANSMITTER SEEKS TESTS.

Mr. G. Fant (SMZZ), Post Box 55, Norrviken, Sweden, would be glad to arrange tests with British amateur transmitters.

SMZZ transmits on Wednesdays and Saturdays after 10 p.m. G.M.T., on a wavelength of 154 metres, though a reduction to 120 or 100 metres will probably be made in September. A power of 20 watts is employed. Mr. Fant reports that he has already carried out successfully two-way communication with 2 XG Northampton, over a distance of 905 miles.

INDIA'S BROADCASTING PROBLEMS.

The suggested regulations for broadcasting in India are not unlike those obtaining in the United Kingdom, but it is considered that the country is

too large to allow of the granting of a monopoly to a single company. It is therefore proposed to grant the monopoly, by Provinces, to persons or companies approved by the local Government concerned. Under the scheme licences for reception would be available to the general public at a yearly fee of ten rupees, the broadcasting company in the province concerned to receive 80 per cent.

Under the regulations, should they be finally approved, programmes other than news may be broadcast at any time of the day.

BAD LUCK ON ARCTIC EXPEDITION.

A series of misfortunes has overtaken the Oxford University Arctic Expedition, which sailed on June 19th, under the leadership of Mr. George Binney, with the principal object of exploring North Eastland.

While the two ships, "Polar Bjorn" and "Oiland" were travelling at full speed a sunken reef was struck and great difficulty was experienced in refloating the ships. After many obstacles had been encountered the Expedition arrived at Mahlonberg Bay, the wireless operator, Mr. Law, was taken ill with pleurisy, and the wireless arrangements were completely disorganised.

This, and the fact that Captain H. Hansen was suffering from blood poisoning in the face, obliged the party to postpone further efforts for the time being. Eventually the wireless operator was landed at Kingsbay and his place has been taken by Mr. Relf, who was wireless operator on the last expedition.

RADIO IN U.S. BALLOON RACE.

Wireless touch with 16 different broadcasting points largely contributed to the winning of the National Elimination Balloon Race in the United States by the Goodyear III, according to the pilot Mr. W. Van Orman. Weather reports broadcast to the balloon enabled the pilot to take advantage of favourable currents and to avoid thunder and snowstorms.

Some interesting observations were made during the trip, regarding the prevalence of atmospherics. For instance, it was discovered that above an altitude of 2,000 ft., the tendency was for the atmospherics to disappear and this was especially noticeable in the early hours of the morning.

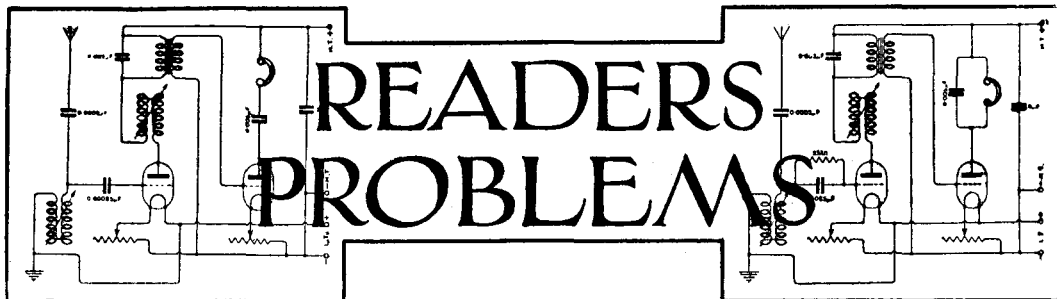
LPZ EMPLOYS SHORT WAVES.

Among the high-powered stations now adopting short waves must be included LPZ, the Argentine Station.

At 10 p.m. on August 2nd, Mr. J. L. Menars, of Le Blancat, France, heard C.W. signals from LPZ on a wavelength of 62 metres, of an intensity of about R 3. The receiver consisted of a Reinartz set and one stage of L.F. magnification, and considering the distance covered such a result is exceptional.

BOOKS RECEIVED.

General Principles of Wireless Transmission and Reception (one of a series of technical pamphlets for workmen). Issued by the P.O. Eng. Dept., London. H.M. Stationery Office, Imperial House, Kingsway. 35 pages, 27 diagrams. Price 6d. net.



1. All questions are answered through the post. A selection of those of general interest is published. 2. Not more than four questions may be sent in at any one time. 3. Every question should be accompanied by a postal order for 1/-, or 3/6 for four questions, and by a coupon taken from the current issue. 4. A free coupon appears in the first issue of each month, and if this is sent in together with coupons from the three previous issues, the reader is entitled to have one question answered free of charge.

ADDING A STAGE OF L.F. AMPLIFICATION WITH CHOKE CAPACITY COUPLING.

It is often convenient to be able to add an extra note magnifier to a receiver without disturbing the internal wiring, especially when the existing receiver is a standard commercial type. This can be done quite easily if the telephones are connected directly in the plate circuit of the last valve of the receiver. Further, the H.T. and L.T. batteries of the receiver may be used to supply the amplifier if the connections are made in the manner indicated

on the additional amplifier. It is always safest to make the battery connections to any additional valve apparatus in this way in order to prevent the possibility of short-circuiting the L.T. battery.

LOSS OF AMPLIFICATION.

A CORRESPONDENT states that the degree of amplification obtainable from the L.F. valves of his receiver varies from time to time. The amplification falls off suddenly, and as suddenly returns to its normal value.

There can be little doubt that the erratic behaviour referred to is due to self-oscillation of the L.F. valves. Oscillation of the L.F. valves can often be heard as a shrill whistle in the telephones or loud-speaker, the pitch being unchanged when tuning adjustments are altered. In this case, however, the frequency of the oscillation is above the upper limit of audition, and the only indication of its presence is the falling off in amplification.

The coupling between the valves which causes oscillation is generally the resistance of the H.T. battery which is common to the plate circuits of all the valves. Oscillation from this cause may be stopped by connecting a large condenser across the H.T. battery. This condenser may have any capacity between 1μF and 4μF, depending on the number of valves and the value of the total H.T. current.

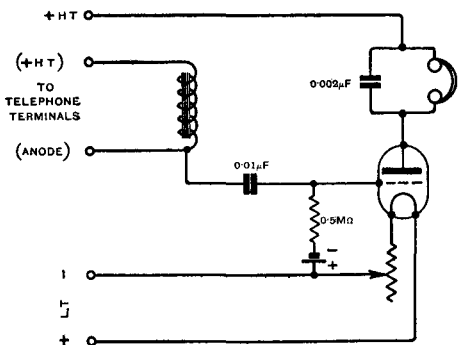


Fig. 1.

in Fig. 1. The choke coil is connected directly across the telephone terminals of the set, care being taken that the end of the choke coil connected to the grid coupling condenser is also connected to the telephone terminal from the anode of the last valve in the receiver. Since the minus end of the H.T. battery is connected to the L.T. battery in the set, only three battery terminals will be necessary

VALVES FOR H.F. AMPLIFICATION.

THERE can be no doubt that valves of the V.24 or D.E.V. type in which the leads from the grid, anode and filament are well separated are the best valves to use for H.F. amplification. The price of these valves is higher than that of the

ordinary four-pin type, and it is natural, therefore, that amateurs should ask whether the benefit they hope to obtain will be commensurate with the additional outlay. The decision as to which type to use will depend upon the wavelength range for which the receiver is designed. On wavelengths above 300 metres it is doubtful whether the difference in the results obtained warrants the extra cost. On wavelengths below 300 metres, however, the low inter-electrode capacity of the "V.24" type will be found a very distinct advantage, while their use will be absolutely imperative if H.F. amplification is to be successfully carried out below 100 metres.

FILAMENT RESISTANCES FOR D.E.R. TYPE VALVES.

WHEN the only receiving valves available were of the bright emitting type, it was customary to fit filament resistances of about 5 ohms and to employ a 6-volt accumulator to supply the filament current to valve receivers. Dull emitting valves of the D.E.R. class, taking a filament current of 0.35 amps. at 1.8 volts may be

A THREE-VALVE AND CRYSTAL RECEIVER.

IN the circuit diagram in Fig. 2, it will be seen that a crystal is used for rectification instead of a valve. The crystal detector and the primary winding of the first intervalve transformer are connected across the tuned anode circuit of the H.F. amplifying valve in order to rectify and pass on to the L.F. valves the amplified H.F. currents in the anode circuit. Two L.F. amplifying valves are employed in conjunction with a double pole, double throw switch to cut out the last valve when great volume of sound is not required.

The receiver as it stands at present would be suitable for the reception of broadcasting stations at loud speaker strength which are just outside the range of a crystal detector. Provided that the necessary attention has been paid to the choice of valves, transformers and suitable anode and grid voltages, the quality of telephony should be good. The range of the receiver could be increased by coupling together the plug-in coils used to tune the anode and grid circuits of the H.F. valves. The use of reaction in this way will also tend to improve the selectivity, which would not otherwise

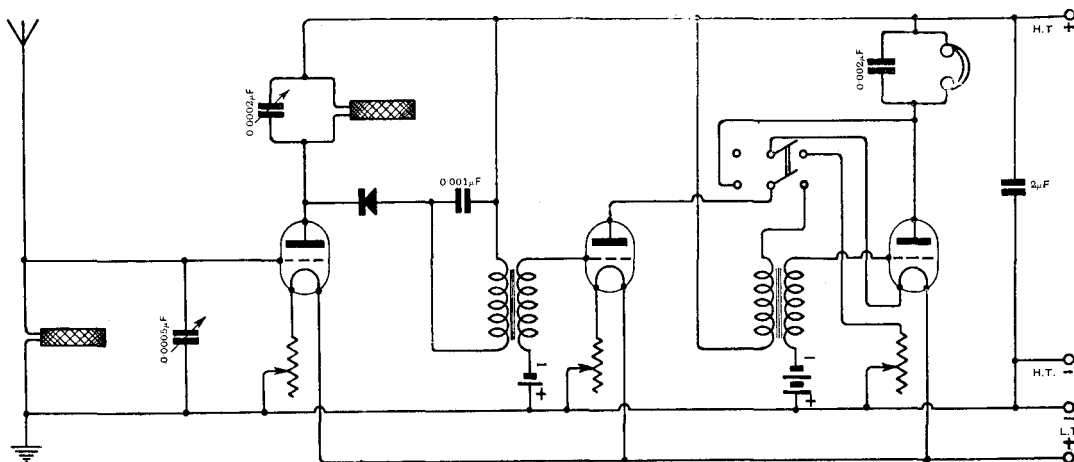


Fig. 2.

used with the existing 5 ohm resistances if the voltage of the accumulator is reduced to 2 volts by connecting the cells in parallel instead of in series. In some accumulators the cells are connected permanently in series by means of lead connecting strips burned on to the plate terminals. The voltage cannot, therefore, be reduced and the only alternative is to connect fixed 10 ohm resistances in series with each valve in order that the maximum filament current specified by the makers may not be exceeded when the whole of the variable resistance is switched out of circuit. With a filament resistance variable throughout the whole of its range there would be a possibility of burning out the valve by turning the resistance too far.

be very high; damping is introduced into the aerial circuit by the resistance of the aerial and earth system and into the tuned anode circuit by the crystal detector.

Many people expect to obtain from a set of this type a signal strength equal to that given by four valves. A moment's consideration will show that this cannot be expected, for not only is signal strength lost by reason of the damping introduced by the crystal, but one also loses the amplification which would be contributed by a valve detector. A three-electrode valve used as a detector does at the same time amplify signals, though not to the same extent that it would if used purely as an H.F. or L.F. amplifier.

The WIRELESS WORLD — AND RADIO REVIEW



RADIO TOPICS.

AN INTERNATIONAL RADIO WEEK.

IT will be remembered that in the autumn of last year, this journal, in conjunction with the American wireless magazine, *Radio Broadcast*, promoted the first Transatlantic broadcast experiments which were carried out by broadcasting organisations in America and this country. Readers will remember that, although speech reproduction of the re-broadcast transmissions could not be regarded as satisfactory, chiefly on account of atmospheric and other disturbances, yet as an experiment, the project was intensely interesting and indicated the possibilities which existed for re-transmission under more favourable conditions.

This autumn we hope to make another attempt, and the B.B.C. is keenly interested, although they feel that transmission of this sort, if they are only experimental in character, must not be repeated too often, as they believe that the public would not support a second enterprise unless it were considered more fruitful of result than the last. This year it is proposed to do more than broadcast American programmes only. The idea will be extended to the Continent. Re-broadcast during some particular week of transmissions of various Continental broadcast stations is proposed. As far as possible an endeavour to co-operate with the Continental stations will be made so that the programmes shall be of a national character.

THE LOCATION OF THE 1,600 METRE STATION.

AT the time when the proposals were first made to establish a long wave high power station as part of the organisation of the B.B.C., we wrote in the pages of this journal expressing regret that the whole matter had apparently been dis-

cussed and final arrangements made by the B.B.C. and the Post Office without consultation with other interests concerned. We found that the complete proposals were disclosed in the daily press before any communication had been made regarding the project to manufacturers, even those who were members of the B.B.C. itself. Considerable resentment was felt by the majority of firms on this account.

The B.B.C., in replying to our criticisms then, justified themselves on the score that the station was nothing more than an experiment at that time, and that, without giving the scheme a trial, it was quite impossible to decide whether it would be a practical possibility and whether indeed the Post Office would authorise it at all. The B.B.C. considered that manufacturers had no reason to be deeply concerned in the matter until such time as it was definitely established that the station would be a permanency.

Now that it is almost certain that the establishment of a permanent station will be sanctioned, it would seem that the time has come when manufacturers and other interests should be consulted regarding the project, and more especially regarding the site for the permanent erection of the station. Instead of this course being adopted by the B.B.C., we find that much the same attitude has been repeated as in the first instance.

Those interests outside the B.B.C. which are vitally concerned about the permanent location of the station, obtained their first information as to the site from the daily press. It has recently been announced, whether officially or otherwise, that the location chosen for the station is North London, and our own information gives us good reason for believing that the site is to be no farther out than a northern suburb.

In a recent issue of this journal we invited readers to express their views on the 1,600

metre station from experience gained during experimental transmissions. Whilst nearly every communication which we have had praised the efficiency and general usefulness of the station, complaints are general that it interferes with reception of some other stations, and particularly Continental transmissions.

If the station is now to be brought into London, it will in our opinion, make reception of anything else over a very wide band almost impossible for Londoners, more particularly with the apparatus which manufacturers have designed up till now, where the necessity for special selectivity has not been so great. Again, what is going to be the position of those who have bought expensive sets in the London area in order to get good loud-speaker reception from London and other stations, when they find that with sets of half the efficiency they can still get the same results as regards strength and quality.

The crystal user will, of course, benefit enormously, but it is doubtful whether the public are being best served by this encouragement to use crystal sets in preference to more stable and satisfactory valve receivers.

The amateur who wishes to experiment is in the worst position of all. He is more numerous in London than in any other part of the country and yet he is going to have placed on his doorstep a station of such power that probably the troubles experienced with Leafield will be insignificant in comparison.

We should have thought that the site chosen for the station should have been one as nearly central to the British Isles as possible, and reasonably remote from thickly populated areas. In any case we consider that a location nearer than 25 or 30 miles from London is a proposal which will not be welcomed whole-heartedly by any section of the community.

THE NEED FOR A NEW VALVE.

A YEAR or two ago the number of different types of valves and other components was comparatively limited. Now, however, owing to the increased demand and the expansion of the wireless industry, coupled of course with the ever stimulating effect of competition, one can no longer stroll into a shop and pick up the first valve or first transformer met with and assume that it is applicable to a particular set or particular

purpose to which we intended to apply it.

These considerations prompt us to express the view that in spite of the wide range of valves at present on the market, there still remains a need for yet another type which is not at present available.

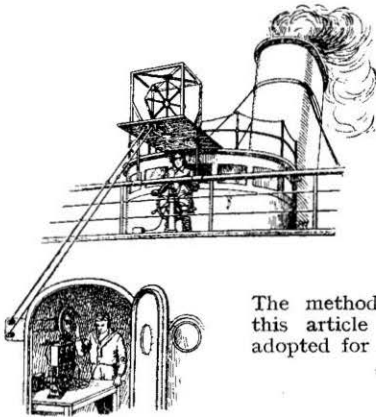
The DE 5 type of valve, for example, requiring six volts for the filament, is efficient in low frequency circuits where transformer coupling is employed, and equally applicable for use as a detector, the reason being that it has good filament efficiency, a low internal anode-filament impedance, and a reasonable amplification factor. A voltage amplification per stage of 32 is obtainable under normal circumstances and uniform amplification over the speech frequency range can be obtained where suitably designed transformers are used.

The valve which we would like to see, however, would be of the DE 5 type, which is really efficient and economical for H.F. circuits or resistance or choke coupled low frequency circuits, but developed so as to have a much greater amplification factor, say in the neighbourhood of 25. Such a valve would have an impedance of about 25,000 ohms, and would be applicable for use in a resistance or choke coupled low frequency amplifier. The advantages of choke, and particularly resistance couplings, are well known, but they have certain disadvantages.

With resistance amplifiers the voltage amplification per stage rarely exceeds 75 per cent. of the voltage amplification factor of the valve, and with choke coupling the figure may be stated to be in the neighbourhood of 90 per cent.

If valves having the characteristics suggested above were available it would then be possible to obtain an amplification of about 20 per stage, whereas the present DE 5 valve gives probably not more than six. Such valves would be equally applicable for high frequency amplification stages, where, for example, the tuned anode system of coupling is employed. At present those who use a six-volt accumulator are restricted in their choice of valves to those of the DE 5 or R V 24 or '06 types.

There is, of course, the DE 3 class, which takes approximately three volts at 60 milliamperes for filament heating, but the valve we should like to see would be one designed along the suggested lines to operate in conjunction with the DE 5.



WIRELESS POSITION FINDING. FRAME AERIAL SHIP EQUIPMENT.

The method of equipping vessels with directional apparatus described in this article is perhaps less familiar than other systems. The means adopted for control of the rotation of the frame may suggest ideas for amateur equipment.

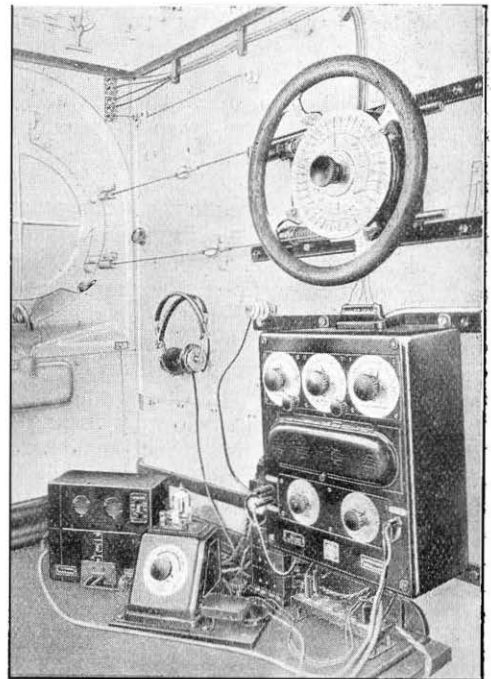
ALTHOUGH the general principles of the operation of directive wireless apparatus is the same in all types, there are various methods of putting these principles into practical operation.

Directive wireless may be classified under two distinct heads—directive reception and directive transmission. Either of these systems may have particular merits of its own and the applicability depends upon the general conditions and circumstances under which the apparatus is to be employed.

If we have a moving station such as a ship, we can transmit signals which can be received by fixed stations on the coast, equipped with directive apparatus. The fixed stations can take bearings on the moving station and by means of a telegraphic or telephonic communication to the ship can inform the latter of its location. Such a system is particularly convenient where it is undesirable to have any complication of apparatus or additional weight on the moving station. Aeroplanes in particular, make use of this system. The method is, however, somewhat cumbersome, because the moving station must first transmit signals which can be identified by the fixed station and these signals must be maintained sufficiently long for satisfactory bearings to be taken by the fixed station. The fixed station has then to transmit to the moving station the results and altogether the time taken may be considerable, especially if bearings from two or three fixed stations have to be reported before position can be established.

Another method which has been employed makes use of a rotating directional trans-

mission at the fixed station. The directional wireless transmission is rotated during a definite period of time, and as the movement takes place, distinctive signals are emitted from the station. In this way, at an angle of say 60 deg., there might perhaps be a series of groups of six dots transmitted continuously and with a change of 5 deg., six dashes instead of dots or any other suitable



The wheel for control of the frame and the receiving apparatus inside the cabin.

code of signals which could be identified by the moving station. Such an arrangement, although it has advantages, has the drawback that the apparatus at the fixed transmitting station has to be somewhat complicated and very accurately timed and checked in order that there shall be no possibility of error in the identification signals transmitted.

Wherever it is practically possible to equip the moving station with directional receiving apparatus, this method has found favour. Then it is only necessary for the fixed coast station to transmit a series of signals continuously, which can be identified as emanating from that station. The moving station has then merely to take a bearing on this and other fixed stations in order to make sure of its position.

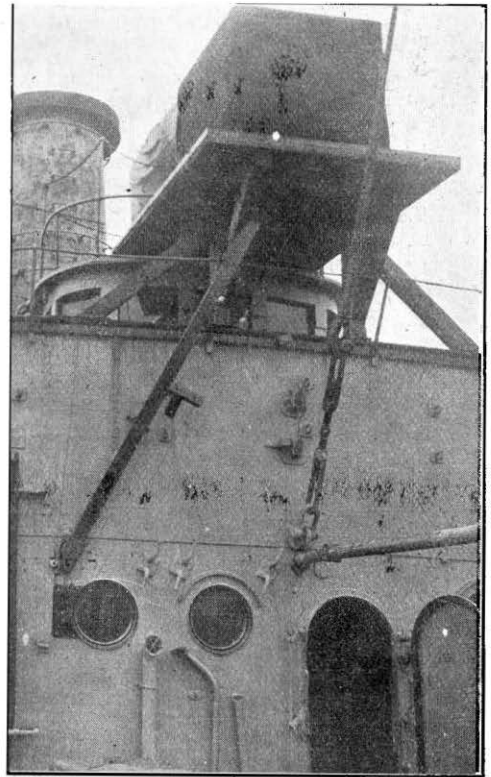
Wireless direction finding has the great advantage over other methods of position finding such as visual or acoustical methods in that in addition to a very greatly increased range, the wireless transmissions are unaffected by the presence of fog, which will often render the other two systems totally ineffective.

The most familiar directional wireless equipment for ships in this country is the Bellini-Tosi system which is fitted by the Marconi Company. As is well known, in that system two aerials, usually triangular in shape, are fitted at right angles and are led to two coils in apparatus termed the radiogoniometer. The two coils are inductively coupled to a third coil constituting the search coil.

The system illustrated in the accompanying photographs is that which is favoured by the Telefunken Company on the Continent, and the particular apparatus here shown is fitted to the s.s. Panther. The arrangement consists of a small frame aerial mounted on the upper deck on a platform projecting as shown. Rotation of this frame is controlled from the cabin below by means of a wheel from which the directional bearing is read off. The receiving equipment consists of a four-valve high frequency amplifier and a two-valve low frequency amplifier. A separate heterodyne is used for C.W. reception. The operator can communicate to the bridge from this cabin and in this

way he can pass on the information obtained.

The method of controlling the rotation of the frame aerial from a distance should be of particular interest to amateurs as it



How the frame is mounted on the upper deck. The cables which control the rotation of the frame enter the cabin near the porthole on the left.

will suggest a means of overcoming the difficulty met with, particularly where it is desired to rotate a frame aerial located on the roof from a room below. It is, of course, essential that there should be no slack in the wires controlling the movement of the frame as otherwise the frame position and the bearing recorded at the wheel will not register. It is also necessary to damp the movement of the frame sufficiently to make sure that there is no slip or undue strain produced by a sudden movement of the wheel or sudden checking.

THE BEST CRYSTAL CIRCUITS.*

There has been much discussion as to what is the best crystal circuit. In this article the relative efficiencies of various crystal circuits are compared, and definite conclusions are arrived at which may help many experimenters to improve their crystal reception.

By W. B. MEDLAM, B.Sc., A.M.I.E.E., and U. A. OSCHWALD, B.A.

TAKING the general form of single coil crystal circuit shown in Fig. 1, which is self-explanatory, an attempt will be made to show what positions the various tappings should occupy to give the best results under given conditions.

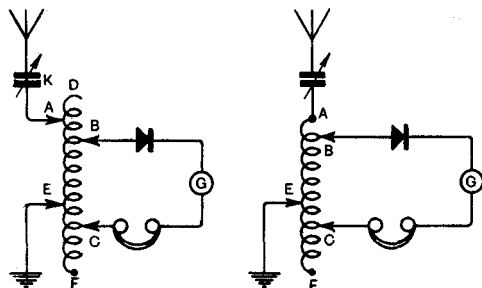


Fig. 1.

Fig. 2.

The position of the tapping points on the tuning coil controls the efficiency of the receiver.

First, the tapping A should be at the extreme end of the coil, for the loss of efficiency due to the dead ends is less when they are on the earth side than when on the aerial end of the coil. The circuit thus improved is shown in Fig. 2. This improvement simplifies the circuit without affecting its flexibility. With regard to the tapping B, we find that, keeping the number of turns in the sections AE and BC fixed, the crystal current falls steadily as B is moved down the coil away from A, and C is moved correspondingly towards F. Thus we may effect the further improvement and simplification shown in

Fig. 3, in which the crystal tap is fixed at the aerial end of the coil. We are left with the double-slider arrangement in which there are two opposing factors to be considered separately, namely, (a) the possibility of a step-up effect across the section AC, and (b) the dead ends between C and F. In order to investigate (a) it is necessary to eliminate the effect of (b). This was done in the first series of tests by bringing the tap C to the end of the coil, as shown in Fig. 4. Readings of the galvanometer G were taken, on 2 LO's carrier, with various numbers of turns on the coil AC, the number of turns between A and E being kept constant. The tests were repeated for a series of values of the fixed turns AE. The coils used were of the basket type, wound initially to 60 turns with 23 S.W.G., D.C.C. wire. The results are plotted in Fig. 5. The graphs show how the crystal current varies with the number of turns in the coil, when the number of turns tapped off has the fixed value indicated by the number against each graph. The dotted line shows the variation of current with turns when the earth tap coincides with C, i.e., with a plain untapped coil. It will be noted

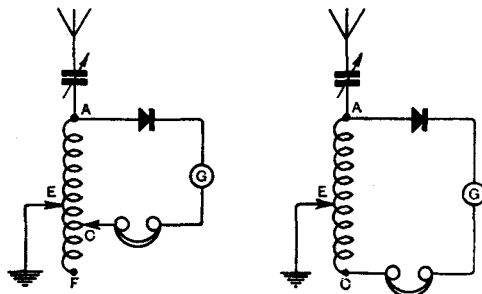


Fig. 3.

Fig. 4.

Simplified circuits on which tests were carried out.

* The experimental work in this article was carried out at Chelsea Polytechnic.

that the greatest current of the whole series, 100 microamperes, is given with a coil of 32.5 turns, at the 25 turn tap. The greatest current obtained with an untapped coil is shown by the dotted curve to be 97 microamperes with 28 turns. Thus only the very small step-up effect of 3 per cent. in crystal current is obtainable when using the best possible values of inductance in the two cases. In other words, a plain coil can be made to give an efficiency of 97 per cent. against the 100 per cent. of the double-slider arrangement (when working with no dead ends), it being assumed, of course, that the aerial capacity is great enough to allow the inductances to be reduced to their best values. The best value of inductance for a crystal circuit on a given wavelength depends on the signal strength

below that of about 35 turns (except by means of a parallel condenser, which would have reduced the efficiency), and our plain coil curve would have ended at 35 turns and

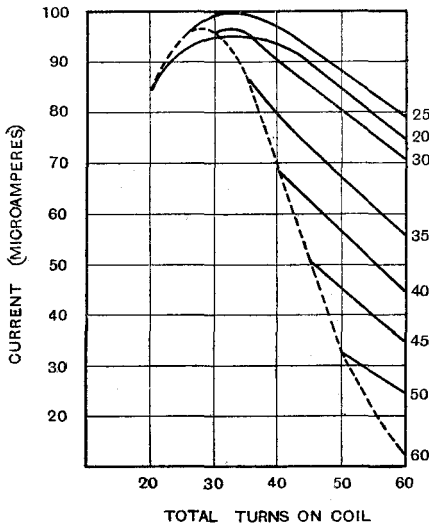


Fig. 5. The current delivered by the crystal detector as changes are made in the position of the tapping point of the circuit in Fig. 4.

and on various constants both of the aerial circuit and of the receiver, but average values for one pair of 'phones in the crystal circuit, on 2 LO, are from 90 microhenries for strong signals to 120 microhenries for weaker signals. Now these inductances require aerial capacities of about 0.0004 mfd. to 0.0003 mfd. respectively, which are higher values than given by the average P.M.G. aerial. Had the capacity of the aerial on which these tests were made been, say, only 0.00023 mfd. we could not have reduced the inductance

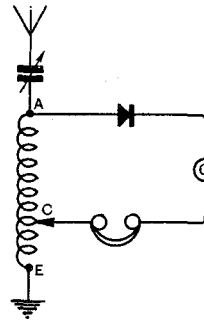


Fig. 6. Auto-transformer circuit.

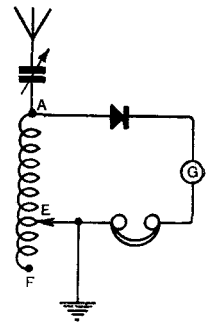


Fig. 8. Circuit with dead-end turns.

87.5 microamps. Also, the 20, 25 and 30 turn curves would not have appeared at all for the same reason. Cutting out these curves we see that no adjustment of the earth tap or number of turns on the whole coil can give a result as good as that given with the plain coil adjusted to tune on the full aerial capacity.

We will now deal with other crystal circuits. Interchanging the tappings E and C (Fig. 4) gives the double-slider circuit of Fig. 6, in which the dead ends on the earth side are

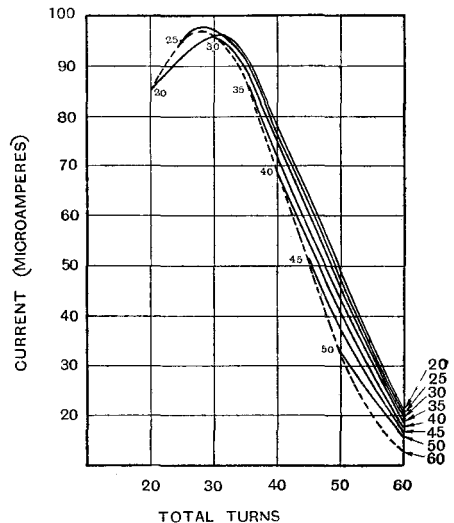


Fig. 7. Current delivered with various settings of the tap C in Fig. 6.

deleted as before. The performance of this circuit is shown in Fig. 7, for the same range of total turns and taps as in the previous series of tests. The coils were of the same type and were wound with the same gauge of wire as before. From Fig. 7, the best number of turns is seen to be 28.5 between A and E and 25 between A and C. The maximum current is 97.5 microamps., against

tapped off (from A to E in this case), and each curve is taken up to 60 total turns (between A and F).

We see from Fig. 9 that the greatest current, 99.5 microamps., is obtained with the 25 turn tap on a 32 turn coil. The seven dead ends actually give an increased current.

Comparing Figs. 5 and 9, it appears from the greater slope of the curves in Fig. 5, that the circuit giving these results is, in general, inferior to that giving the results of Fig. 9. Thus the single slider circuit of Fig. 8, with its dead ends, is, in general, better than the double-slider circuit of Fig. 4, even when the latter circuit has its "ends" deleted.

(To be concluded).

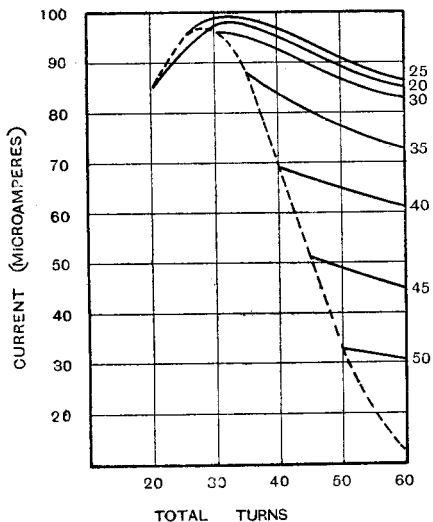
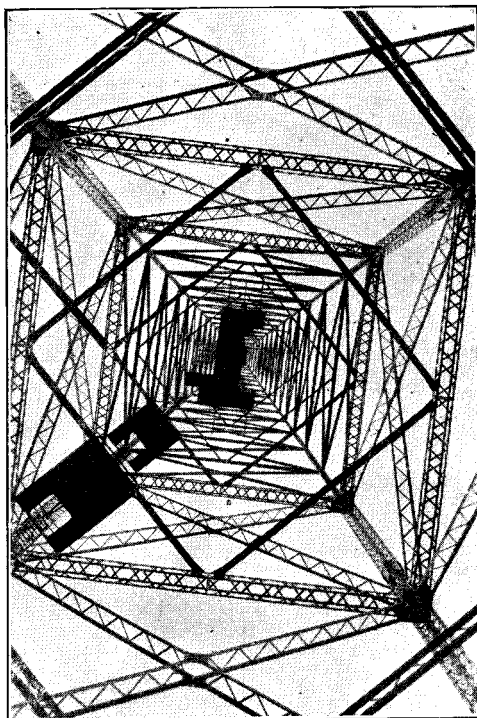


Fig. 9. Results obtained with the circuit shown in Fig. 8.

97 microamps. with 28 plain turns. Comparing Figs. 5 and 7, it will be seen that the slope of the curves is much steeper in Fig. 7, from which it would appear that the circuit of Fig. 6, is, in general, inferior to that of Fig. 4.

So far we have deleted all dead ends in order to investigate the autotransformer action between two sections of the winding. We will now deal with the "ends," and cut out the transformer action by making the earth and 'phone taps co-incident. This gives the single-slider circuit of Fig. 8. Results obtained with this circuit are plotted in Fig. 9, for the same range of tappings and total turns (on exactly similar coils) as for the other tests. As before, the curves are numbered to indicate the number of turns

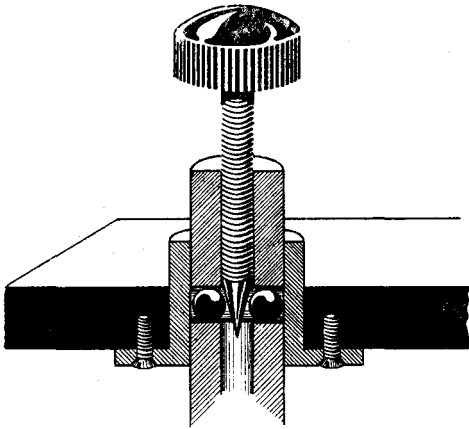


An unusual view of one of the masts of the new Radio Paris Station at Clichy. The mast is 330 ft. high and is supported without guys or lateral struts of any kind.

READERS' PRACTICAL IDEAS.

Locking a Condenser Spindle.

The weight of the moving plates on one side of a condenser spindle may cause it to revolve when mounted edgewise, whilst difficulty may be experienced in retaining condenser settings on portable sets as the result of vibration.



Simple lock for a condenser spindle.

A very simple method of locking a spindle in position consists of tapping a hole, say 4 B.A., down the centre of the shaft and making another hole transversely through it. A pointed screw can now be made to engage on two steel balls such as are used in ball bearings, and by driving the screw down tight, the two steel balls can be made to grip on the face of the condenser bearing.

L. H.

Tinning Brass Parts.

A simple and effective method of tinning terminals and metal parts which does not entail the need of a workshop, and therefore is within the limits of all readers for a matter of a few coppers, may be found by using the following method.

Obtain in the first place, one stick of solder, an ounce of cream of tartar and a metal vessel or bath.

The size of this bath depends upon the articles to be tinned, but usually a tobacco tin or any other tin about 4 ins. diameter and about 3 ins. deep, will answer the purpose quite well.

The amount of water should be judged to cover the articles, while the ounce of cream of tartar is sufficient for a pint of water, but adding more than necessary will not affect the results.

When the amount of water is gauged, the solder should be dropped in a molten condition into the water, by means of a ladle, an old tablespoon, or by using a soldering iron, after which the cream of tartar is added.

The metal to be tinned should be thoroughly cleaned (dipping into nitric acid is the quickest way), and then placed into the "bath."

For most parts, an hour's boiling is sufficient, but where a moving contact is needed, twice the time or a second bath is necessary with the solder renewed.

W. F. G.

Low Capacity Lead-in.

It is not merely sufficient to *insulate* the leading-in wire from contact with earth, for what is just as important is to make sure that the wire, in passing through the wall or window frame, presents a minimum of capacity to earth. Leakage through capacity is almost as serious as leakage through resistance, and the detrimental effects of a



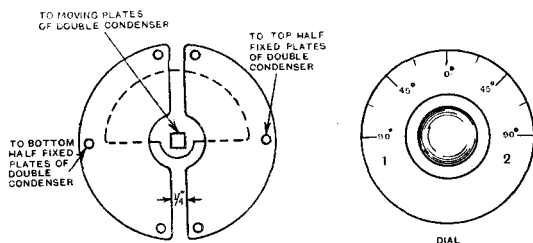
Efficient lead-in. Here the leakage due to capacity is a minimum.

high capacity lead-in increase as the wavelength is decreased. To keep capacity as low as possible, air spacing is recommended, and a good construction is shown in the accompanying diagram, making use of two old sparking plugs and a piece of ebonite or fibre tube. The connection between the plugs may be a piece of flexible wire.

Balancing Two H.F. Circuits.

In receiving apparatus containing two stages of tuned high frequency amplification and where a double condenser is used, the following device has proved of value in balancing the two circuits so that the double condenser will accurately tune both. A small condenser is constructed with two fixed and one moving plate of standard size, and mounted as indicated in the diagram. The two fixed plates are respectively connected to the two fixed plate terminals of the double condenser, and the moving plate to the moving plate of the double condenser. The circuit becomes that given.

It will be seen that when the moving plate is overlapping the two fixed plates equally, the additional capacity is equally divided between the two halves of the double condenser, and rotating the moving plate 90 degrees to the left or right will add capacity to one half of the double condenser and subtract it from the other half. It is convenient to attach a scale or dial with a



The solution to tuning two H.F. circuits simultaneously.

centre zero and reading to 90 degrees on either side, and to mark the two scales 1 and 2 to indicate which valve circuit is receiving a larger capacity.

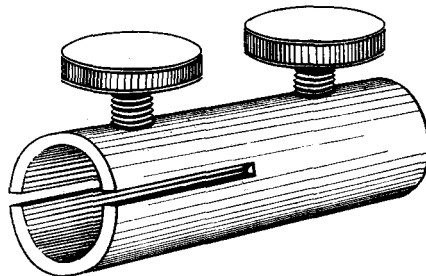
In operation, set the *double* condenser to its best position, and then rotate the *balancing* condenser to the best advantage, finally adjusting the double condenser if required. Minor differences in coils, transformers, and the connecting wires and layout of the two circuits can thus be balanced.

If the receiver incorporates a switch for cutting out one of the high frequency valves, the device will then become a simple one-plate vernier in the tuning circuit of the remaining high frequency valve.

C. H. M.

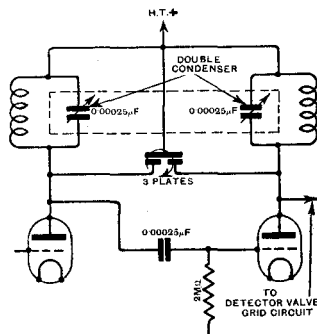
Useful Battery Connectors.

The linking up of flash lamp batteries to form a high voltage is a troublesome process unless soldered leads are adopted, but this



The saw cut extends the utility of the usual barrel connector.

method does not permit of ready disconnection. Ordinary barrel type connectors can be adapted for the purpose by making a saw-cut in one end so that good connection can be made to the battery clip. The wire lead is inserted in the other end.



As a variable tapping point on a soldered-up set of batteries, nothing could be more useful, while the modified connector is adaptable for a dozen purposes.

G. W. S.

VALVES FOR IDEAS.

Readers are invited to send in descriptions of "gadgets" for inclusion in this section. To readers whose suggestions are accepted a receiving valve of standard make will be despatched. Letters should be addressed to the Editor, *Wireless World and Radio Review*, and marked "Ideas."

The many communications which have already come to hand are being dealt with as expeditiously as possible.

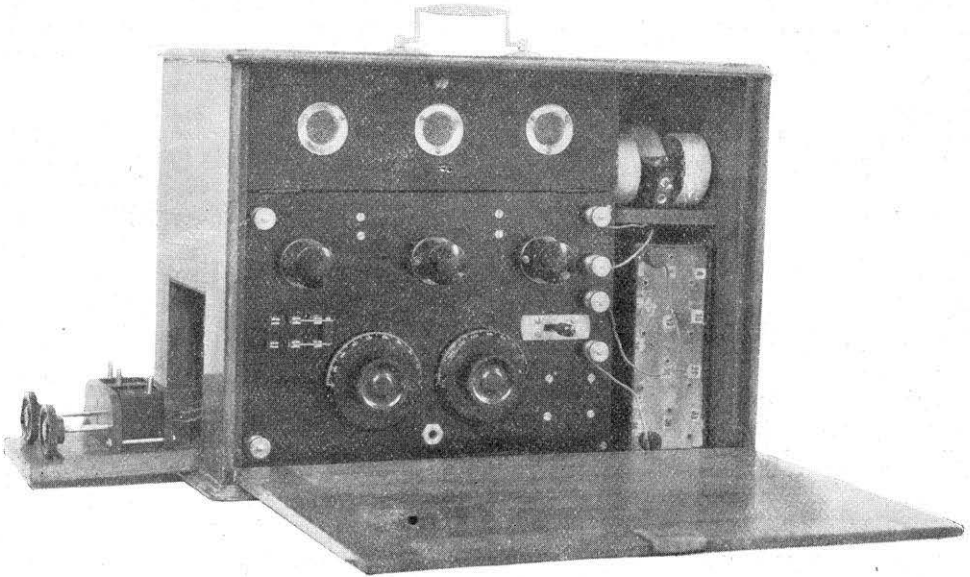


Fig. 1. The finished instrument. Provision is made for housing both L.T. and H.T. batteries if required, when dull emitter valves are employed, whilst another compartment is used to carry a wide range of coils. The method of fitting the coil holder can be clearly seen.

A COMPACT THREE-VALVE SET.

The three-valve set can still claim to be the most useful for good all round reception. It is useful to dispense with the H.F. amplifier for reception at short range and to cut out the L.F. valve when using telephone receivers, and in this set these operations are carried out on a single key switch. Other novel features of special interest to the home constructor are to be found in the set here described.

By W. F. GILDERSLEVE.

THE aim in the design of a really portable receiver should be to make adequate provision for the protection of the various dials when the instrument is closed. It is in this direction that there is perhaps considerable scope in the design of portable sets, which while being fairly compact when closed, make provision for the many necessary tuning adjustments when brought into operation.

In the first place the panel may be recessed below the front of the instrument in order to protect the knobs, keys, etc., from damage, whilst this facilitates also the fitting of a lid which completely closes the instrument. The most difficult problem which presents

itself is the method by which the coil holder is to be attached to its panel and the manner in which it is carried in the box-work. For the instrument under description it was decided to fit the coil holder to the side of the box in preference to attaching it to the panel where the movement of the coils would obscure a big area of the instrument panel. It thus became necessary to provide a small door on the side of the cabinet to give access to the coil holder and it occurred to the writer that by attaching it on to a hinged flap, that an easily accessible arrangement was produced permitting of the coils being operated entirely externally to the set. The circuit employed embodies high fre-

quency amplification on the well-known tuned anode principle, followed by a valve detector and note magnifier. By means of a switch it is possible to take out of circuit either of the amplifying valves so that the receiver may be operated with all three valves in use or as a high frequency amplifier with detector valve, or alternatively, as a

on the face of the instrument panel, while the required degree of amplification is easily obtained, according to the circumstances in which the set is to be used.

The usual series parallel switch has also been fitted in order that the receiver might operate over a full range of wavelengths, and particularly does the use of the parallel

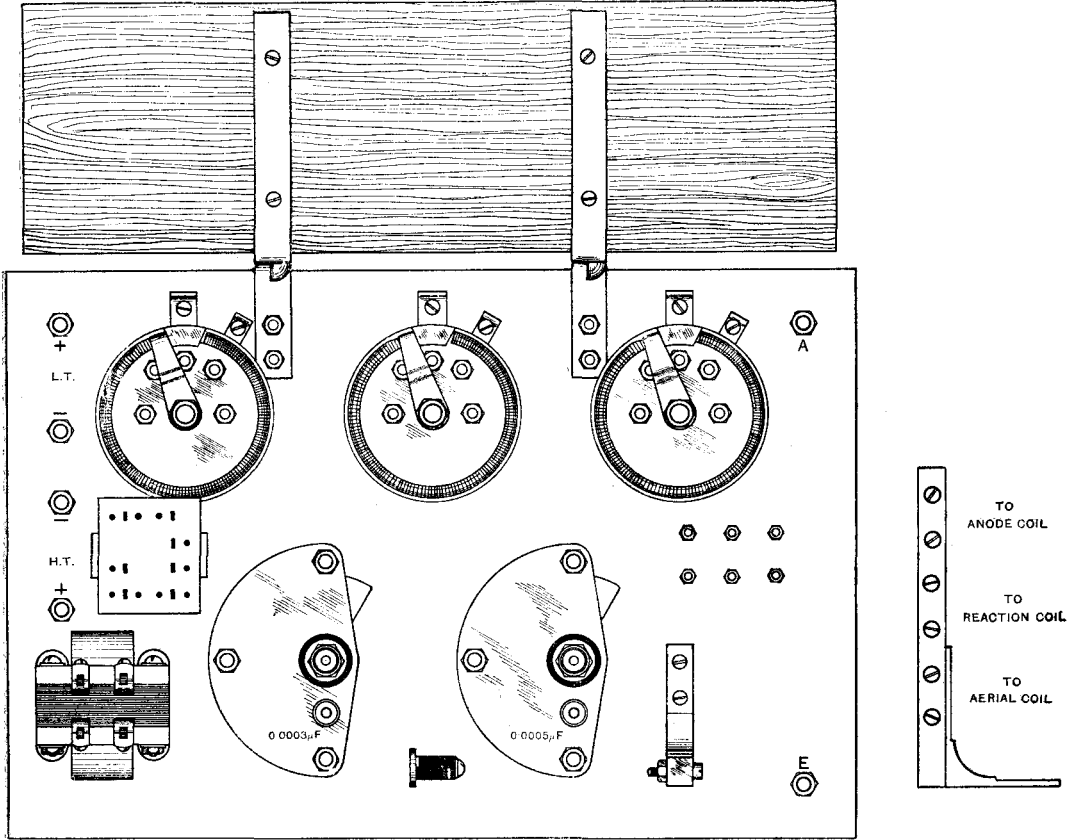


Fig. 2. The underside view of the panel showing the layout of the component parts.

detector valve followed by a low frequency amplifier. This switching is accomplished by means of a single three-position keyswitch of the type specially designed for use in high frequency circuits. The key employed possesses actually 17 tags, though it was found to be only necessary to make use of 10 of its contacts. This method of switching will be found to be particularly convenient, for in the first place very little space is occupied

condenser become necessary at the present time now that 5 XX is operating on a wavelength of 1,600 metres.

As is well known, when switching a high frequency amplifier in and out of circuit in front of a detector valve, it becomes necessary to reverse the connections of the reaction coil when it is coupled to the aerial circuit. Provision is made for this by means of two plug and socket connectors, fitted actually to the

end plate of the coil holder and this serves an additional purpose inasmuch as reversed reaction can be obtained as required.

The three coils in the holder consist of aerial inductance, reaction inductance, tuned anode inductance, reaction being the centre one so that it can be made to stimulate oscillation in the aerial circuit and thus compensate for the damping which is produced by resistance and radiation, while the reaction coupling of the tuned anode is such that the

long wavelengths and this is used in conjunction with the leak, having a value of 2 megohms. The low frequency valve is coupled up with the usual intervalve transformer, which has its primary bridged with a 0.001 mfd. condenser, and a separate bridging condenser is used across the telephones. Connection is picked up to the telephones by means of a plug and jack, which will be found to be a most convenient arrangement.

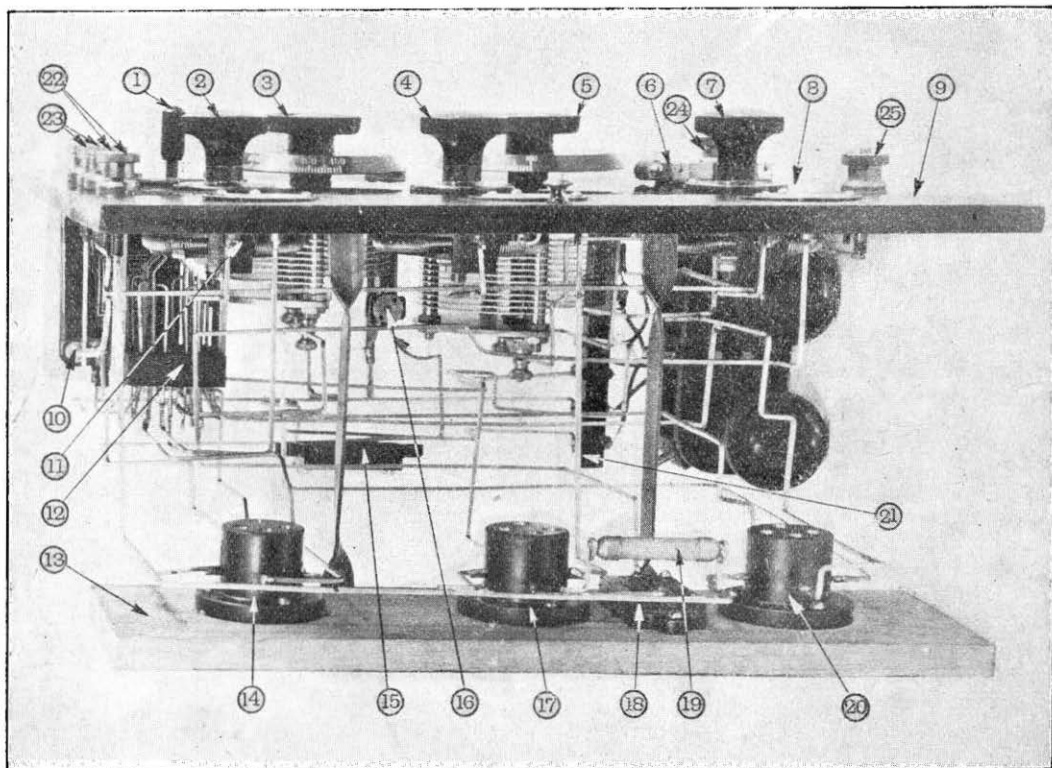


Fig. 3. For the purpose of identification of the parts, reference numbers are given. 1, anti-capacity key switch; 2, low frequency valve filament resistance; 3, tuned anode condenser; 4, detector valve filament resistance; 5, aerial tuning condenser; 6, series-parallel switch; 7, high frequency valve filament resistance; 8, ebonite panel; 9, hinged wooden cover over valves, with gauze windows fixed; 10, low frequency transformer; 11, the underside of one filament resistance; 12, key switch; 13, wooden base for valves, etc.; 14, low frequency valve holder; 15, telephone condenser; 16, telephone jack; 17, detector valve holder; 18, grid condenser; 19, grid leak; 20, high frequency valve holder; 21, ebonite strip with connections to coil holder; 22, low tension battery terminals; 23, high tension battery terminals; 24, earth terminal; 25, aerial terminal.

tendency to self-oscillate, which is a property possessed by that circuit, may be damped down.

Coming to the detector valve, it may be mentioned that the grid condenser has a value of 0.0003 mfd., which is a good value when the receiver has to be operated at times on

Turning to the general lay-out of the instrument, it may be said that only such components which have to be adjusted in the process of tuning are attached to the front panel and that an additional sub-panel supported by brass brackets is fitted to carry the valves, and by this means they are

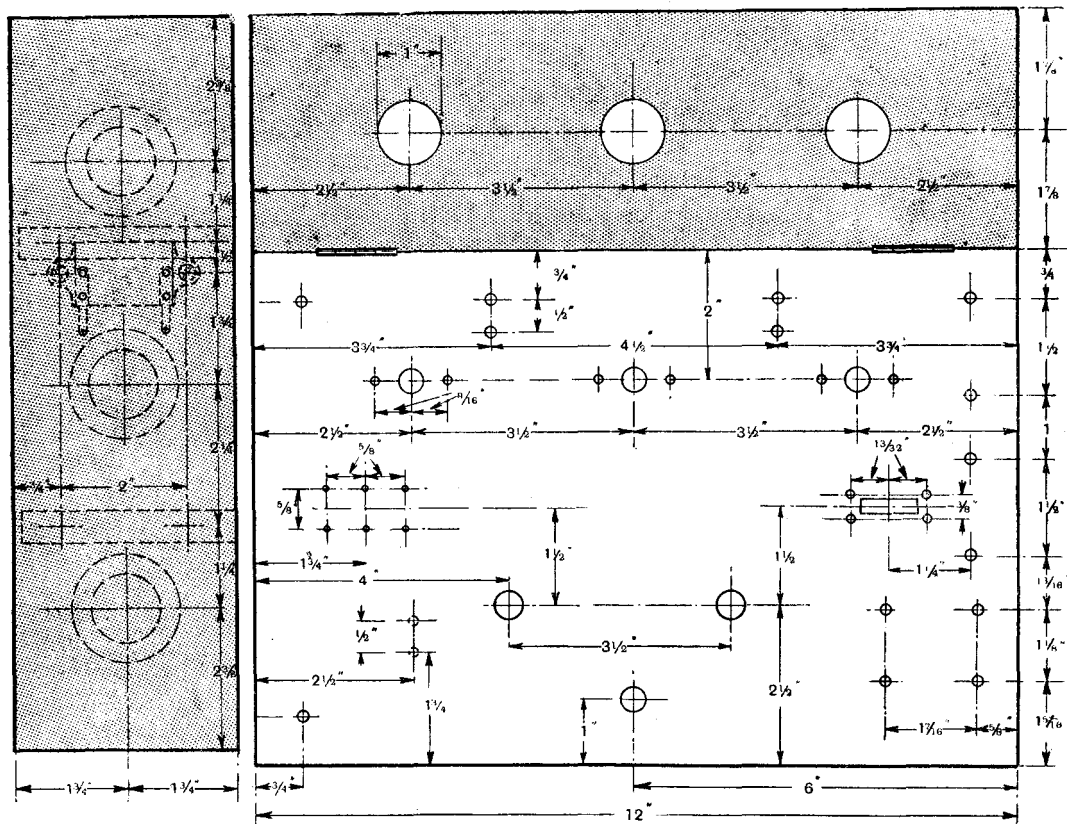


Fig. 4. Details for constructing the ebonite front panel, the wooden strip which carries the valve windows and the wooden platform to which the valve holders are attached.

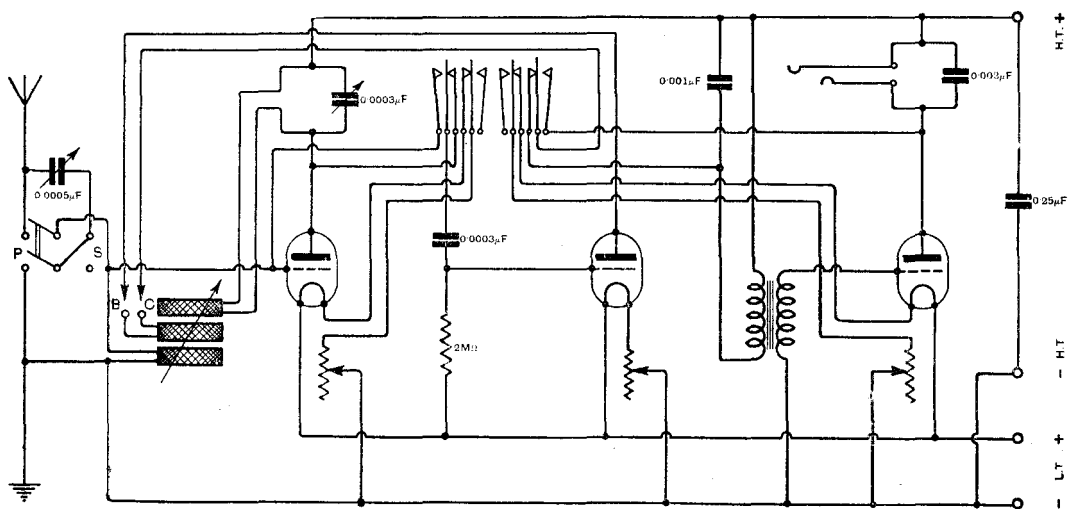


Fig. 5. The feature in this circuit is that of a single switch for throwing either the high or low frequency amplifying valves out of circuit. The points B and C make provision for reversing the connections to the reaction coil.

enclosed in the interior of the instrument, so that they are protected from damage, and perhaps an additional advantage is gained inasmuch as the heat which they emit keeps the interior of the instrument thoroughly dried out. The panel in which they are carried is made of wood and some saving is effected as the area of ebonite panel required is lessened.

guide. The other working drawings which are shown in the accompanying figures are sufficiently self-explanatory for the reader to carry out the construction of the set on the lines described here. The general lay-out clearly shows the location of the various component parts, whilst a practical wiring diagram shows the points between which the connecting leads are actually run. In fitting

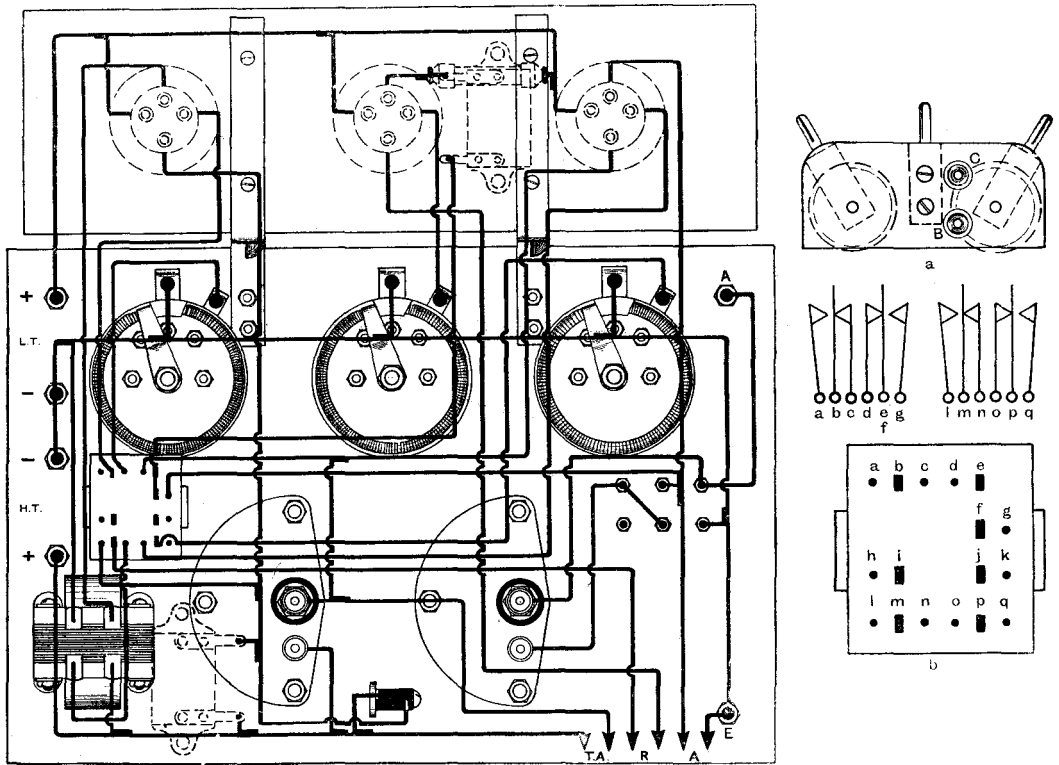


Fig. 6. Practical wiring diagram. To facilitate the connecting of the leads to the three-position switch, an enlarged diagram shows the connections produced with various settings of the switch. The circuit diagram shows the blades of the switch in the same order as they are set out here. The bridging condenser which has a capacity of 0.001 mfd., shown in the circuit diagram, is attached to convenient points on the wiring.

Regarding the actual construction of the set, it would perhaps be the best plan before building to decide upon the general dimensions of the cabinet in which the set is to be carried, for although actual dimensions of the panel and the location of the components are given, it is quite an easy matter to redistribute them over a panel of slightly different dimensions. It should be the aim to produce a well-balanced lay-out and the accompanying drawings will be found to serve as a useful

up the coil holder it will be found convenient to terminate the flexible leads on an ebonite strip, which for convenience may be attached to the face of the panel by means of a small brass bracket. The wiring up is carried out in the customary manner by means of stiff wire connections which is, of course, the only permissible method for wiring up an instrument of this type. The complete instrument has been found particularly useful, inasmuch as it is easily portable and is not susceptible

to damage in transit, whilst as regards its performance, it will be found to bring in most of the British and European broadcasting stations on an outside aerial, whilst good results can be obtained on a short length of wire, which results are, of course, typical of all carefully constructed three-valve sets.

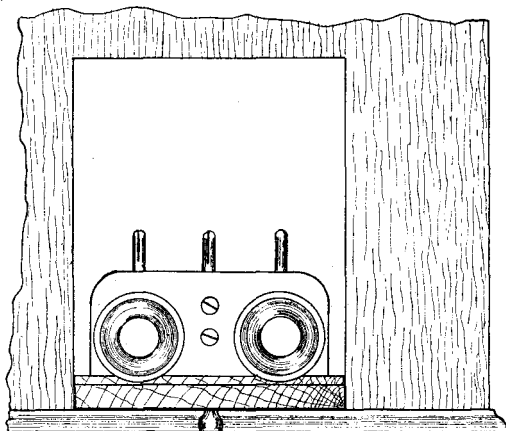


Fig. 7. Details of the hinged door to which the coil holder is attached. A knob is attached for the purpose of drawing the panel out of the box and when in the open position this also serves as a rest to keep the coil holder level and avoid strain on the hinges.

PROPERTIES OF FUSIBLE ALLOYS*

A very complete and useful investigation of fusible alloys has been published recently by Mr. N. F. Budgen as the result of research conducted in the Metallurgy Department of the Birmingham University.

In this paper the physical properties of these alloys are very fully described with reference to their commercial applications. Readers who are interested in this subject are referred to the original paper, but we take the liberty of abstracting a few useful notes from this valuable research.

* "Properties of Fusible Alloys" by N. F. Budgen, M.Sc., Ph.D., Jour. Soc. Chem. Ind., Trans. XLIII, pp. 200-203 T.

The accompanying table gives the percentage composition of twelve alloys with their points of complete liquefaction (melting point) and complete solidification. No. 1 is the well-known "Wood's alloy," and No. 2 is "Lipowitz's alloy." Nos. 1, 9 and 11 are coarse-grained in structure, the others being very fine-grained. All these alloys are corroded by water, but Nos. 1 and 6 are the worst in this respect. All of these alloys are brittle, but Nos. 9 and 11 much more so than the others. Maximum hardness is associated with highest bismuth content.

TABLE OF FUSIBLE ALLOYS.

COMPILED FROM TABLES V. AND VI., "PROPERTIES OF FUSIBLE ALLOYS"—Budgen.

Alloy No.	Composition.				Melting Point °C.	Solidifying Point °C.
	Lead.	Tin.	Bismuth.	Cadmium.		
1	25	12.5	50	12.5	73	68.5
2	26.7	13.3	50	10	74.5	68
3	26	14.8	52.2	7	73.5	68
4	28.6	14.3	50	7.1	74	67.5
5	27.6	10.3	27.6	34.5	120	71
6	35.1	20.05	35.35	9.5	90	67
7	27.27	13.13	49.5	10.1	73.5	65.5
8	33.1	19	33.6	14.3	93	70
9	22.85	11.45	57.1	8.6	73	67
10	23.5	23.5	44.15	8.85	75	66
11	15.4	15.4	57.65	11.55	82	68.5
12	30.8	15.4	38.4	15.4	85	68

VALVE TESTS.

THE G.W.I. "PLATELESS" VALVE.

We have become so accustomed to a definite style of valve construction that any real variation from the ordinary is particularly refreshing. Consequently it was with great interest that we undertook the testing of the "Plateless" valve recently submitted to us by Messrs. G.W.I., Ltd., of Crouch End. This valve being of somewhat unusual design, claims the attention of the experimenter.

IN this valve, instead of the usual form of anode, a silver deposit is placed upon the tubular glass bulb itself and this forms the conducting surface and functions as the plate.

This silver coating extends over the whole bulb, with the exception of a narrow strip immediately above the cap, and consequently it is impossible to see anything of the internal structure.

There is another point worthy of attention in the method of mounting the bulb in its cap which dispenses with the more usual cement paste. A flange is turned on the base of the bulb and this is fixed in the

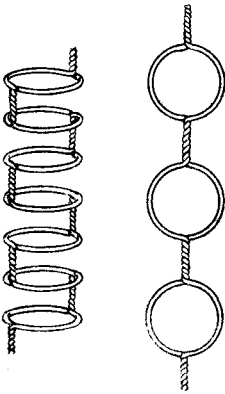
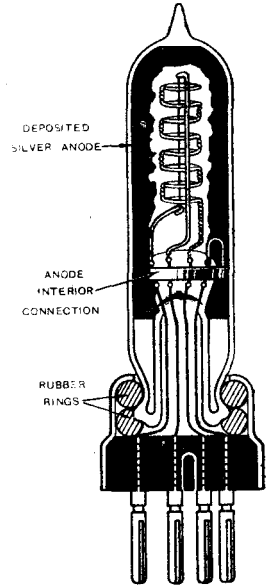


Fig. 1. Construction of the grid of the G.W.I. "plateless" valve.

metal cap by holding the flange tightly between two rubber rings, compression of these rings being made by the ebonite base which carries the usual four contact pins.



Sectional view showing the construction of the grid and anode. The rubber rings minimise vibration noises.

A resilient seating is thus formed which tends to insulate the bulb and electrode system from mechanical shocks and the makers claim that by this arrangement, coupled with the general construction, the valve is rendered free from microphonic noises.

We understand that two types of "Plateless" valves are being manufactured. The **AI** for low frequency amplification, and a valve for general use, known as the **GI**. That submitted to us was of the latter type.

After test, the tube was opened so that its construction might be studied.

Connection to the silver deposit, which as already stated forms the plate, is made by means of a strip of metal sprung into and fitting tightly against the interior of the bulb, the lead being brought to the usual anode pin in the base.

The construction of the grid next claims attention and is shown in Fig. 1. As will be seen the supporting system is "staggered," but we think it is very debatable whether this method is, as the makers claim, more rigid than the spiral supported along its whole length, and further, the method does

not seem to be one that would ensure similar characteristics between different

The filament rating is rather wide in its limits, being given as volts 3.5 to 6.0; amps. 0.3 to 0.5, and Fig. 2 shows the results obtained on the sample valve tested. At 4.0 volts the current is 0.58 ampere, giving an emission of 5 milliamperes, and subsequent tests were carried out at this figure.

It is interesting to note that at 3.5 volts, the current is 0.54 ampere, giving but 1 milliampere emission.

Plate current, grid volts curves are shown in Fig. 3 for two values of plate voltage,

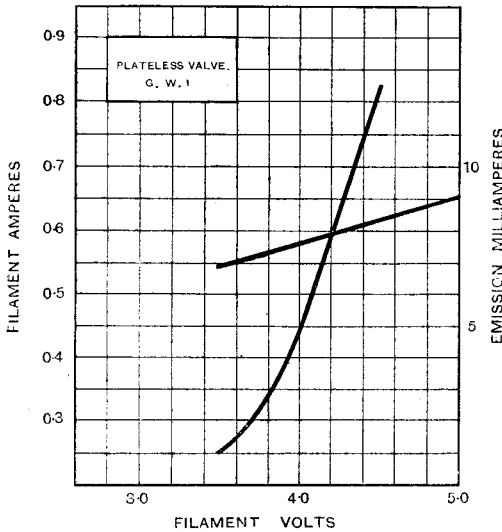


Fig. 2. Filament current and emission curves.

values of the same class.

The results of our standard bench tests are given by Figs. 2, 3 and 4.

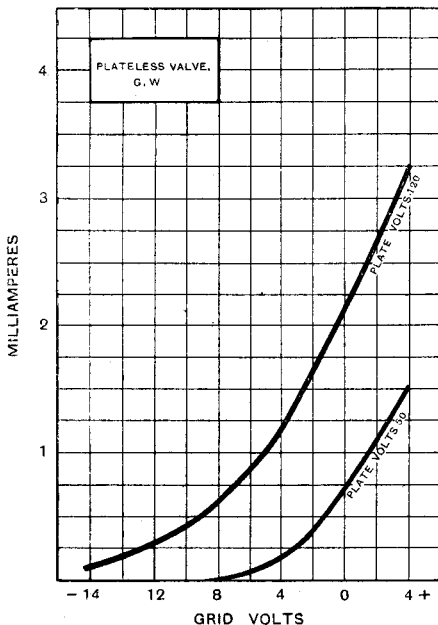


Fig. 3. Plate current, grid volts curve.

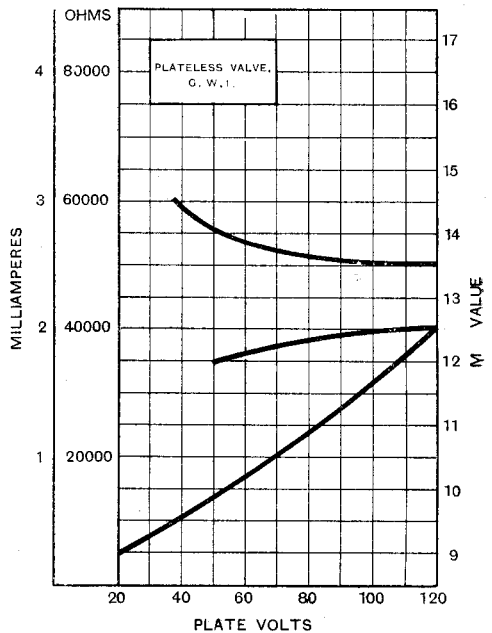


Fig. 4. Plate voltage curve, magnification and impedance values.

50 and 120. The curves extend for a considerable range of negative grid voltage, which is probably due to the exceptionally large effective plate area.

The plate voltage is given as 50 to 120, and over this range the magnification value is seen to vary from 12 to 12.5, and the plate impedance from 55,000 to 50,000 ohms. This is shown by Fig. 4.

It was observed that the bulb became very hot after being in circuit for a short time, but no ill effect seemed to ensue.

The valve was first tried out as a detector and the results compared favourably with those of other bright emitting general purpose valves. 45 to 50 volts on the plate are sufficient.

As a high frequency amplifier, it is particularly good, but on the low frequency side, only fair results were obtained, due no doubt to its high plate impedance. (It will be remembered the makers market another plateless valve specially designed for L.F. work—the A1).

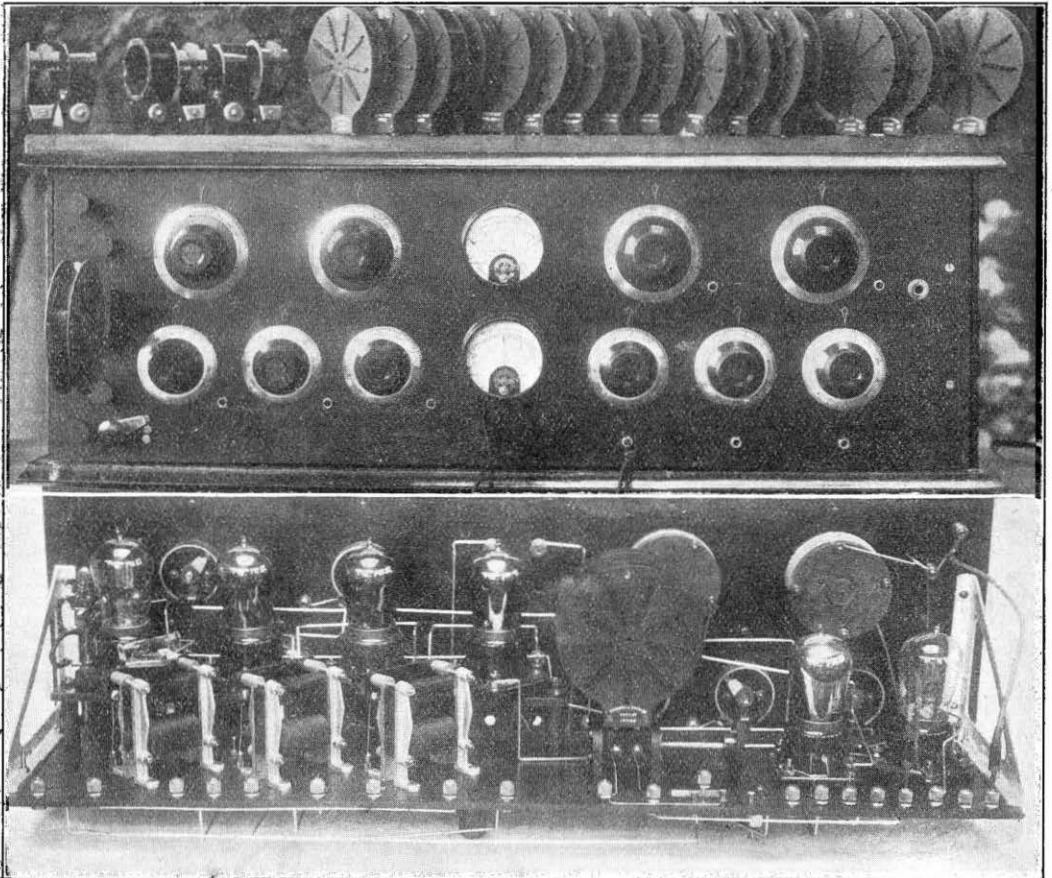
Summarising, the valve can be strongly recommended for use as a detector or high frequency amplifier, and although we do

not test valves on any but straightforward circuits, we are of the opinion that the valve would not be too happy in reflex circuits.

As this valve is claimed to be practically free from microphonic noises (a serious drawback to many otherwise excellent tubes) we carried out extended tests against certain other bright emitters known to be particularly free from this defect.

The plateless valve came through this test very well indeed, and while the problem of microphonic noises has not yet been completely solved, the G. W. I. Company are to be congratulated on their product.

SUPERSONIC HETERODYNE DESIGN.



A super-sonic heterodyne receiver built of British and American component parts by Mr. Hamilton Emmons, of Hamble, Hants. The set is used in conjunction with a frame aerial.

PATENTS AND ABSTRACTS



Tuning Coils.

This patent* describes the method of constructing inductance coils, in which each layer of wire is separated from adjacent layers by string, there being spaces between each strand of string.

The method of making a coil of this type may be followed by referring to Fig. 1, where A is a sketch of a former, and B a finished coil. The former consists of a tube (1) of cardboard fitted over a block (2), which is provided with a hole (3),

slot in the opposite disc, then carried along on the outside of this disc to and through the next slot, and then back to the slot in the other disc, and so on until a complete layer of separated strands encompasses the tube. A layer of wire is then wound over the string, the turns being preferably not in contact, but having air spaces between them. When the first layer of the coil is wound, the string is again carried to and fro over the layer of wire, and then a second layer of wire is wound upon the string, and so on

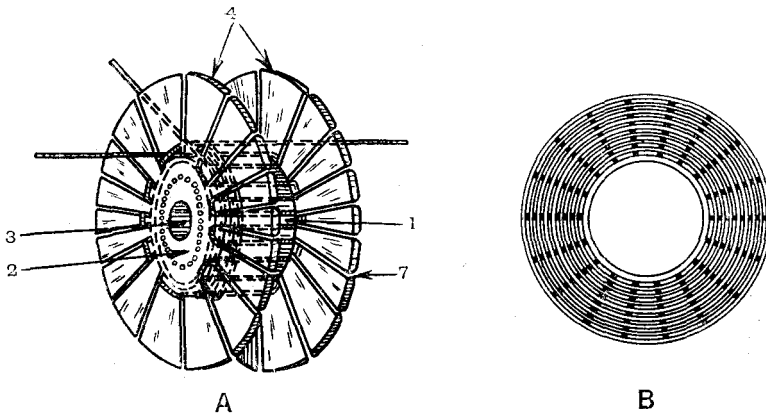


Fig. 1. Explaining the construction of a new type of tuning coil.

by which the former may be mounted on the spindle of a winding machine. Two discs (4) with radial slots (7) are mounted on pins provided on (2), which fit in holes in the discs. The coil is wound as follows:

First, string or cord is wound to and fro across the tube (1), being passed through one slot, across the tube, to the corresponding

slot in the opposite disc, then carried along on the outside of this disc to and through the next slot, and then back to the slot in the other disc, and so on until a complete layer of separated strands encompasses the tube. A layer of wire is then wound over the string, the turns being preferably not in contact, but having air spaces between them. When the first layer of the coil is wound, the string is again carried to and fro over the layer of wire, and then a second layer of wire is wound upon the string, and so on

* British Patent No. 217,045, by J. D. Dunthorne and W. R. Ricketts.

A coil of this sort will have a fairly low self-capacity, and is easily constructed.

Neutralizing Stray Capacity Coupling.

When a circuit is connected to the grid and filament of a three-electrode valve and another circuit is connected to the anode and filament, there is a possibility that the system may start oscillating, owing to the fact that the capacity between the anode and the grid furnishes an electrostatic coupling between these two circuits. This is particularly true if instead of considering one valve we have an arrangement of several valves in cascade.

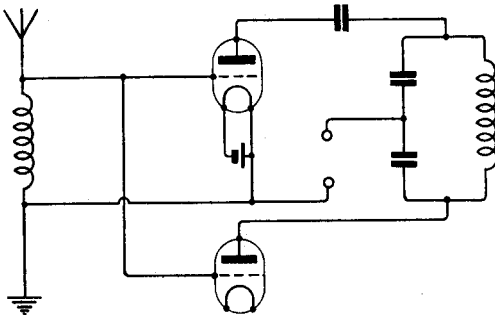


Fig. 2. A bridge arrangement for neutralizing stray capacity coupling.

According to this invention,* the inductance or the capacity of one of the circuits is divided into two portions by the lead from the filament to that circuit. Instead of connecting the filament to the end of the inductance as usual, a balancing capacity is connected between the two circuits, thus forming a Wheatstone bridge arrangement, of which the two portions into which the inductance or capacity of the one circuit is thus divided form one pair of arms, while the balancing capacity and the capacity between the grid and anode form the other pair of arms. Thus, provided the ratio between the balancing capacity and the grid anode capacity is the same as the ratio between the two portions of the inductance or capacity, as the case may be, there will be a balance in the bridge. Since the well-known conditions for obtaining a balance in a bridge comprising both reactance and resistance require that two conditions shall be satisfied, it may be necessary in some cases to provide means whereby this is brought about. This can be done by adjusting the values of resistance

* British Patent No. 215,105, by H. J. Round and P. W. Willans.

in the two inductive branches or by other means. In some cases the balancing condenser may be a burnt-out valve of the same type as the active valve. The connections of one arrangement are shown in Fig. 2.

The aerial circuit is connected as usual between the grid and filament of the valve, and the anode is connected to an oscillatory circuit, the capacity of which is divided into two portions by the lead from the filament. A dummy or burnt-out valve which is used as a condenser is shown connected between the grid and the lower end of the anode circuit.

A New Aerial.

This patent specification* describes an aerial which consists of approximately 100 small gauge copper wires, 8 ins. long (Fig. 3), leading from a holder E, through the insulator D, to which a bracket for fixing is connected. The wires are spread out in the manner shown, and the ends are secured to a copper ring A, 7 ins. in diameter.

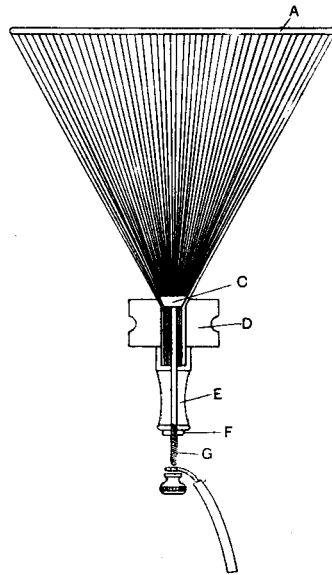


Fig. 3. A new aerial.

At the bottom of the holder E, a terminal G is fitted, to which is connected a cone-shaped piece C. The wires are therefore held between the pieces C and D when the nut F is tightened. The lead-in wire is also taken from this terminal.

W. J.

* British Patent No. 216,981, by A. W. Vincent.

CORRESPONDENCE.

Tuner Efficiency.

To the Editor of THE WIRELESS WORLD AND
RADIO REVIEW.

SIR,—I am sure that all amateurs have appreciated Mr. Ashton J. Cooper's article in your issue of July 2nd on Tuner Efficiency, and I hope that the following remarks will be taken as being constructive and not destructive criticism.

Most experimenters will agree with Mr. Cooper's conclusion that variometer or "tapped coil" tuning is preferable to "plug-in" coils and condensers, but it is only fair to say that such tuners must be well designed and constructed—otherwise the H.F. losses may well be as great as with condensers.

It must further not be lost sight of that it is more practicable and convenient to secure magnetic reaction with plug-in coils, and it is questionable whether the added efficiency of variometers, etc., will counter-balance the lack of sensitivity due to the lack of reaction effects.

These remarks apply particularly to the reception of distant signals, where reaction has more effect than on near-by strong signals such as those considered by Mr. Cooper.

The writer is carrying out experiments on this point and the views and experiences of other amateurs would be of interest.

Possibly a compromise might be effected by the use of the more efficient tuners in conjunction with capacity reaction.

JOHN W. BOYS.

London, S.E.15.

A Short Wave Query.

To the Editor of THE WIRELESS WORLD AND
RADIO REVIEW.

SIR,—In your number of July 23rd, Mr. B. J. Archer mentions in a letter having heard **POZ** on 95 metres. In the early hours of July 27th, and also this morning for a couple of hours (from about 2 a.m. till I closed down), I have heard **POZ** transmitting on about 102 metres.

The signals were so strong that they could be heard all over the room on a loud speaker without using aerial or earth.

Also just below **KDKA** there is another carrier wave and faint telephony is just audible during the same hours as **KDKA's** transmission. Have any of your readers heard this station? If so, what station is it and what is its exact wavelength?

It may interest you to know that this short wave reception is done down to about 85 metres on a standard commercial tuner and amplifier of British manufacture (Burndept). **KDKA** is received every day on detector and 2 L.F. with very good audibility, though sometimes the announcer's twang sends the Marconi-Osrams into oscillations.

The antenna used consists of about three yards of common bell wire, hung from the ceiling.

EL CONDE DE ALBA DE YELTES.

Madrid.

The Transmitting Licence Regulations.

To the Editor of THE WIRELESS WORLD AND
RADIO REVIEW.

SIR,—With reference to the letter by "Birmingham" published in the July 30th issue of *The Wireless World and Radio Review*. After a careful perusal and consideration of his article it would appear that the writer is certainly very sore and prejudiced by being refused an open aerial transmitting licence. In fact he goes so far as to criticise with disrespect the working of experimental transmitters who have satisfied the Postmaster-General—and not your writer—that they have some definite experiments in view.

"Birmingham" is certainly unlucky in his endeavours but surely he will appreciate the fact that he is only one of a majority of unsuccessful applicants for a transmitting licence.

It might interest him to know that I had to be satisfied with a licence for use of artificial aerial only for a period of over 12 months before I was finally permitted to use an open aerial—but I certainly did not fill a column in your Journal criticising all this procedure and expressing personal feelings on the matter.

Surely, if everyone who has experienced disappointment in this direction were to send up for insertion a letter to that effect, there would be no room for the valued articles and other features your paper otherwise contains.

J. FITTON,
Operating 5 HM.

Rochdale.

To the Editor of THE WIRELESS WORLD AND
RADIO REVIEW.

SIR,—I have just read the letter from "Birmingham" in your issue of to-day's date. In stating his case he has practically stated mine. Fifteen months ago I applied for a licence to use a radiating aerial (I hold a licence for artificial aerial work) and it was refused; although I have made two further applications, I have been refused the necessary authority on both occasions. I am a pre-broadcast experimenter and send and receive Morse code at 25 words per minute (a certificate could and would be produced if necessary). I had in mind a system of secret telephony but, as in "Birmingham's" case, it has now been patented by another worker.

I heartily endorse his remarks *re* the gramophone enthusiasts and think it hard that these people should be allowed to use the ether as they do when genuine experimenters are refused the permission to enable them to continue their work. "Birmingham" and myself are only two who have been so treated; there must be many others.

"Vic."

London.

NOTES & CLUB NEWS



A new studio is under construction for **2 ZY**, the Manchester broadcasting station.

* * *

Austrian police are now provided with wireless equipped motor cars to assist in the tracking of reckless motorists.

* * *

According to our contemporary, *La T.S.F. Moderne*, German broadcasting is heard throughout Eastern France with much greater intensity than the British stations.

* * *

Experiments in wireless reception in a gold mine were recently carried out in the vicinity of Johannesburg. A small party in the upper levels of the mine succeeded in hearing various items broadcast from **JB**, the Johannesburg station.

* * *

The new broadcasting station at Vienna constitutes the fourteenth on the Continent employing the German tongue, as compared with seven using French.

* * *

Eight Marconiphone Super Loud Speakers were employed in the Wembley Stadium on the occasion of the Bloomfield-Gibbons fight on August 9th. Two microphones exactly similar to those used in the B.B.C. studios, conveyed the ringside sounds to the vast open air audience.

* * *

IMPORTANT CHANGE AT EIFFEL TOWER.

Paris amateurs are rejoicing at the decision of the authorities at **FL** to abolish the arc transmitters so long in use at that station.

This timely change is due to the efforts of Professor Holweck, whose demountable water-cooled valve is being installed for use with all transmissions. A thirty kilowatt specimen has been perfected, and two of this type are shortly to be installed in the new transmitter now being constructed at the base of the Eiffel Tower.

SHORT WAVE TRANSMISSION FROM ST. ASSISE.

The high-power station at St. Assise, near Paris, is now carrying on a service with Buenos Aires, on the low wavelength of 75 metres. Two reflectors are used, producing a highly directional system. A power of 20 kilowatts is used for these transmissions.

GERMAN BROADCAST NEWS AGENCY.

The Wolff News Agency in Berlin has established a regular broadcast news service, operating from 7.30 a.m. to 8.45 p.m. In opening a programme of news the announcer exclaims: "Achtung! Hier ist das Wolff-Bino in Berlin . . ."

PROPOSED FRENCH BROADCASTING CHAIN.

A chain of broadcasting stations, to link up Southern, Eastern and Central France, is the project of the "Union Francaise de la T.S.F." It is hoped to complete plans by the autumn.

SHORT WAVE TESTS FROM WGY.

A Schenectady report says that the well-known broadcasting station **WGY** is trying the experiment of transmitting on a wavelength of 15.85 metres. Simultaneously the same programme is being sent out on two other wavelengths (380 metres and 107 metres), and this is believed to be the first time that any station has transmitted the same programme on three distinct wavelengths.

Particular attention will be given to the effect of the short wavelength on the afternoon programmes, as it is believed that short waves will improve daylight broadcasting.

SOUTH AFRICAN BROADCASTING.

The new broadcasting station at Johannesburg is reported to be giving great satisfaction and programmes have been heard over a distance of a thousand miles. The installation, comprising a Western Electric 500-watt equipment, is located in one of the principal department stores.

Some protest has been aroused by the inclusion of advertising announcements between the usual items of the broadcast programmes, but the organisers retort that the £2 fee paid by each listener-in (in addition to the Post Office licence of 5s.) does not cover the cost of the service!

LONDON-BOSTON (U.S.A.) WIRELESS SERVICE.

A new telegraph office has been opened at Boston, U.S.A., by the Radio Corporation of America, extending the commercial wireless service between Great Britain and the United States. The new office is in wireless communication with the main telegraph office of Marconi's Wireless Telegraph Co., Ltd., at Radio House, 2-12 Wilson Street, London, E.C.

GERMAN RADIO EXHIBITION.

Under the auspices of the German Verband der Radio Industrie, the first radio exhibition to be held in Germany is to take place in Berlin from September 26th to October 6th next.

CALLS HEARD.

Whilst of primary value to transmitters, the "Calls Heard" section of this Journal is of no doubted interest to keen listeners-in. A correspondent mentions that he knows several enthusiasts

in his district whose chief interest is centred in the Calls Heard column, although they are not transmitters. The information given is frequently of service in comparing receptions with other receivers in the same neighbourhood.

TENANTS AND WIRELESS AERIALS.

The National Federation of Property Owners has taken a legal opinion on the rights of tenants to place poles for wireless aerials on rented property. The advice of counsel is that the owner cannot prevent the tenant from putting up wireless poles or attaching aerials to the house, but if the tenant does damage in doing so, then he is liable as for damage done in other circumstances.

The principal interest of the accounts centres on the decision of the directors to write down certain of the Company's assets, giving them more accurate values. These include Russian shares, debts and securities, overdue debts from other foreign governments, obsolescent plant and other items.

Having regard to the prospect of the considerable sums due from the Government, and the improved outlook generally, the directors propose to pay a dividend of 10 per cent. on the ordinary shares, in addition to the fixed Preference Dividend, leaving a balance of £403,309 to be carried forward.

FLAGRANT PIRACY.

Many references have been made from time to



[Photo Press.]

A broadcast receiver has been installed at Eastern Lodge, Dunmow, the home of the Countess of Warwick, and known as the Labour "Chequers." Mr. F. O. Roberts, M.P. (Minister of Pensions) is seen listening-in on a "V4" Marconiphone set.

MORE THAN ONE 6 GO ?

Mr. Leonard A. Sayce, of Sunderland, reports that he has received reliable information to the effect that a station in North Wales is making illicit use of his call sign 6 GO. The Post Office authorities have been informed of this fact, but 6 GO hopes that this warning may save the offender from serious trouble.

THE MARCONI REPORT.

Although the trading profits of Marconi's Wireless Telegraph Company for 1923 were well maintained at £552,113, the net profit was reduced from £302,948 to £172,543, the decrease being accounted for by an advance in expenses of over £32,000, and the fact that Debenture interest now requires £97,494, compared with £4,187 previously.

time in these columns regarding the illegitimate use of call signs allocated to others.

The most flagrant case in our recollection is that submitted to us by Mr. L. Bland Flagg (2 GO), of Bayswater. On Sunday, August 10th, Mr. Bland Flagg heard his own call sign annexed to a test transmission from a powerful C.W. station on 360 metres, sending from 2.55 to 3.10 p.m., to the detriment of a musical item from 2 LO.

Many listeners in the immediate vicinity were disturbed, and, as Mr. Bland Flagg points out, such an act must react unfavourably on the legitimate holder of the licence. Every step is being taken by him to locate the offender and to obtain satisfaction for an act which contravenes all accepted laws of radio courtesy.

DX on a Field Day.

Three open-air wireless stations, one of them mobile, took an active part in a successful field day held jointly by the Golders Green, Hendon, Hounslow, and Hampstead and St. Pancras Radio Societies on Sunday, August 9th.

The control station (2 JB), under the direction of Mr. W. J. T. Crewe, was located at Mill Hill and used a Colpitt's transmitter, with a 40-foot aerial and twin counterpoise, supplied by the Hendon Society.

The second field station (2 AH), controlled by the Hounslow Society, was located at Hounslow Heath, 15 miles from Control, under the direction of Mr. R. K. T. Stevenson.

2 DZ, the mobile station, was the responsibility of the Hampstead and St. Pancras Society. Owing to absence of members on holiday, an operator for this station had to be "borrowed," Mr. D. B. Knock (6 XG), of the Golders Green Society, undertaking the task.

Within a few minutes of schedule, the first test call, 2 AH iii 2 DZ de 2 JB, was radiated. Communication was instantly established and the control station issued the official time signal. Speech from control was received by the other stations on a single valve, 2 DZ being at this time at Alperton.

A second test call was radiated at 1300 (B.S.T.) and all stations reported O.K. During the ensuing free period a number of London amateurs were worked by all three stations.

DX tests were carried out during the evening and the stations made themselves heard at Newbury, Margate, Salisbury and Manchester.



2 DZ, the mobile station of the Hampstead and St. Pancras Radio Society, which established communication while on the move.



[Photos by Barratts

The meet at Mill Hill. Members of the Golders Green and Hendon Radio Societies photographed on Sunday, August 9th.

8 EU, 8 FSE, 8 LO, 8 PA. Dutch: 0 AB, 0 HD, 0 ZN. Belgian
4 WC. Rhineland: 1 CF. Sweden: 5 LZ. Finland: 1 NA,
2 NC. Unknown: YA 1, 3 CA. (J. W. Pallister, 2 AUH.)

Harrogate.

British: 2 KF, 2 KT, 2 TO, 5 BY, 5 JX, 5 QY. French: 8 BS,
8 CZ, 8 EU. American: 1 SF, 1 XAK, 1 XAR, 1 XW. Canadian:
1 AR. (All under 120 metres.) (0—v—r.) (W. Hartley.)

Workop, Notts. (July 17th to August 2nd).

British: 2 OD, 2 SH, 6 GM, 8 PT. French: 8 AG, 8 AP,
8 BA, 8 BN, 8 BS, 8 CA, 8 CZ, 8 DI, 8 DO, 8 DP, 8 DS, 8 ED,
8 EM, 8 EU, 8 EX, 8 FC, 8 FS, 8 JG, 8 JH, 8 LO, 8 LS, 8 PA,
8 RX. Rhineland: 1 CF. Finland: 1 NA. Dutch: 0 OX,
0 BA. Unknown: 3 CA, 9 AD, 3 TT (below 200 metres). 2 OZ,
2 SO, 2 KO, 2 QUG, 2 YX (above 200 metres). (Telephony and
Morse.) (0—v—r.) (J. Davidson.)

New Southgate, London, N.11 (during July).

3 CA, 3 KO, 3 XO, 4 WR, 5 BH, 5 GS, 5 LS, 8 BS, 8 ED, 8 EU,
8 FSE, 8 LO, 8 PA, 8 RV, 8 CA, SMSV, YA 1. (0—v—r.)
(W. D. Keiller, 6 HR.)

Beaulieu, Hants (June 23rd to July 6th).

2 AB, 2 AT, 2 CI, 2 DR, 2 GG, 2 IL, 2 OF, 2 UV, 2 VQ, 5 DN,
5 DO, 5 KO, 5 MA, 5 MO, 5 MU, 5 NW, 5 OT, 5 SI, 5 TB, 5 TU,
5 UG, 5 VN, 8 JO, 6 JW, 6 NE, 6 QB, 6 QZ, 8 BG, 8 BP, 8 DP,
8 LO, 8 EM, 8 EU, 8 EX, 8 RN, 8 RO, 8 TV, 8 WZ, 8 ZY, 0 BA,
0 GC, NAB 2, 1 CF. (0—v—0.) (J. L. Mackenzie.)

Kirby Muxloe, near Leicester (June 14th to July 24th).

British: 2 DZ, 2 NW, 2 XY, 5 BH, 5 KG, 5 KK, 5 SN, 6 CC,
6 GM, 6 RM, 6 UZ, 6 XX, 6 ZZ. French: 8 AE, 8 AP, 8 AZ,
8 BV, 8 CZ, 8 DP, 8 EM, 8 LM, 8 LO, 8 MN, 8 PP, 8 TV. Mis-
cellaneous: 1 NA, 3 OX, POZ, LPZ, ARRL, AIN. (F. H. Tyler, 2 ASH.)

Norwich (July 7th to 28th).

2 AB, 2 AT, 2 JP, 2 JX, 2 OD, 2 SH, 5 AW, 5 BV, 5 HN, 5 LA,
5 LF, 5 MO, 5 ND, 5 NW, 5 OT, 5 QV, 5 SI, 5 YL, 6 NF, 6 QZ,
6 RV, 6 TD, 6 UD, 6 UN, 6 BN, 8 BP, 8 CF, 8 CH, 8 DI, 8 DP, 8 PA.
Unknown stations: 2 XAA, 5 UP, 6 BF, 8 AMH, 8 ED, 8 EM,
8 EU, 8 EX, F 3 CA, 1 CC, 1 CF, 0 RA, 0 WA, 0 XF, XDA,
FN, 1 NA. (Single valve Reinartz and superonic heterodyne.)
(Capt. H. J. B. Hampson.)

BROADCASTING.

REGULAR PROGRAMMES ARE BROADCAST FROM THE FOLLOWING EUROPEAN STATIONS:—

GREAT BRITAIN.

CHELMSFORD 5 XX, 1,600 metres. Tests. **ABERDEEN 2 BD**, 495 metres; **BIRMINGHAM 5 IT**, 475 metres; **GLASGOW 5 SC**, 420 metres; **NEWCASTLE 5 NO**, 400 metres; **BOURNEMOUTH 6 BM**, 385 metres; **MANCHESTER 2 ZY**, 375 metres; **LONDON 2 LO**, 365 metres; **CARDIFF 5 WA**, 351 metres; **PLYMOUTH 5 PY** (Relay), 335 metres; **EDINBURGH 2 EH** (Relay), 325 metres; **LIVERPOOL 6 LV** (Relay), 318 metres; **SHEFFIELD 6 FL** (Relay), 303 metres; **LEEDS-BRADFORD 2 LS** (Relay), 346 and 310 metres. Tuesdays, Thursdays and Fridays, 1.0 p.m. to 2.0 p.m. (2 LO only). Regular daily programmes, 3.0 to 7.30 p.m., 8.0 to 11.30 p.m. Sundays, 3.0 to 5.0 p.m., 8.30 to 10.30 p.m.

FRANCE.

PARIS (Eiffel Tower), FL, 2,600 metres. 7.40 a.m. Weather Forecasts, 11.0 a.m. (Sunday); 10.45 a.m., Cotton Prices; 12 noon Market Report; 12.15 to 12.30 (Weekdays), Time Signal and Weather Forecast; 3.40 p.m., Financial Reports; 5.30 p.m., Bourse Closing Prices; 6.15 p.m., Concert; 8.0 p.m., Weather Report; 9.0 p.m. (Wednesday and Sunday), Concert; 10.10 p.m., Weather Forecast.

PARIS ("Radio Paris"), SFR, 1,780 metres. 12.30 p.m., Cotton Prices News; 12.45 p.m., Concert; 1.30 p.m., Exchange Prices; 4.30 p.m., Financial Report; 5.0 p.m., Concert; 8.30 p.m., News and Concert.

PARIS Ecole Supérieure des Postes et Telegraphes, 450 metres. 3.45 p.m. (Wednesday), Talk on History; 8.0 p.m. (Tuesday), English Lesson; 8.30 p.m., Concert; 9.0 p.m.,elayed Concert or Play.

PARIS (Station du Petit Parisien), 340 metres; 8.30 p.m., Tests.

BELGIUM.

BRUSSELS, BAV, 1,100 metres. At 2.0 p.m. and 6.50 p.m., Meteorological Forecast.

BRUSSELS ("Radio-Belgique"), 265 metres. Weekdays, 5.0 p.m. to 6.0 p.m., and 8.0 p.m. to 10.0 p.m.; Sunday, 5.0 p.m. to 6.0 p.m., and 8.30 p.m. to 10.0 p.m.

HOLLAND.

THE HAGUE, PCGG, 1,070 metres. 4.0 to 6.0 p.m. (Sunday), 9.40 to 11.40 p.m. (Monday and Thursday), Concerts.

THE HAGUE (Heussen Laboratory), PCUU, 1,050 metres. 10.40 to 11.40 a.m. (Sunday), Concert; 9.40 to 10.40 p.m., Concert; 8.45 to 9.0 p.m. (Thursday), Concert.

THE HAGUE (Velthuisen), PCKK, 1,050 metres, 9.40 to 11.40 p.m. (Friday), Concert.

HILVERSUM, 1,050 metres. 9.10 to 11.10 (Sunday), Concert and News.

IJMUIDEN (Middelraad), PCMM, 1,050 metres. Saturday, 9.10 to 10.40 p.m., Concert.

AMSTERDAM, PA 5, 1,050 metres (Irregular), 8.40 to 10.10 p.m., Concert.

AMSTERDAM (Van Diaz), PCFF, 2,000 metres, 9.0 a.m. and 5.0 p.m., Share Market Report, Exchange Rates and News

DENMARK.

LYNGBY, OXE, 2,400 metres. 8.30 to 9.45 p.m. (Weekdays), 8.0 to 9.0 (Sunday), Concert.

SWEDEN.

STOCKHOLM (Telegrafverket), 440 metres. Daily, 12.45 to 1.0 p.m., Weather Report and Nauen Time Signal; Monday, Wednesday and Saturday, 8.0 to 9.0 p.m., Concert and News;

Sunday, 11.0 a.m. to 12.30 p.m., Divine Service from St. James' Church.

STOCKHOLM (Radiologget), 470 metres. Tuesday and Thursday, 8.0 to 9.30 p.m., Concert and News.

GÖTHENBERG (Nya Varvet), 700 metres. Wednesday, 7.0 to 8.0 p.m.

BODEN, 2,800 metres. Tuesday and Friday, 6.30 to 7.30 p.m., Sunday, 5.30 to 6.30 p.m., Concert and News.

GERMANY.

BERLIN (Koenigswusterhausen), LP, 680 metres. Sunday, 10.50 to 11.50 a.m., Concert; 2,800 metres, Sunday, 11.50 a.m. to 12.50 p.m., Concert.

EBERSWALDE, 2,930 metres. Daily, 1.0 to 2.0 p.m., Address and Concert; 6.0 to 7.30 p.m., Address and Concert; Thursday and Saturday, 7.20 p.m., Concert.

BERLIN (Vox Hals), 430 metres. 11.0 a.m., Stock Exchange; 1.55 p.m., Time Signals; 5.40 to 7.0 p.m., Concert; 7.0 to 8.0 p.m. (Sunday), Concert.

BRESLAU, 415 metres.

HAMBURG, 392 metres.

STUTTGART, 437 metres.

KONIGSBERG, 460 metres.

FRANKFURT AM MAIN, 467 metres. 7.30 to 10.0 p.m., Tests, Gramophone Records.

LEIPZIG (Mitteldeutsche Rundfunk A.G.), 452 metres.

MUNCHEN (Die Deutsche Stunde in Bayern), 485 metres.

AUSTRIA.

VIENNA (Radio-Hekaphon), 600 metres. Monday and Friday 8.0 to 8.30 p.m.

CZECHO SLOVAKIA.

PRAGUE, PRG, 1,800 metres. 8.0 a.m., 12.0 a.m., and 4.0 p.m., Meteorological Bulletin and News; 4.500 metres, 10.0 a.m., 3.0 p.m., and 10.0 p.m., Concert.

KBELY (near Prague), 1,150 metres. Weekdays, 7.15 p.m. and 10.0 p.m., Sundays, 11.0 a.m. to 12.0 noon, Concert and News.

BRUNN, 1,800 metres. 10.0 to 11.0 a.m., Concert; 2.30 p.m., News.

SWITZERLAND.

GENEVA, 1,100 metres. Weekdays, 3.15 and 8.0 p.m., Concert or Lecture.

LAUSANNE, HB 2, 850 metres. Daily, 9.15 p.m., Concert and Address.

SPAIN.

MADRID, PTT, 400 to 700 metres. 6.0 to 8.0 p.m., Tests.

MADRID (Radio Iberica), 392 metres. Daily (except Thursdays and Sundays), 7.0 to 9.0 p.m. Thursdays and Sundays, 10.0 to 12.0 p.m., Concerts.

MADRID, 1,800 metres. Irregular.

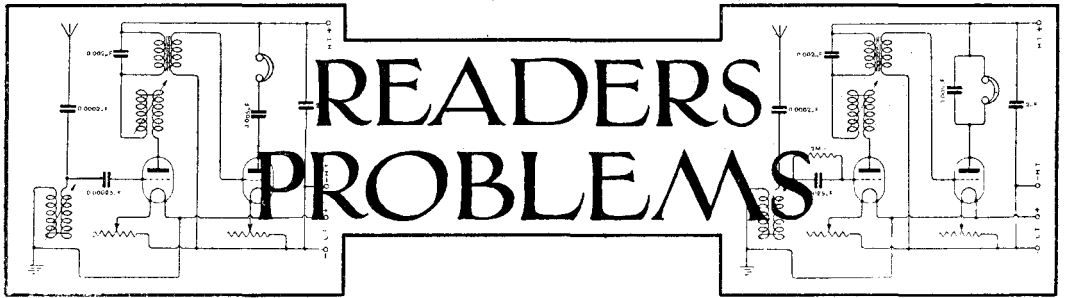
CARTAGENA, EBX, 1,200 metres, 12.0 to 12.30 p.m., 5.0 to 5.30 p.m., Lectures and Concerts.

PORTUGAL.

LISBON (Aero Lisboa), 370 to 400 metres. Wednesdays and Fridays, 9.30 to 12.0 p.m., Irregular Tests.

ITALY.

ROME, ICD, 3,200 metres. Weekdays, 12.0 a.m. 1.800 metres, 4.0 p.m. and 8.30 p.m., Tests, Gramophone Records.



Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement section.

IMPROVING THE SELECTIVITY OF EXISTING VALVE SETS.

ALTHOUGH the selectivity of a receiver is governed principally by the design and arrangement of the tuning circuits and H.F. valve couplings, it is often possible to effect improvements in this direction without disturbing the inside of the set in any way. For instance, if it is known that the aerial tuning condenser in the set is connected in parallel with the aerial tuning inductance, a variable condenser of about 0.0005 μ F. capacity may be connected between the aerial and the aerial terminal on the receiver. Since this condenser is in series with the aerial circuit, the effective capacity across the ends of the aerial coil will be reduced, and for a given wavelength it will be possible to increase the size of this coil. Under these conditions the signal strength and selectivity will be much improved.

The effective resistance of the aerial and earth system has a pronounced influence on the selectivity of the receiver as a whole. To reduce this resistance the earth connection should be made with great care and the aerial wires should be erected well clear of semi-conductors such as trees and the walls of buildings. At the expense of a certain amount of signal strength the selectivity may be greatly improved by using a short single-wire aerial. If a long twin has been used previously, the increase in selectivity will be at once noticed on changing over to the smaller aerial.

It should be understood, of course, that the above suggestions do not cover the whole of the subject, but they are remedies which can be tried before making any alteration to the receiver itself.

A SIMPLE TWO-VALVE SET.

THERE is an increasing demand for receivers which are simple in operation, and a reader has asked for a circuit of a two-valve set with only one tuning adjustment and a switch for the filament current to the valves. The set is required to receive a relay station about 25 miles away and the new high-powered station at Chelmsford.

The best arrangement to use under these circumstances would be a detector valve used without

reaction and followed by a note magnifier. A diagram of this circuit is given in Fig. 1. Our correspondent already has a variometer suitable for the 300 to 500 metre stations, and this has, therefore, been connected in the aerial circuit, together with a load coil for the 1,600 metre wavelength. The actual size of this coil will naturally depend upon the dimensions of the aerial, but an Igranite

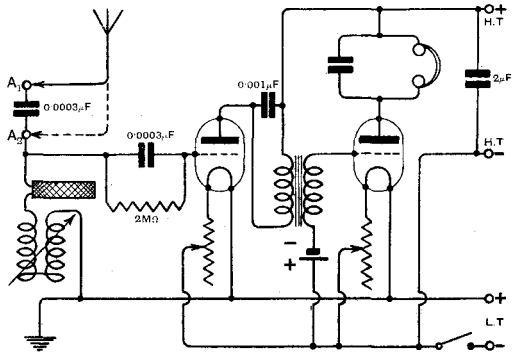


Fig. 1.

150 coil will not be far wrong. A fixed condenser in series with the aerial is often an advantage on short wavelengths. If this condenser is connected between two aerial terminals, A₁ and A₂, it will be an easy matter to include the condenser in the aerial circuit by connecting the aerial to A₁ or to exclude it by connecting to A₂.

CONNECTIONS OF VARIABLE CONDENSERS.

IT is often asked whether there is any special way of connecting variable condensers in a receiver; i.e., whether the connections of the fixed or moving vanes have any influence on the functioning of the receiver.

Generally speaking, the method of connection does not affect the functioning of the receiver after it has

been tuned and adjusted, but it is possible to facilitate the process of tuning by connecting the moving vanes, if possible, to a point of fixed potential. The spindle carrying the moving vanes passes through the panel of the receiver and comes in close proximity to the hand of the operator. If the spindle is connected to one of the filament leads in the case of condensers tuning grid circuits and to + H.T. in the case of anode tuning condensers, hand capacity effects will be greatly reduced, if not entirely eliminated.

chosen, which should be placed out on a piece of paper in order that the dimensions of the panel may be estimated. The sizes of plug-in coils may be obtained from the lists issued by the various manufacturers.

THE POSITION OF FILAMENT RESISTANCES.

FILAMENT resistances may be connected either in the positive or negative low tension lead, and their position will influence the operation of the receiver. When a current is flowing through the

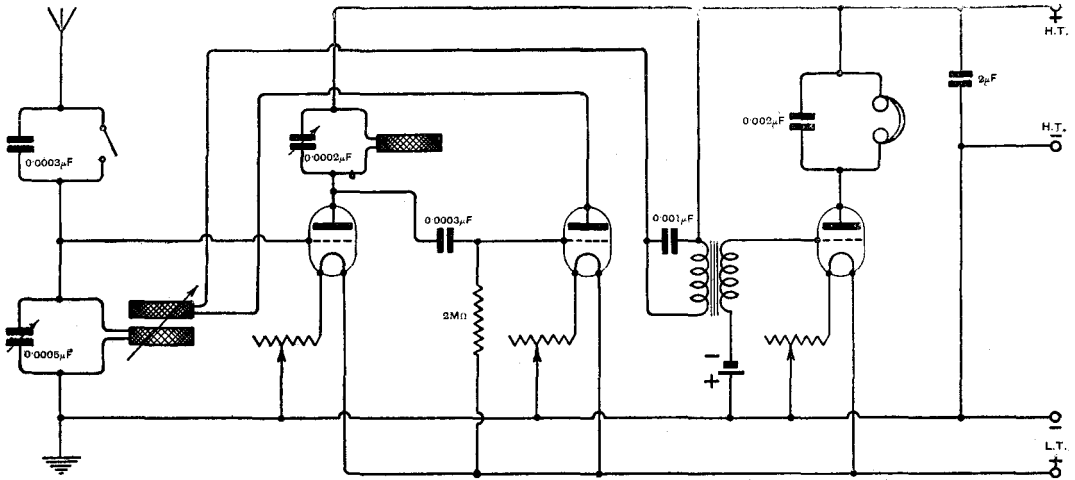


Fig. 2.

A THREE-VALVE BROADCAST RECEIVER.

THE circuit diagram given in Fig. 2 is that of a simple three-valve set suitable for the reception of broadcasting. The first valve, which operates as an H.F. amplifier, is coupled to the detector valve by the tuned anode method. With tuned anode coupling, plug-in type tuning coils may be used and a wide band of wavelengths can be covered without additional cost if a set of coils is already in use for the tuning of the aerial circuit. The reaction coil is coupled to the aerial circuit, thus leaving the anode circuit free for calibration. A list of the components necessary for the construction of this set is given below.

- 1 Variable condenser, 0.0005 μ F.
- 1 " " 0.0002 μ F.
- 2 Fixed condensers, 0.0003 μ F.
- 1 " " 0.001 μ F.
- 1 " " 0.002 μ F.
- 1 " " 1 μ F. (Mansbridge type).
- 1 Grid leak, 2 megohms.
- 1 Single coil holder.
- 1 Two-coil holder.
- 1 Intervalve transformer.
- 3 Valve holders.
- 3 Filament resistances.
- 1 Switch (for 0.0003 μ F. aerial condenser).
- A small dry cell (for grid bias battery).

In addition to the above terminals, wire, and an ebonite panel will be required. The size of the panel will depend upon the type of components

resistance there will be a difference of potential between the ends. Advantage is often taken of this fall of potential to increase or supplement the grid potential of the valves. Thus, if the filament end of the secondary winding of a transformer is connected to the - L.T. lead, and if the filament resistance is connected in the negative side, the grid will receive a negative potential with respect to the filament as a result of the fall of voltage along the resistance. Unfortunately the value of the grid bias obtained in this way varies with each adjustment of the filament resistance, since the fall of potential along the resistance depends both on the filament current and on the value of the resistance in the external circuit. In the case of note magnifiers, the grid potential is not very critical, and the filament resistance may be adjusted without appreciably affecting the functioning of the valve. For H.F. amplification and rectification, however, it is often desirable to keep the grid potential fixed and independent of any movement of the filament resistances. This may be done by connecting the grid return lead to - L.T. in the case of the H.F. valves and inserting the filament resistances in the positive lead; and by connecting the filament resistance in the negative lead and the grid lead to + L.T. in the case of the detector valve. Finally, one should always make a rough estimate of the grid voltage available before making use of it, since its value may be too high if the filament resistance in circuit is large compared with the resistance of the filament of the valve itself.

The WIRELESS WORLD AND RADIO — REVIEW



RADIO TOPICS.

IS THE PRICE OF VALVES TOO HIGH?

WE ask the question, "Is the price of valves too high?" because we consider that it is a matter which ought to be raised, not only in the interests of the public who are making use of valves, but also in the interests of the wireless industry as a whole.

It must not be thought that we are looking upon the matter from a short-sighted point of view and consider that the price of a valve should be that of the materials used in its composition and cost of manufacture, plus a percentage for profits. We realise that in the production of the modern valve an enormous expenditure has been made by the Companies who have produced it, owing to the high costs of research work, and what are usually spoken of as "overhead charges" incurred before it was possible to put the finished article on the market.

Even whilst certain types of valves are being sold, one must remember that all the time expensive research work is being undertaken in the improvement of types and the introduction of new valves for special purposes. It is these costs which contribute largely to deciding the selling price of the valve and not the cost of the materials or the direct process of manufacture. Having, therefore, made clear that we recognise the costs involved, we again repeat our question, "Is the present price of valves too high?"

Broadcasting has created a phenomenal demand for valves and they have been sold in numbers far exceeding the earlier expectations of the manufacturers, but in spite of this, the difference in selling price at the time broadcasting started and to-day does not show such a difference as we believe it should.

Everyone knows that the public regard the valve as the most expensive item in an

efficient receiver. It is generally recognised that a crystal receiver is not an entirely satisfactory proposition, and we feel sure that there are thousands of users of crystal sets who would not hesitate to change these for valve receivers if it were not for the question of the valve costs; and not the initial cost only, but the expenses incurred through the necessity for renewals as valves are burnt out.

We believe that a very substantial reduction in the price of valves would not mean loss of business to the valve manufacturers and would stimulate the sales of valve apparatus and components of every description. This would incidentally result in greater satisfaction to the users of broadcast receivers. In America the prices of valves are, we believe, higher even than in this country, and public feeling is strong on the matter.

If valve manufacturers state that they are not in a position to make any substantial reduction in the price of valves and that the present price constitutes only a fair return after their expenses have been covered, then if we accept their word, there is, of course, nothing more to be said at the moment, and we must look for cheaper production in the future before a price reduction can take place, but before dismissing the subject, there is a point which we wish to raise which requires some explanation in fairness to the British consumer of valves. It has recently come to our notice, through sources which we believe to be reliable, that British valves of standard types can be purchased fairly generally on the Continent at a price which is in competition with the prices of Continental valves, in spite of the difference in exchange. In fact it has been pointed out that the price at which the valves are retailed on the Continent is such that one effects a saving over the retail selling price in this

country if these valves are re-imported into this country and import duty paid. Again we hasten here to explain that we are not accusing British valve manufacturers of distributing their valves at these competitive prices on the Continent. We recognise that by various underhand means, price cutting by some wireless dealers is practised and we hope sincerely that this is the explanation of these circumstances.

We hope that British valve manufacturers will write to us to banish any misgivings which we may be tempted to feel. Surely no British manufacturer would be responsible for selling abroad his products at a price far more favourable than is granted to the British consumer.

THE TRANS-OCEAN AMATEUR TESTS.

IN our last issue we published an announcement by the Radio Society of Great Britain on the subject of the Trans-Ocean amateur tests to be conducted this autumn. As in previous years, these tests will take the form of competition between amateurs to achieve the best long distance transmissions and communications with overseas amateurs.

The Postmaster-General has recognised these annual tests officially in the past and there is little doubt but that this attitude will be repeated this year. The question of obtaining the necessary permission from the Postmaster-General to communicate or to attempt to communicate with amateur stations abroad is not likely to be withheld, but we suggest that the Postmaster-General would save himself a great deal of trouble and inconvenience and simplify the organisation of the tests for that body which is undertaking to arrange them, if for the purpose of these tests over a definite period he were to grant a comprehensive permission to the Radio Society of Great Britain so that all those who were officially entered for the tests by that Society could act as it were as "agents" of the Society under the one comprehensive permit.

The same remark applies with regard to special permits for additional power to be used for the tests. The Postmaster-General could stipulate the maximum power to be authorised and leave the granting of the facilities in the hands of the organisers of

the tests. Of course, we know the Postmaster-General would raise the objection to this latter suggestion that he would not be in a position to know from whom to collect fees for the additional power. That is a question which we cannot discuss here, but can only say that we ourselves feel that the charges made for the use of additional power in previous years has been unreasonable in the circumstances and that this year a comprehensive fee at an amount to be mutually agreed might be payable by the Radio Society to cover those members who take part in the tests.

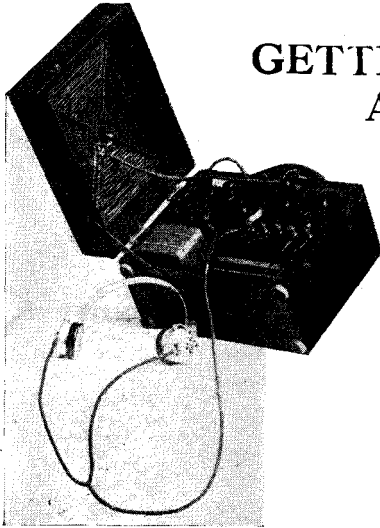
AERIALS AND LIGHTNING AGAIN.

THE stormy weather has produced its usual crop of paragraphs in the daily press on the subject of damage attributed to the presence of wireless aerials on private buildings. These news items are usually sufficiently sensational to attract the attention of the journalist, but unfortunately the journalist is seldom a scientist and, as a consequence, we hear only one side of the story and may be carried away to believe that the presence of aerials on buildings constitutes a danger.

We think that the time has come when a proper investigation into such accidental occurrences should be made. We know that some insurance companies would like to make much of the risks because therein lies their hope of premiums. We honestly believe that the risks from this cause are negligible and in any case are certainly not more than are run where telephone wires are in proximity to or attached to such buildings.

If any reader has had experience or can obtain reliable information regarding any case of damage to property where an aerial has been blamed as the cause, we should very much appreciate his co-operation in supplying us with details, as we think that a collection of reports from different sources, especially where these are compiled by persons who will look upon the matter from a scientific point of view, would be of the utmost value in correcting what we believe to be entirely erroneous impressions which have been thrust upon the general public through sensational paragraphs in the daily press.

GETTING RESULTS WITH AN ARMSTRONG SUPER



The receiver complete with frame aerial and batteries.

The Armstrong super-regenerative receiver has attracted interest from time to time since its introduction some two years ago. In many instances, however, the amateur has not met with entire success when experimenting with this type of receiver, due probably not to the lack of reliable constructional advice, but to manipulating difficulties. This article has been compiled as it is thought necessary to combine both constructional and precise operating data in order to ensure success.

This instalment describes the construction of a simple set, and the results obtainable, including the reception of American amateur transmitting stations on the small frame aerial, will be related in the next issue.

By J. G. W. THOMPSON.

THE following is an account of some long distance reception obtained last winter on a single-valve Armstrong super - regenerative receiver coupled up to a small frame aerial. The tests extended from November, 1923, to May, 1924, and were carried out with the object of determining what could be done on short wavelengths with a receiver of this type.

The location of the instrument during the tests was not ideal from a wireless point of view, the instrument being situated indoors on the ground floor of a house which is badly shielded to the west by a big belt of tall trees, and to the south by a high railway embankment.

Before giving particulars of reception, some constructional details of the set employed might be of interest, especially as so many modifications have been made in the design of Armstrong super-regenerative sets. The photographs show the front and back views of the instrument exactly as used, while Fig. 1 is the circuit. The set was originally intended as a portable broadcast receiver for use with a 2-ft. frame aerial, and it was found that with careful handling it would tune down to about 200 metres. Further improvements suggested themselves in the course of operating the instrument, and after slight modifications it was finally possible to get down to 150 metres.

The aerial tuning inductance L_1 is a tapped tubular coil with a tapped reaction coil L_2 rotating inside. The quenching coils L_3 and L_4 , slab wound and stiffened by immersion in wax, are set up with a fixed coupling. Tappings are provided on each coil, so that variation of both quenching frequency and coupling can be obtained. It will be noticed that the "sequence" of H.T., telephones and reaction coil, is unusual and possibly bad practice, but it was found that for some

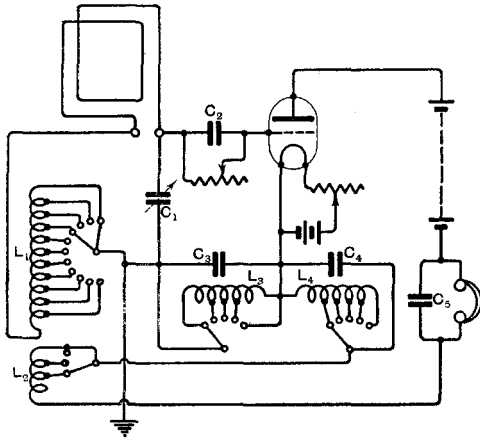


Fig. 1. The Armstrong-super circuit. L_1 approx. 130 turns No. 30 D.C.C. on $3\frac{1}{4}$ " diameter tube, 10 tappings. L_2 approx. 75 turns on $2\frac{3}{8}$ " diameter tube, 2 tappings. L_3 approx. 1,800 turns, wound "slab" fashion, 4 tappings. L_4 approx. 1,000 turns, 4 tappings. C_1 0.00015 mfd. C_2 0.00015 to 0.0002 mfd. C_3 0.006 mfd. C_4 0.006 mfd. C_5 0.006 mfd. Grid leak 0.5 to 5 megohms.

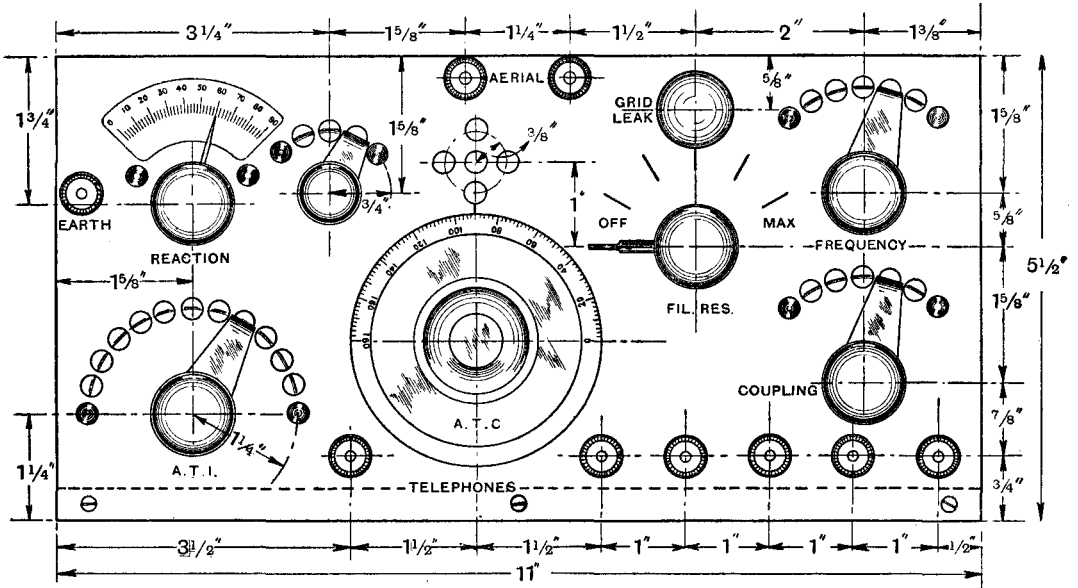


Fig. 2. Dimensional lay-out of the front panel of the author's set.

reason best results were given in this way, although, of course, tuning is upset when the telephones are handled.

Figs. 2 and 3 show the general lay-out of the receiver panel. The precise dimensions for these parts and their location on the panel are, of course, such as would suit the components at the disposal of the writer, but it is quite an easy matter to make the

minor modifications necessary for using slightly different component parts, using this description as a guide. All the tuning coils are, however, home made, and as these dimensions are critical in value the particular details of construction might be given.

The aerial tuning inductance L_1 is wound on a thin cardboard tube, $3\frac{1}{4}$ ins. long by $3\frac{1}{4}$ ins. internal diameter. This is wound

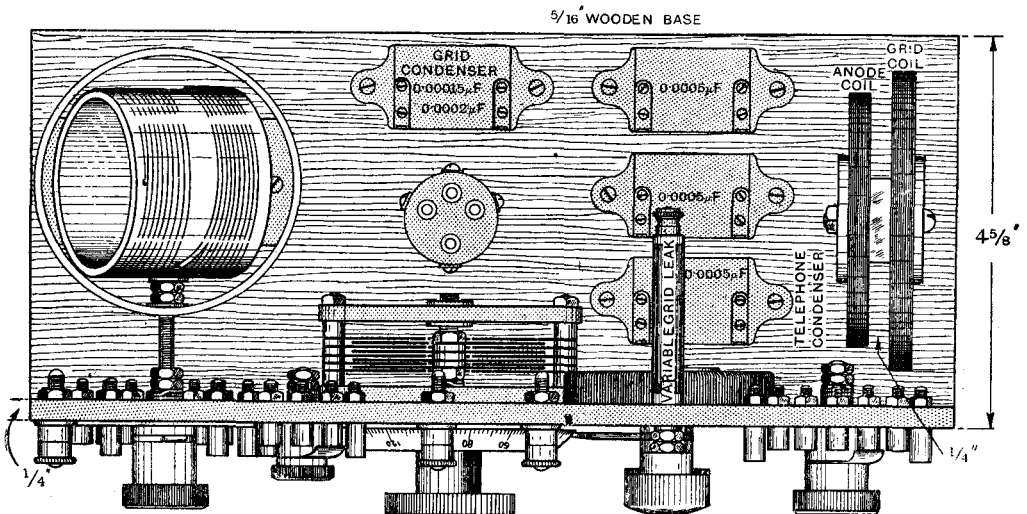
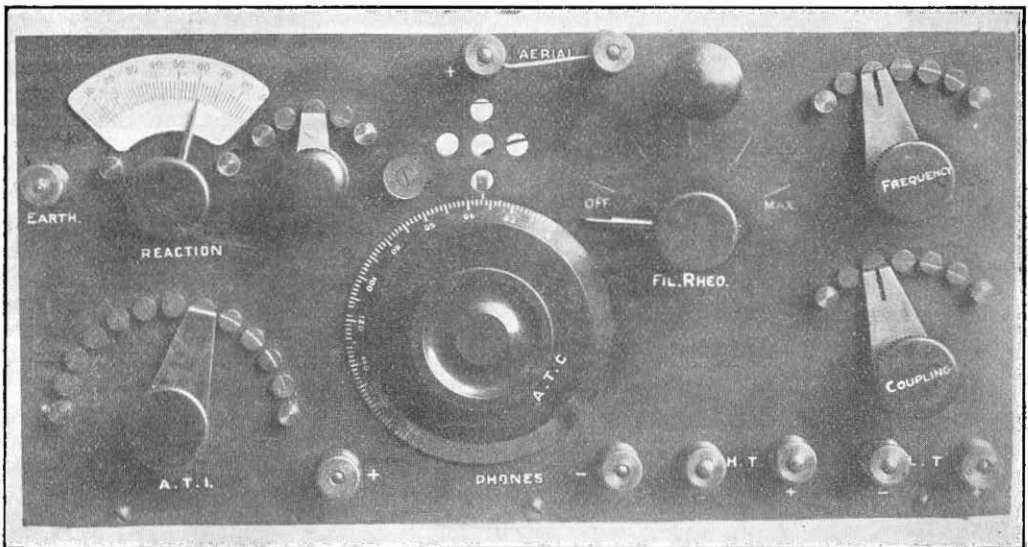


Fig. 3. The arrangement of the components on the wooden base.

with 30 turns of No. 30 D.C.C., and then, after leaving a gap of $\frac{3}{8}$ in. for the reaction spindle, another 90 turns are wound on. Ten tappings are taken to the 11-point switch, and the finishing end, *i.e.*, that remote from the space in the winding, is taken to the eleventh stud. Tappings at the beginning should be about $\frac{3}{16}$ in. apart, increasing gradually to $\frac{3}{8}$ in. A thin coating of shellac is applied to keep the turns in place.

Reaction coil L2 is $1\frac{5}{8}$ ins. in length by $2\frac{1}{2}$ ins. in diameter, and is mounted on a 2 B.A. spindle rotating inside the L2 inductance. It is wound with 72 turns of

radial slots it is possible, prior to removing them from the winding former, to bind the coils up at a number of points with thread. The anode coil L4 is a similar slab coil, but is only $3\frac{1}{2}$ ins. in diameter, and wound with No. 32 enamelled wire. The tappings on each coil (Fig. 4) are easily made by prising up the wire at the desired points, slipping a strip of mica under the raised wire, and soldering a short lead to the raised portions. The mica may then be substituted by a small piece of empire cloth held in position with melted paraffin wax. The arrangements of the tappings are such that on the first active



A front view showing the compactness of the instrument, an important feature if the set is to be really portable.

No. 30 D.S.C. with $\frac{1}{4}$ in. gap in the centre. Two tappings are taken off with good thin flex to a 3-point switch, the end of the coil going to the third stud, the first tappings at 27 turns and the second at 52. The first stud is used for 200 metre work, and the second and third for medium or long wave broadcasting, the tuning range extending to about 600 metres.

The two slab inductances in the quenching circuit are wound with No. 36 D.S.C. between two discs, and have internal and external diameters of 1 in. and 4 ins. respectively, and a width of $\frac{3}{16}$ in. The discs used for winding these coils should be about $4\frac{1}{2}$ ins. in diameter, and by making a number of

studs the outer half of each respective coil is in action, the inductance being increased inwards. It was arranged thus so that the tappings could be well spread out without causing the very wide jumps in inductance value which would occur were the tappings arranged from the inner end.

In the grid coil the first stud short-circuits the coil, thus making the set an ordinary "straight" one-valve arrangement for use on outdoor aerial and earth. Variation of the inductance of the grid coil, changes the quenching frequency, while variation of the anode coil varies coupling more than frequency.

The switch arms are wired so as to make contact with two studs if it is desired, thus providing a greater variety of inductance changes, and also to screen, if necessary, that portion of the coil which is not in use. The mounting of the various coils must be rigid, owing, of course, to the weight, and a

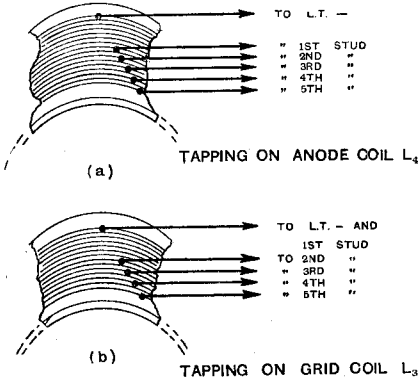


Fig 4. Tapping points on the oscillator coil.

good arrangement is to clamp them between pieces of ebonite, the centre being screwed to the wooden baseboard (Fig. 5). Owing to the limited vertical height the valve holder must be as short as possible, and the writer undertook the construction of a special valve holder for the purpose.

The containing cabinet is a cut-down Mark III tuner box now measuring 11 ins. by 8½ ins. by 4¾ ins. deep (internal measurements), while the lid is 2 ins. deep. Resting on two narrow wooden strips the set leaves a space at the bottom for batteries, measuring 11 ins. by 3½ ins. by 4¾ ins., sufficient to contain a 30-volt high tension battery, which may be made up to the most suitable shape, together with a suitable dry cell for use with the dull emitter valve, the complete outfit, including batteries, weighing about 15 lbs.

The frame in the lid consists of 15 turns of No. 22 D.C.C. wire, wound on four wooden pieces screwed to the inside of the lid, its sides measuring approximately 10 ins. by 8 ins.

The usual settings on the writer's own set for broadcast reception are:—Frequency switch (*i.e.*, grid coil), No. 2 stud; coupling switch, No. 2 or 3. Quenching whistle on these adjustments is quite high and not objectionable. For greater sensitivity and stability on weak signals the frequency has to be lowered (No. 3 or 4 studs).

For 200 metres frequency can be made very high when switch is between 2 and 3

and coupling must be made very loose by putting switch between 1 and 2 or 2 and 3.

Regarding results on broadcasting, Glasgow at 42 miles is received well on the small frame, even in a railway train moving at high speed. The local (Edinburgh) relay station can, of course, be received almost anywhere in the Edinburgh area without the frame at all—just the set alone. Reception of other stations is not reliable, although Manchester and Bournemouth have been heard on good nights. On the 2-ft. frame, however, practically all the B.B.C. stations have been heard when conditions have been favourable.

The set may be used on an aerial and earth as a "straight" circuit by cutting out quenching oscillations (first stud of frequency switch), connecting aerial to the (shorted) frame terminals, and earth to the terminal provided.

One of the greatest disadvantages of the super-regenerative circuit is that when the reaction is increased to oscillation point, the well-known harsh "roar" is produced. This roar is strongest when amplification is greatest, *i.e.*, at lowest condenser settings and optimum quenching - coil coupling. Reception of a C.W. beat-note is practically impossible here, so searching has to be

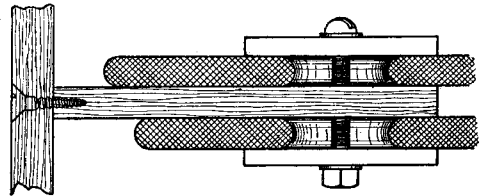


Fig. 5. Mounting the oscillator coils.

carried out higher up the scale, where the roar (and the amplification) is less. (This does not refer to the reception of the comparatively strong broadcast telephony, as the roar entirely disappears on reception of the strong carrier-wave). However, one soon gets accustomed to the reading of weak C.W. morse through a background not entirely silent. It is almost impossible to miss C.W., as it comes in as the well-known "bunch" of beat notes, covering quite a wide wavelength range. So much so, that three or four transmissions were often heard at the same time, although differing considerably in wavelength.

(To be concluded).

PRODUCTS OF THE MANUFACTURERS.

New Charger for L.T. and H.T. accumulators from A.C. supply.—Improved intervalve transformer construction.—Insulating beads.

A New Battery Charger.

Those who are fortunate enough to be connected to a D.C. supply for electric lighting are usually able to undertake the charging of their batteries at home by using lamps or some other resistance in series. Consumers on alternating current networks, however, are unable to do this without employing some form of rectifying apparatus, of which many designs have appeared on the market.

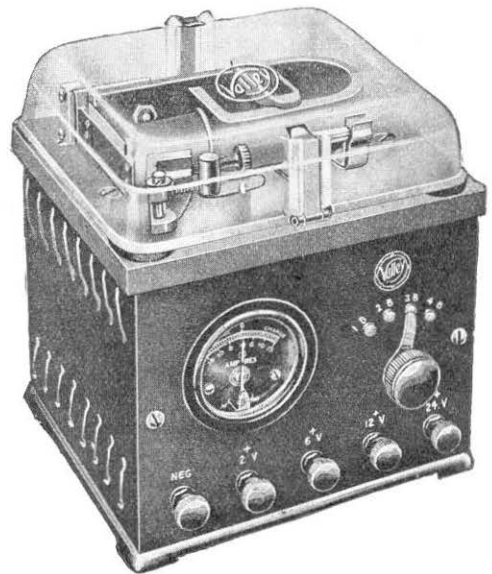
These rectifiers are of several types, and include small motor generators and rotary converters, electrolytic rectifiers, others employing valves, the well known mercury arc rectifier, and, lastly, the vibrating reed, electromagnetic type. The last mentioned, by reason of its simplicity of design and operation, is one of the most popular. A good example of this form of charger is the "Valley" Battery Charger of the General Electric Co., Ltd., illustrated here. It consists essentially of two portions, (a) a transformer, the secondary of which is tapped to supply circuits at 2, 6, 12 and 24 volts respectively, and (b) the rectifying element. This comprises a compound magnetic circuit composed of a permanent magnet and a small electromagnet energised by the A.C. supply, and a vibrating armature carrying a silver plate which makes contact during alternate half-cycles with a heavy carbon contact.

The moving portion of the apparatus is mounted on a slate base on the top of the case containing the transformer, and, together with a replaceable fuse in the battery circuit, is protected by a moulded glass cover.

The front of the instrument is a panel of Bakelite, carrying a flush type ammeter, which indicates the value of the charging current, clearly marked terminals for connecting 2, 6, 12 or 24-volt batteries and switch for varying the charging rate of 24-volt H.T. units being charged in parallel.

This charger is made in two stock windings, one for operating on 50 cycle circuits at voltages between 100 and 125, and the other for 50 cycle circuits between 200 and

250 volts. Chargers for non-standard periodicities between 25 and 65 cycles can be specially made. The standard apparatus charges 2 and 12-volt batteries at approximately 3 amperes, 6-volt batteries at 6 amperes, and 24-volt H.T. batteries at approximately 0.1 to 0.4 amperes.



The new G.E.C. accumulator charging set for use on A.C. supply. It will charge both high and low voltage batteries.

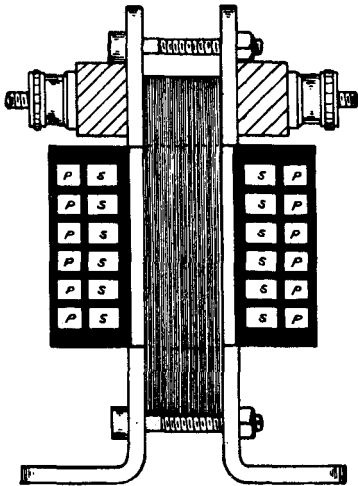
The New R.I. Transformer.

As the result of a series of tests, Messrs. Radio Instruments, Ltd., have decided to place on the market a low frequency transformer which in many respects is an improvement on the present well-known R.I. transformer. The transformer is not designed for use with any particular valve, but has been produced to meet the needs of those who use general purpose valves.

In the new model the primary and secondary windings are each divided into

six sections as shown in the accompanying sketch. The six primary sections are now situated on the outside of the six secondary sections, whereas in the old model the primary is on the inside, nearest the core. As a consequence the self-capacity of the complete coil is only 18 micromicrofarads when measured at a frequency of 750 cycles. The coil has a very low self-capacity, which is an advantage, inasmuch as, other things being correct, a transformer having a low self-capacity will probably have a flat, straight frequency characteristic.

The bobbin on which the coil of the new model is wound is built up of special insulating material into six main sections, the whole bobbin being finally baked, after impregnation, with an insulating compound of low dielectric constant and high insulating properties. The construction of the bobbin is shown clearly in the sketch.



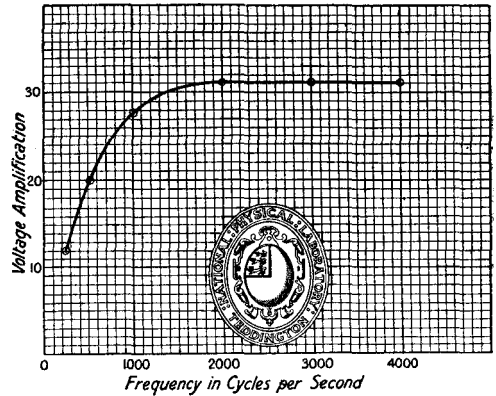
Section of the new R.I. transformer showing the arrangement of the primary and secondary windings.

A laminated core is employed and consists of iron stampings interleaved to prevent eddy current losses. It is of large cross section, the manufacturers realising that it is just as important that the core shall be of suitable size as the windings having correct values.

Many experiments were made to determine the most suitable number of turns. Ultimately it was found that good results were obtained with a primary winding of 3,000 turns

(500 turns per section), and with a secondary winding of 12,000 turns (2,000 turns per section). Thus a primary inductance of 11 henries and a secondary inductance of 160 henries was obtained with a turn ratio of 4-1.

Coils having other values were found to give good or even better results under certain



Curve obtained with R.I. transformer showing the uniform amplification over a wide band of note frequencies.

conditions, but for use with ordinary or general purpose valves the values given were found most suitable.

The accompanying curve shows the relation between amplification and frequency. It will be seen that the amplification increases between the frequency of 250 cycles and 1,500 cycles, but the amplification is uniform for frequencies above 1,500 cycles.

"Fish-Spine" Beads.

One of the best methods of producing insulated flexible lead consists of threading a number of beads on a stranded conductor. The principle was made use of in a three-valve receiver not long ago described in this journal, and those readers interested in this type of flexible lead will welcome the introduction of special closely fitting beads by Messrs. Taylor, Tunnicliff & Co., Ltd. Bead insulation has long been used for switchboard and general electrical work, and its application to wireless instrument making is an advance of amateur interest.

DESIGNING SMALL POWER TRANSFORMERS

In a recent number we described the construction of a chemical rectifier involving the use of a transformer, and a large number of readers have asked for particulars of suitable transformers. In this article we give the principles underlying the design of small power transformers, which will conclude with a number of representative designs.

By W. JAMES.

A TRANSFORMER consists (generally) of two insulated windings and an iron core. One type is sketched in Fig. 1A where *P* represents the primary winding, *S* the secondary winding, and *C* the iron core. A transformer of this general arrangement is called a shell type transformer. A core type transformer is sketched in Fig. 1B.

If the alternating current is passed through one of the windings (this winding is called the primary) an alternating magnetic field is created. This magnetic field "links" with or "cuts" the turns of wire forming the secondary, the turns of wire forming the secondary, and the iron core.

Now when magnetic lines of force cut a conductor, a difference of potential is set up in the conductor. The magnitude of the induced voltage depends upon the number of turns which are cut, the number of magnetic lines of force and the frequency of the alternating flux.

Thus we may write

Induced voltage is proportional to Turns × Flux × Frequency. For sine waves :

$$E = \frac{4.44 T F f}{10^8} \text{ volts}$$

Where *T* = the number of turns of wire connected in series.

F = the maximum value of the flux and

f = the frequency in cycles per second.

EXAMPLE.

If the cross section of the iron core is 4 square inches and the maximum flux density is 50,000 lines per square inch, what is the induced voltage when the frequency is 50 cycles per second, and there are 400 turns in series.

Writing the values in the above equation we obtain

$$E = \frac{4.44 \times 400 \times 50,000 \times 4 \times 50}{10^8} = 178 \text{ volts.}$$

THE VOLTAGE RATIO.

If we assume that there are no losses, when there are twice as many turns of wire in the secondary as in the primary, and all the turns are linked with the total flux, the secondary voltage will be twice the voltage applied to the primary.

We may write :

$$\frac{\text{Secondary turns}}{\text{Primary turns}} = \frac{\text{Secondary voltage}}{\text{Primary voltage}}$$

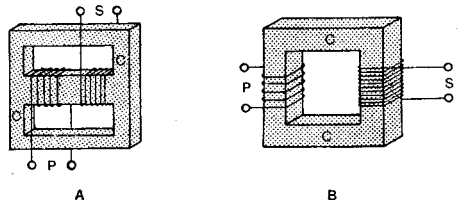


Fig. 1. Explaining (A) the shell type transformer, and (B) the core type transformer.

Thus the voltage ratio is equal to the turn ratio. If a secondary voltage of 5 times the primary voltage is required, the secondary winding must have 5 times as many turns as the primary.

THE CURRENT RATIO.

In a perfect transformer, a given power input to the primary would produce an equal power, although at a different voltage, in the load connected to the secondary. Consequently if the secondary voltage is say five times the primary voltage, the current flowing in the secondary circuit is one-fifth of the primary current.

THE OPERATION OF A TRANSFORMER.

Let us for a moment ignore the secondary winding and consider what happens when the primary winding is connected to a supply of alternating current, Fig. 2A. The alternating current sets up an alternating magnetic field which cuts the turns of the primary winding. Hence a voltage is induced in the primary. This voltage acts in opposition to the applied voltage, so that the effective voltage acting to force a current through the winding is equal to the difference between the applied and the induced voltage.

Now the primary is usually wound with a fairly heavy gauge copper wire and its resistance is fairly low. Therefore a heavy current will be taken if the induced voltage is small compared with the applied voltage. The induced voltage may be made almost the same as the applied voltage by employing a suitable number of turns in the winding, and a suitable iron core. Then the primary current will be relatively small. The transformer is in fact operating as a choke coil, the "choking" action being dependent on the number of turns and the iron core as explained above.

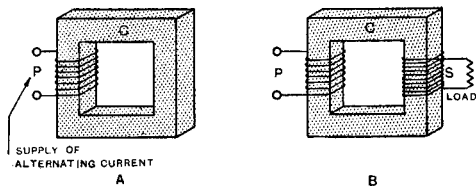


Fig. 2. Explaining the operation of a transformer.

When the secondary winding is connected to a load, such as a resistance, Fig. 2B, a current flows round the secondary circuit. This current in passing through the secondary winding creates a magnetic field which acts in opposition to the magnetic field created by the current flowing in the primary. Hence there is a tendency for the number of magnetic lines of force to be reduced and therefore a tendency for the back voltage induced in the primary winding to be reduced. If the back voltage falls off, however, the primary current increases and so the magnetic field is strengthened.

Connecting a load to the secondary therefore has the effect of allowing the primary current to increase, thereby maintaining a balance.

THE CORE.

The transformer core is generally built up of iron or steel laminations.

The usual thickness lies between 8 and 20 thousandths of an inch, the thinner laminations being used when the material is of poor quality or when the frequency is high.

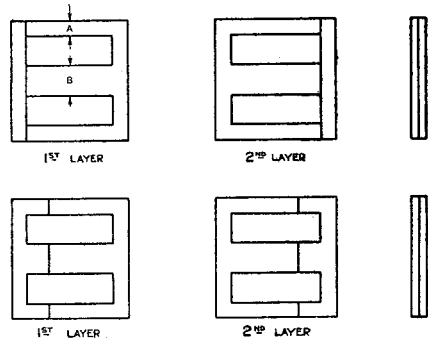


Fig. 3. Showing the shape of two sorts of core laminations for shell type transformers, and how they are arranged.

The object in employing a laminated instead of a solid core is to reduce the eddy current loss. The core is, of course, cut by the magnetic field in the same way as the windings, and the voltages induced in the core tend to set up a flow of current. Laminations are generally provided with a coating of insulating material, and they are assembled at right angles to the plane of the flux, in order that the currents which tend to flow along the core are directly opposed by the resistance of the coating of the laminations.

One type of core, called the shell type, is built up of laminations like those of Fig. 3, which shows the method of building up successive layers. It will be noticed that the joints are not all on one side, the laminations being first placed one way round and then the other way round, as shown. The result is to provide a better magnetic path than would be provided if the joints were all at one side. The width of the core at A need be only half the width at B, because while the whole of the flux is carried by the central portion B, the limbs A each carry only half the total flux.

Methods of building up the laminations for the magnetic circuit of a core type transformer are shown in Fig. 4.

There is not much to choose between the two types of transformer from an electrical point of view.

The laminations may be held together by a small bolt placed at each of the corners ; but an insulating bush and washers should be fitted to prevent the bolts from short-circuiting the laminations and so increasing the eddy-current losses. If the laminations are not tightly clamped, they may vibrate and damage the windings.

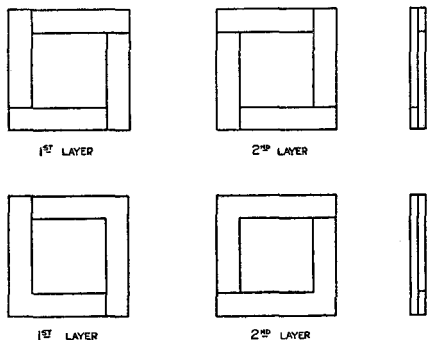


Fig. 4. Showing the shape of two sorts of core laminations for core type transformers, and how they are arranged.

Transformer cores should always be very carefully assembled, with the object of providing the best possible path for the flux. Particular care is necessary at the joints. If the design calls for an air gap, it is better to make this by providing a piece of non-magnetic material, such as wood or felt, at the proper place.

ARRANGEMENT OF THE WINDINGS.

In the core type of transformer, the windings may be arranged as suggested by Fig. 5. In Fig. 5A the primary winding is fitted over one limb of the core, and the secondary over the other limb. This is the simplest arrangement from the point of view of construction and the insulation of the windings. A better method consists of arranging the windings into two sections, one half of each winding being fitted on

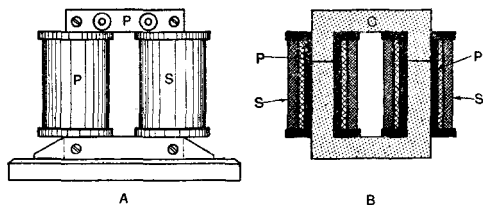


Fig. 5. Explaining two methods of arranging the windings of core type transformers.

each limb as in Fig. 5B. Sometimes the windings are split up into more sections and connected in series or parallel as required.

The windings of a shell type of transformer may be arranged as indicated in Fig. 6. In Fig. 6C, the primary winding is next to the core, and the secondary is fitted over the primary winding. When the transformer has to deal with high voltages, it is usually preferable to split the secondary into sections and connect them in series as in Figs. 6A and 6B.

Cotton covered wires are usually employed for the windings, although in small transformers and where space is a consideration, silk covered wires are often used.

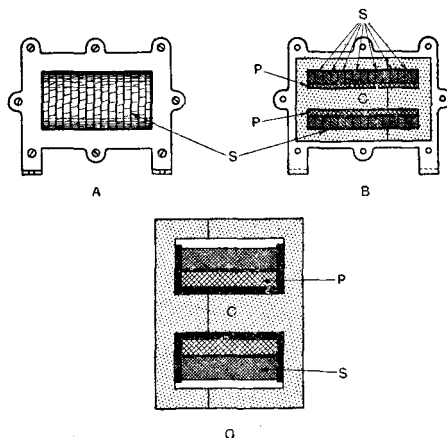


Fig. 6. Explaining methods of arranging the windings of shell type transformers.

The insulation between the windings, and between the windings and the core is determined by the voltages, and the sort of circuit in which the transformer is to be used. For example a transformer to be employed for heating the filaments of rectifying valves should be well insulated because the filament circuits are usually at a high voltage to earth.

LOSSES.

Transformer losses may be divided into those due to the core (core losses) and those due to the ohmic resistance of the windings. Core losses depend on the quality and thickness of the iron, the frequency and the flux density. Copper losses are proportional to the resistance of the winding and are kept down by using the largest conductors permissible.

(To be concluded.)

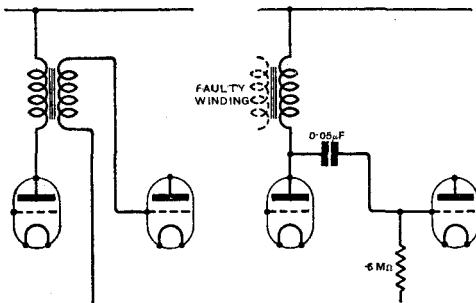
READERS' PRACTICAL IDEAS.

This section is devoted to the publication of ideas submitted by readers, and forms a very valuable contribution, inasmuch as it includes just those devices which the experimenter welcomes. These pages are intended to facilitate the interchanging of ideas.

Using Burnt-out Transformers.

When one has the misfortune to burn out a low frequency intervalve transformer, there is no need to discard it, for almost equally good amplification can be obtained by the following slight modification of the circuit.

Neglecting the winding which has become faulty, whether it be primary or secondary, the good winding is connected between the H.T. positive and the plate of the valve or, in other words, in a position formerly occupied by the primary winding. The plate end of the winding is then connected across to the grid of the next valve through a mica condenser having a value of between 0.001 and 0.05 mfd. A leak resistance, which may for economy consist of a pencil line on paper or ebonite, must now be connected from the



Remedying a burnt out L.F. transformer.

grid side of the condenser to the L.T. —, thus converting the former transformer coupling to choke coupling.

G. J. S.

Tuning Two H.F. Circuits.

In Fig. 1 is shown two tuned circuits as would be employed in two stages of tuned

high frequency amplification. If the inductances L_1 and L_2 and the capacities C_1 and C_2 are exactly matched, it will be apparent that the potential at the point A

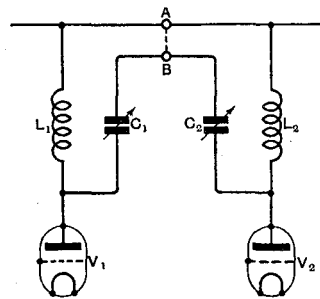


Fig. 1. When C_1 exactly equals C_2 , and L_1 equals L_2 , then the potentials at A and B are equal, and the connection between A and B is no longer necessary.

is the mean of the potential at the plate end of the inductances and that the potential of B is the same, thus rendering any connection between A and B unnecessary.

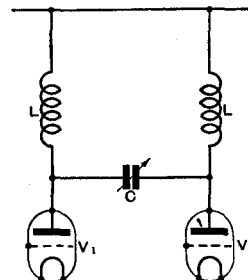


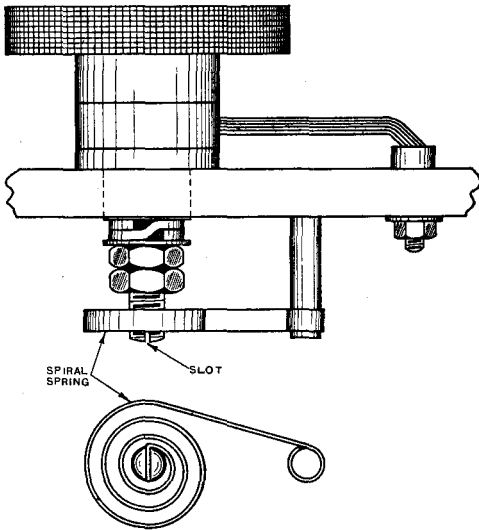
Fig. 2. A modified circuit for tuning two anode coils.

It is suggested therefore that the condensers C_1 and C_2 may be replaced by a single condenser C (Fig. 2), thus greatly simplifying tuning control.

J. T.

Making Contact with A Switch Arm.

A faulty contact between the spindle of a rotating switch and its bush is frequently the cause of noises in receiving sets. Intermittent contact can be easily avoided by soldering a strip of thin brass or bronze into a slot on to the end of the spindle and terminating it on a peg secured to the under face of the instrument panel. This form of connection is better than one in which a flexible wire is made use of, for when soldering a piece of flexible wire its ends are rendered very brittle and it is at these points that the greatest bending takes



Making a reliable contact with a switch spindle.

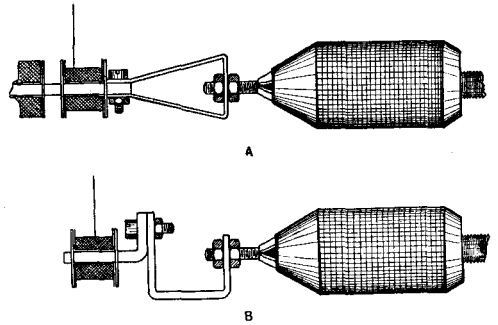
place. A soldered flexible lead thus rapidly breaks off and the use of a coiled spiral of strip metal will be found to be quite durable.

W. T. M.

Rewinding Telephone Bobbins.

It falls to the lot of most experimenters at some time or other to undertake the rewinding or repairing of telephone receiver bobbins. The job is, of course, a delicate one, and in consequence, a hand brace gripped in the vice will serve quite well for rotating the pole-piece. A difficulty arises in exactly centering the pole-piece and it is most important that it should run true to avoid jerking the very fine and fragile wire. Two methods of centering the bobbins are shown.

The first arrangement is for the "Brown" type of receiver and the second for the more usual pattern. Rigid strip metal can easily be bent to the shape shown and it is advisable



The method of mounting receiver bobbins for rewinding.

to make the hole, where the spindle, gripped by the chuck, enters the bent piece, a little large, so that centering adjustments are possible.

The reel with a rod through it, from which the wire is withdrawn, should stand vertically, so that a very slight friction is set up between the end of the reel and the surface on which it rests. If this friction is too great, washers of various areas may be inserted, while almost frictionless running is obtained by standing the reel on a ball-race of the thrust type. It is advisable to purchase fine wire only, on small reels which require very little pull on the wire to cause them to rotate and will not continue to revolve when once set in motion. The maximum weight of fine wire on a reel should not be more than 4 ozs.

C. H.

VALVES FOR IDEAS.

Readers are asked to submit ideas for inclusion in this section. A receiving valve will be despatched to every reader whose idea is accepted for publication.

Letters should be marked "Ideas" and addressed to the Editor, Wireless World and Radio Review, 12 Henrietta St., W.C.2.



CORRESPONDENCE.

[In our issue of August 20th we discussed, on the editorial page, the location of the 1,600-metre station. The information we had received from various sources led us to believe that a site had been selected in a North London suburb for the erection of the permanent station. The following letter received from the British Broadcasting Company serves to reassure us and our readers, and to allay the reasonable fears which we had expressed.—EDITOR.]

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—In the WIRELESS WORLD of the 20th August, we notice certain criticisms in regard to the procedure adopted by the B.B.C., in fixing the location of the 1,600 metres station.

In this connection, we beg to state that no site has even been considered, nor will be until the Post Office decision has been made known. In anything we do, however, the interests of the public will, of course, have first consideration.

So far as the trade is concerned, we would point out that our Board of Directors almost entirely consists of representatives of the manufacturer Members of the B.B.C., who are keenly alive to all the interests of the trade.

We might also add that whenever any important decision is made which affects the trade, it is our invariable policy to circularise all our Members.

In conclusion, you can rest assured that in deciding on the location of the high-powered station, full consideration will be given to all the points you have raised in your article.

Yours faithfully,
for The British Broadcasting
Company, Ltd.,
(Signed) G. V. RICE.
Secretary.

2, Savoy Hill,
London, W.C.2.

Interchangeable H.F. Couplings.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—The interchangeable H.F. valve couplings were on the panel shown by the Kensington Radio Society at the Radio exhibition last year, but the method of mounting was different. Mr. Cook's use of valve stems and sockets is better, and for some while I have used these for mounting tuning inductances as well. The point I wish to emphasise is the spacing, viz., 2 ins., and in view of possible interchange of coils, transformers, etc., among amateurs working on these lines, I should like to urge that this 2 in. spacing be adopted as standard.

My practice has differed from Mr. Cook in one respect. Both pins are on the movable part, both sockets on the panel part. The reason for this is that on the panel one can use the flush

sockets to the improvement of appearance. This is particularly the case when the usual two or three coil holder is adapted to suit.

Transformers.—I advise Mr. Cook to try the No. 38 quadruple covered wire I mentioned in my article on fine wire coils, WIRELESS WORLD, April 30th, 1924. This was described as particularly good for winding tuned transformers.

Between layers I used tough paper, wetted, gummed, and well dried. This gives a better surface on which to wind the second layer, and if damp is suspected, a short period before a fire gets rid of it. My experience—and that of some others—is that these single layer coils give a far greater tuning range than the plug-in disc type.

Details for B.B.C.— $1\frac{1}{2}$ in. diameter, 200 turns No. 38 Q.C.C. (rather under 4 ins.) tuned from below Cardiff to well over 600 metres.

These transformers and their winder (with counter) were shown in the WIRELESS WORLD of February 24th, 1923.

J. H. REEVES.

London.

The A.R.R.L. and International Language.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—The letter from the Assistant Secretary of the A.R.R.L. published in your issue of August 13th, 1924, being entirely a flat contradiction of a statement of mine which you published on July 9th, 1924, I trust you will allow me to show that my authority for the statement was no less than the Secretary of the A.R.R.L. himself, according to a published letter of February last to the Secretary of the Internaciona Ido-Radio-Klubo, Seccion Amerika, D. C. Roos, B.S., M.E., Fellow I.R.E.

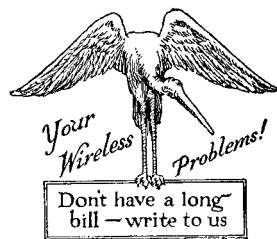
Mr. K. B. Warner there stated " We are now undertaking a solicitation of sentiment on the part of all our correspondents . . . proposing an international language for amateur radio use, and that that language should be Ido We are recommending Ido I haven't any doubt about the superiority of Ido"

I enclose a published full copy of this letter, and further confirmation is obtainable from many journals, e.g., *Radio News* (U.S.A.), page 206.

Mr. Sexton's letter I much appreciate, voicing the reasons that led me to leave Esperanto in favour of Ido.

E. H. TURLE, A.M.I.E.E.

London.



THE BEST CRYSTAL CIRCUITS

In this, the concluding section of their article, the authors give the practical results arrived at from their comparisons of relative efficiencies of crystal circuits.

By W. B. MEDLAM, B.Sc., A.M.I.E.E., and U. A. OSCHWALD, B.A.

(Concluded from page 591 of previous issue.)

FOR our final circuit we will take that shown in Fig. 10, which is a single-slider circuit, with shorted ends. The results, obtained under exactly the same conditions as for all the other tests, are plotted in Fig. 11. It will be noted that the curves for all tapings are rising at the ordinate for 60 total turns. The rise continues indefinitely as the number of turns is increased. The curves for the 30 and 35-turn taps show that one must be very careful in shorting the ends when they number less than 15 or 20 turns. With a larger number of ends it is quite safe, and preferable, to short them.

The results plotted in Figs. 5, 7, 9 and 11 may be viewed from a somewhat different angle. Suppose we have a tapped coil of 60 turns (which would tune up to 540 metres on a 0.0002 mfd. aerial) and we wish to determine the best crystal circuit to work,

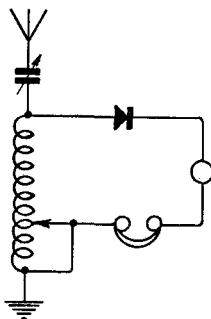


Fig. 10. A single slider circuit with short circuited turns.

mainly on 2 LO, under the following limitations:—

- (a) the number of turns on the coil is to remain fixed at 60 turns, and
- (b) the circuit must suit any given aerial.

We will start by plotting a curve showing the variation of current with the number of turns tapped off, for a 60-turn coil, for each of the circuits of Figs. 4, 6, 8 and 10, which circuits will be denoted by the letters A, B, C and D, respectively. These curves are shown in Fig. 12.

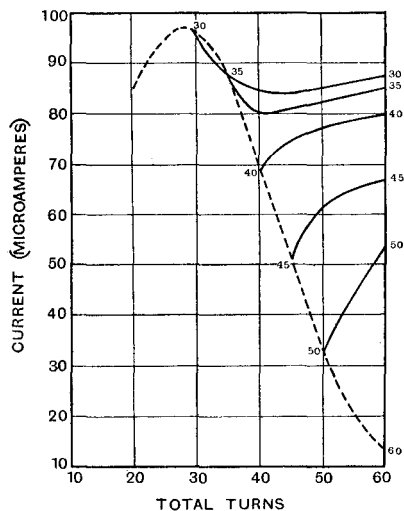


Fig. 11. Current delivered for various positions of the tapping point in the circuit of Fig. 10.

If we were not restricted by the limitation (b) we should say that circuit D was the best one (for any given tapping), although its peak value is very little different from that of circuit A; but when the aerial capacity is insufficient to enable us to reach the peak values there is this complication: that the aerial capacity required to tune on a given tap is different for all four circuits, and it might happen that one of the circuits other than D might utilise a given aerial capacity to better advantage and thus give better

results. To get over this difficulty we have plotted (Fig. 13) the aerial capacities required to tune the 60-turn coil on various taps.

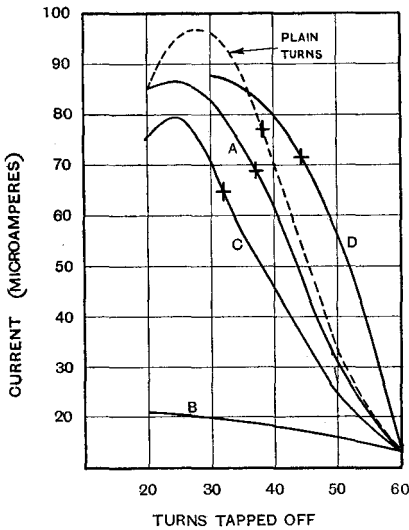


Fig. 12. Current values for various tappings of 60-turn coils included in the circuits already illustrated.

Now, suppose our given aerial has a capacity of 0.0002 mfd. We find from Fig. 13 that with this maximum capacity the circuits are untunable when the number of turns tapped off falls below the value given in Table I.

TABLE I.

Circuit.	Minimum Turns.	Current.
A	37	69
B	—	21
C	31.5	67.4
D	44	70.5

Reverting to Fig. 12, it is clear that for any of the circuits we should tap off the smallest number of turns with which we can tune on the full aerial capacity (this being below its best value). In this case the turns can be reduced to the values given in Table I. The corresponding point on each of the curves in Fig. 12 is shown by a X, and the currents are set out in the

third column of Table I. Thus, although circuit D is the best of all, there is remarkably little difference between the currents obtained with circuits A, C and D, with the particular limitations we have imposed. If the coil had many more turns the circuit D would leave the others far behind, and if the coil had less turns, say 40 turns instead of 60, circuit A becomes the best, and D becomes the worst of all, worse even than B, as in this case we should be shorting a very small number of turns. The curves for a 40-turn coil are reproduced in Fig. 14. The tap for a 0.0002 mfd. aerial is marked by a X on each curve, as before.

We will conclude with a summary of the results and a few miscellaneous observations.

(a) With any type of crystal circuit the results are improved as the inductance is decreased, and the aerial capacity is increased, up to their best values.

(b) The best value of inductance is in the neighbourhood of 90 to 120 microhenries, requiring aerial capacities of 0.0004 mfd. to 0.0003 mfd., respectively, on 360 metres. Also, we may add that both the inductance and aerial capacity should increase almost in direct proportion to the wavelength.

(c) In the event of the aerial capacity being greater than that given in (b) for any wavelength, use a series condenser to bring the resultant capacity to its correct value: 100 per cent. results are then obtainable.

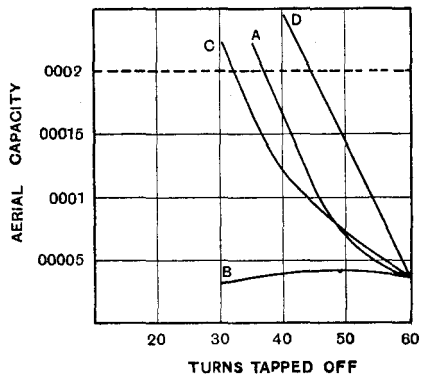


Fig. 13. Aerial capacities required to tune 60-turn coil on various taps.

(d) When the aerial capacity is less than its optimum, we have to be content with less than 100 per cent. results. In this

case, using, of course, the full aerial capacity, it is better to tune on the inductance rather than to use a parallel capacity. A parallel condenser does not make up for a deficiency of aerial capacity, and it will be found in all cases that the results are improved as the parallel capacity is reduced and the inductance is increased.

(e) When the aerial capacity is deficient, a plain untapped coil with spade tuning, or a variometer of low self-capacity, should give better results than any arrangement of single or double slider, or tapped coil circuit.

(f) When the aerial capacity is not less than its best value, a double-slider, or a double tapped coil, may be made to give slightly better results than the variometer

or its equivalent, but, in practice, the possible slight increase in efficiency is scarcely worth the extra complication of the double circuit. In all these cases a series condenser should be used as well to bring down the aerial capacity to its best value.

(g) If tapped coils must be used, the circuit of Fig. 10 (without the series condenser if the aerial capacity is below its best value) is much the best crystal circuit if the number of dead ends exceeds about 15 turns. If the number of ends is very small, the circuit of Fig. 8 or the double-slider circuit of Fig. 3 becomes the best. The possible advantage of the circuit of Fig. 3 over that of Fig. 8, as in (f), is hardly worth the extra tuning control.

THE NEW BROADCASTING STATION WILL IT SUPERSEDE 2 LO ?

AN invitation to readers to send in a postcard expressing their views on the high power 1,600-metre station, was extended recently in our editorial columns. The response which has been made to this invitation has brought out some extremely interesting points of view on the new station and its utility.

If one regards this correspondence in the nature of a popular vote, then the response is overwhelmingly in favour of the permanent establishment of such a station.

Naturally there are a great many replies which raise various objections to the scheme, but these are certainly in the minority. One interesting point which is shown up in the correspondence is the preponderance of enthusiasm amongst coast town dwellers, where every reply indicates that hitherto the interference from ship and coast station working has made reception almost impossible, or at any rate has made it of no particular pleasure to those who listen. It appears that the new wavelength gets over the difficulty of jamming from ship traffic almost entirely. One of our readers even goes so far as to suggest that it shows great lack of touch on the part of this journal with the circumstances at coastal towns, for

any suggestion to have been made that there could be two sides to the question of the usefulness of the station; here, of course, our correspondent has jumped to the conclusion that in asking for views we were inviting criticism of the station. Then you have the other point of view. One reader writes in to say that he would be glad to know that the station was "either shut down or compelled to change its wavelength because he much prefers the Radiola entertainment. Another correspondent from the London area complains that, although he is 45 miles from Chelmsford, he finds that he can receive **5 XX** almost 2,000 metres above and 400 metres below the allotted wavelengths. This with a double circuit tuner and tuned anode, and he suggests that in these circumstances, although the station will be a boon to crystal users, it is likely to be a source of considerable annoyance to commercial traffic. He considers it would be of interest to know what has been the recent experience of commercial stations operating anywhere in the neighbourhood of Chelmsford.

A correspondent on the South Coast writes: "I would rather pay two guineas a year for **5 XX** than 5s. for all the rest put

together. This because one can listen to **5 XX** with pleasure on account of freedom from jamming."

Here again, this communication comes from the coast and is typical of many others where interference from ship stations has hitherto made broadcast reception almost impossible.

A large number of letters, whilst favouring the permanency of the station, criticise the location and the majority seem to consider that a high power station of this nature should be located in a much more central position or, as a number have suggested, two or more such stations erected down the centre of England would serve the whole country under a very more satisfactory scheme than the present distribution of small stations; particularly where simultaneous broadcasting has to be resorted to, when, on account of the relay from place to place, reproduction, although wonderful in face of the difficulties, is not always satisfactory.

We think that there may be a great deal in such a suggestion as this. The possibility of installing two, or, say, three high power stations working on different but all comparatively long wavelengths, might solve the whole problem of distribution of broadcasting throughout the country. In the end one would imagine, without going into the matter in detail, that an economy could be effected by the Broadcasting Company in this way, for although the cost, at least the initial cost and the running cost of the high power station would be greater, yet by reducing the number of stations to two or three and with a consequent reduction in the personnel to control the stations, some considerable saving might be effected.

Perhaps the views of some other Londoners may be in harmony with the opinion expressed by a correspondent from South London, who considers the 1,600 metre station, under present circumstances, to be "an unmitigated nuisance." But he at once proceeds to modify this rather bald statement. His view is that **2 LO** is good enough to serve everyone in the London area, even with a crystal set, and that if the same programme is going to be put out by **5 XX**, then proximity of the latter station to London is no advantage to anybody in that area. Incidentally, the station prevents the possibility of switching over to the Continental programmes on approximately

that same wavelength because they are so interfered with by the 1,600 metre transmissions.

The only excuse for this station which our correspondent can find is in the event of a separate programme being transmitted and the location being somewhere well away from the London area.

To sum up in a few words the results obtained from our readers' communications one is led to consider that:

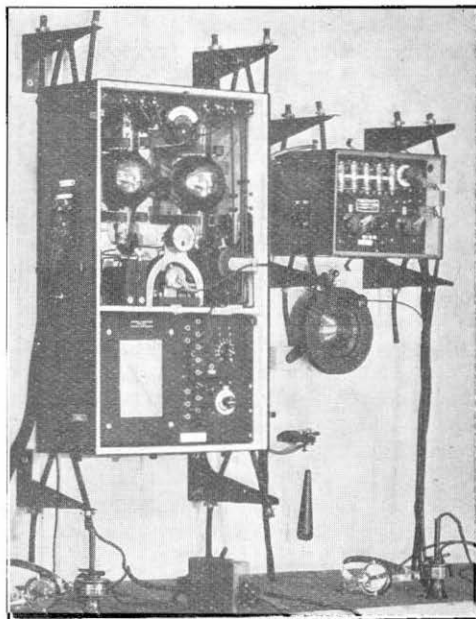
(1) From the point of view of reception the station is welcomed, and more particularly by those who were formerly interfered with by local transmissions of spark stations.

(2) Londoners get all they need from **2 LO** unless **5 XX** is to transmit an independent programme.

(3) The location of the high power station should be more central and not near a thickly populated area.

(4) High power stations, located centrally about the country, might provide a better service than the existing network of small powered stations and relay stations.

AIRCRAFT RADIOPHONE.



An aircraft transmitting and receiving equipment, Type A.D. 8, by Marconi's Wireless Telegraph Co., Ltd.

VALVE TESTS.

THE MARCONI-OSRAM D.E.R. AND D.E.6.

OF all the receiving valves having dull emitting or low temperature filaments, the D.E.R. is one of the most widely used. This product of the M.O. Valve Company is, as its name implies, a dull emitting "R" valve and is one of the earliest valves with a low consumption filament to be produced in this country.

not be exceeded. At this figure the current taken is of the order of 0.4 ampere, the usual characteristics being given in Fig. 1. Generally speaking, a lower filament voltage than 2 can be used, for the above - mentioned figure shows that with a voltage of only 1.5, the total emission is 5 milliamperes, which is sufficient for many purposes. The filament efficiency when the voltage is 2.0 was actually 18.3 milliamperes per watt on the sample tested. Fig. 2 gives the plate current grid volts characteristics for plate potentials of 40 and



The D.E.R. Valve. The D.E.6 is similar in external appearance.

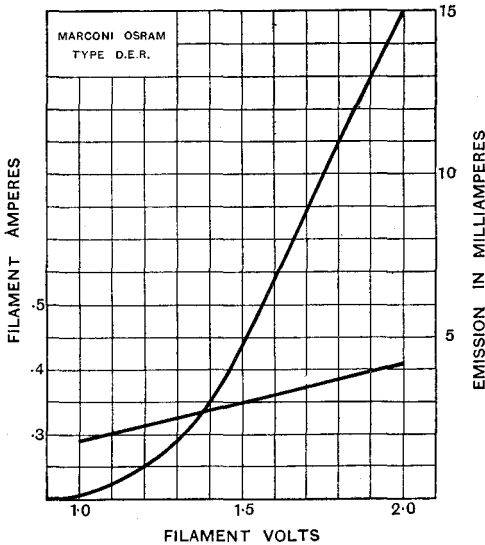


Fig. 1. Showing the relation between filament volts, filament current, and emission of D.E.R. valve.

The D.E.R. was designed to give the same general characteristics as the bright emitting "R" and, bearing in mind the popularity of the latter in the days prior to the advent of the low consumption filament, it is not surprising that the D.E.R. has won equal favour. Judging by the experience of users, its life is extraordinarily long.

The filament is designed to work off one 2-volt accumulator and this voltage should

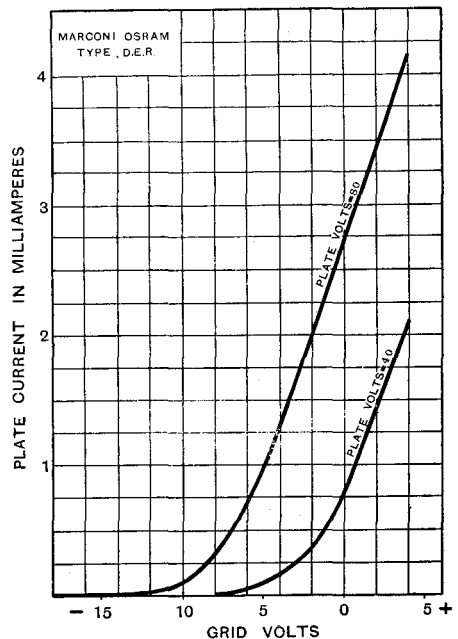


Fig. 2. Grid-voltage plate-current curves of D.E.R. valve.

80. These call for no special comment and are indicative of a good performance as a general purpose valve, showing good slope and ample emission.

From Fig. 3 we find the magnification factor and impedance at normal plate volts (i.e., 45) to be 8 and 25,000 ohms respectively.

The circuit test proved the valve to be excellent for all-round use and a plate potential of 40 gave satisfactory operation when in use as a H.F. amplifier or detector. When used for the latter purpose, however, it is advisable, owing to the shape of the grid current curve, to connect the grid return lead to the + end of the filament battery.

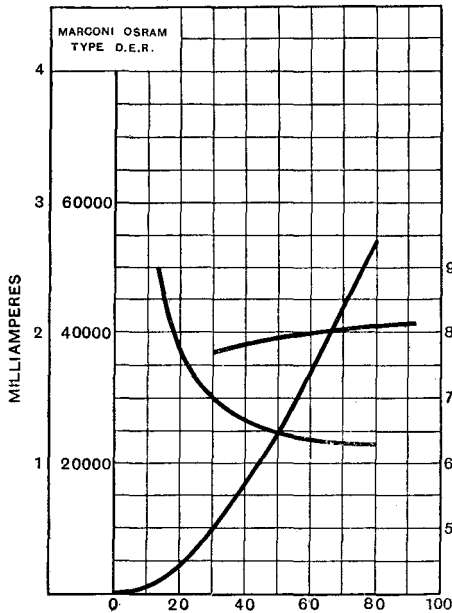


Fig. 3. Curves giving plate current, amplification factor and plate impedance of D.E.R. valve.

In passing it may be mentioned that this method of connection is desirable with most low temperature emitters when they are operating as a detector. For the first stage of a low frequency amplifier 60 to 80 volts H.T. should be employed and under such conditions good service will be given.

For second and subsequent stages of a L.F. amplifier and when desiring efficiently to work a loud speaker, no good general purpose valve can be considered entirely satisfactory. Battery arrangements become

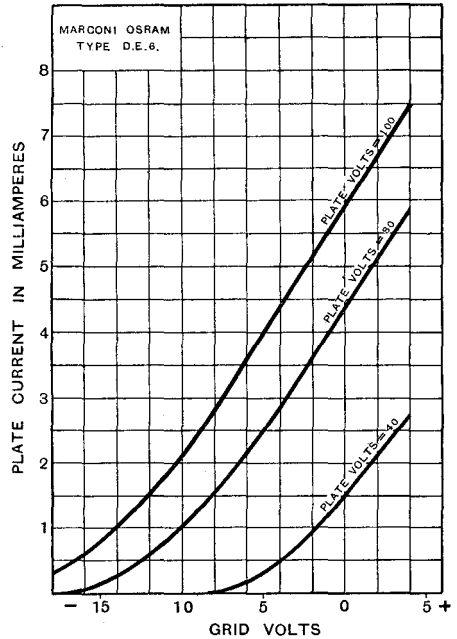


Fig. 4. Grid-voltage plate-current curves of D.E.6 valve.

somewhat awkward when one voltage is used for certain valves in the set and another voltage for the others, as is usually the case when power amplifiers are employed.

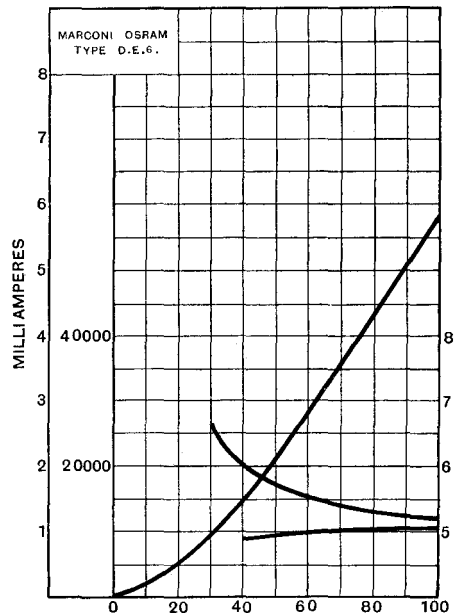


Fig. 5. Curves giving plate current, amplification factor and plate impedance of D.E.6 valve.

For those who use D.E.R. valves for the H.F. and detector the M.O. Valve Company have produced a special loud speaker (small power amplifier) valve to work off the same 2 volts. This is known as the D.E.6 and, since the filament is the same as the D.E.R., Fig. 1 is also typical of the former.

Plate current grid volt curves are shown in Fig. 4, but when making comparisons between these curves and those of Fig. 2, the reader must remember that the plate current scale of Fig. 2 is *double* that of Fig. 4.

Similarly with Fig. 5, the plate current scale is one-half the scale of Fig. 3, but direct

comparisons may be made as far as the magnification and impedance factors are concerned, as the same scale is adopted for both sets of curves.

The circuit test of the D.E.6 was carried out with the valve working as a L.F. amplifier only. With a plate potential of 100 the grid should be given a negative bias of 5 volts, which allows a maximum swing of about 5 grid volts without materially leaving the straight part of the plate current characteristic.

This combination of D.E.R. and D.E.6 is a particularly good and useful one.

PATENTS AND ABSTRACTS.

Improvements in Valve Circuits.

This patent describes methods of arranging valve circuits so that it is not possible for oscillations which may be set up to be communicated to one of the circuits (such as the aerial circuit) connected or coupled to the valve.*

One method may be explained by referring to Fig. 1A, where A is the aerial coil, B a tuned circuit, and X an impedance.

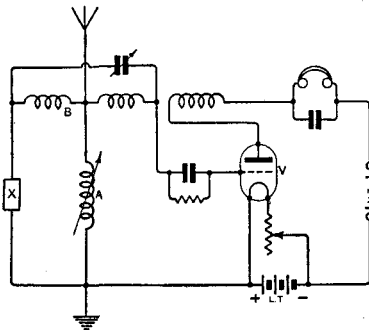


Fig. 1A.

Explaining a bridge arrangement for preventing the setting up of locally generated oscillations in the aerial.

It is supposed that the valve circuits are arranged for the reception of continuous waves, and it is desirable that the local oscillations shall not appear in the aerial circuit. This is effected by dividing the inductance B, so that the portion of the coil in the grid circuit is similar to that which

is connected to the filament through the impedance X. This forms a Wheatstone bridge arrangement, of which the two parts of B are two arms, and the impedance of the grid and that of X the other two arms. Thus, when a balance is obtained, oscillations will not be transmitted to the aerial.

A modified arrangement is shown in Fig. 1B, where the aerial coil A is coupled to coil C, but electrostatically screened from

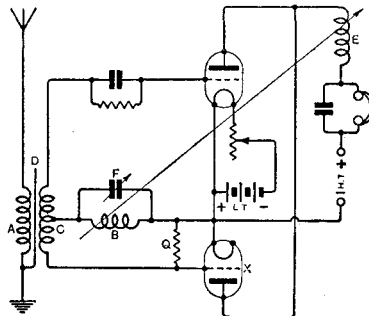


Fig. 1B.

it by the shield D. In this arrangement the impedance X consists of a valve whose filament is of course not heated by the battery.

A Method of Preventing Self-Oscillation Affecting the Aerial.

It is, of course, well-known that a reacting single valve receiver arranged to produce

* British Patent No. 216,589, by P. W. Willans.

supersonic beats may set up oscillations in the aerial unless special arrangements are provided.

An interesting method* of arranging a circuit in order that the aerial shall not be excited by the oscillations set up by the valve may be understood by referring to Fig. 2.

The aerial circuit comprises a variable condenser 1, and the tuning coil 2, and the grid and filament of the valve are connected through a coil 5, across the parallel circuit consisting of condenser 4 and coil 3. A reaction circuit 6 is connected in the usual manner. The aerial circuit is tuned to the wavelength of the incoming oscillations and the oscillating potentials set up across the tuned circuit 3 — 4 are communicated to the valve.

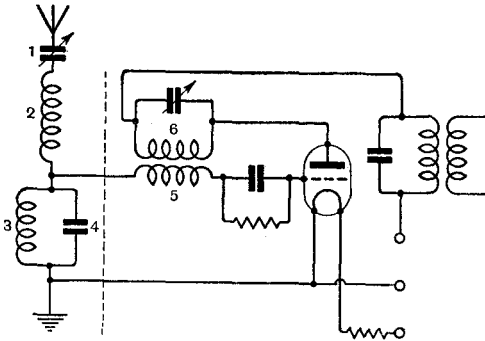


Fig. 2. Showing the connections of a special circuit for preventing the setting up of locally generated oscillation in the aerial.

The capacity of the condenser 4, and the inductance of coil 3 are so chosen that the impedance of this circuit is negligible for the frequency of the self-oscillations of the valve, so that they are not communicated to the aerial. To obtain this condition, the ratio of the capacity of 4 to the inductance of 3, is made very large and the coil carefully designed to have a low resistance.

Renewing Valve Filaments.

One method of replacing the filament of a valve is as follows† :—

The pip of the valve is removed to destroy the vacuum and air is pumped through the

aperture thus formed, while a blow-pipe flame is directed on the sides of the bulb opposite the filament supports. Through the holes thus formed suitable tools are inserted for removing the old filament and preparing the supports for the new filament.

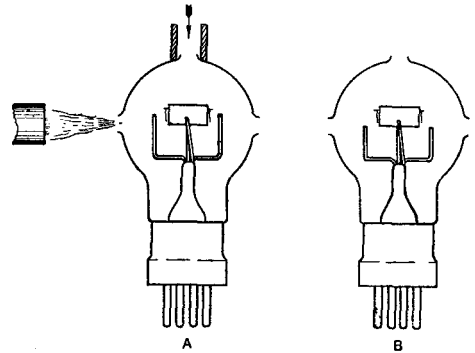


Fig. 3 (A and B). Renewing valve filaments. Showing two stages in the process.

A new filament is then inserted and secured, the holes resealed, the bulb exhausted and finally the bulb is sealed.

The sketches of Fig. 3 will enable the operations to be clearly understood. Fig. 3A shows a valve with an opening at the top of the bulb for the admission of air under pressure, and openings in the side produced by a blow-pipe flame; Fig. 3B shows the valve with the filament supports cut away;

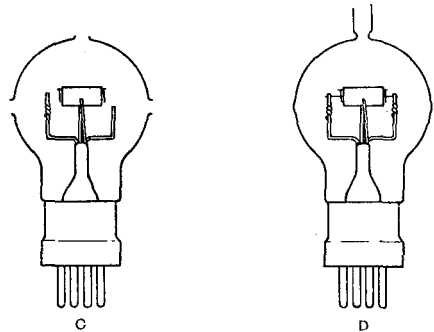


Fig. 3 (C and D). Renewing valve filaments. Showing the third and final stages in the process.

Fig. 3C the valve with an extension piece fitted to one of the filament supports, and Fig. 3D a valve with extension pieces fitted to both supports, a filament attached thereto, the side openings closed and the top opening fitted with an attachment tube for re-exhausting the bulb.

* British Patent, No. 216308, by T. H. Kinman.
† British Patent, No. 215437, by J. M. Longe and P. V. Castell-Evans.

NOTES & CLUB NEWS



Among the projects discussed at the International Esperanto Congress at Vienna, which has just terminated, was the establishment on the Continent of an Esperanto broadcasting station.

* * *
 "World-wide Wireless: Marvels of the New Bean."—*Liverpool Daily Courier*.

More assertive, even, than the onion.

* * *
 The French are not without a sense of humour. We are notified in an official publication that the wireless station, Lorient Pen Mané, with the call sign FUN, maintains continuous watch for *distress* signals.

* * * 5 XX AND THE PARISIANS.

According to our correspondent in Paris, it is not considered unusual there to tune in the Chelmsford station with a galena detector. Indeed, he states 5 XX is heard in Paris with greater purity than the Eiffel Tower.

Farmers in the neighbourhood complain that, owing to the power of the British station, they are unable to make out the meteorological predictions of FL. By way of compensation, however, they enjoy listening to Chelmsford's programmes.

WIRELESS AND LIFEBOATS.

In the new rules made by the Board of Trade relating to life-saving appliances to be carried on board ship, much importance is laid on the necessity of wireless for lifeboat use. The regulations are intended to come into force on July 1st, 1925. All foreign-going passenger steamships carrying more than 15 lifeboats must also be equipped with a motor boat or boats fitted with wireless apparatus and searchlights. If the vessel does not carry a motor boat, and has more than 10 lifeboats, one of these must be fitted with wireless.

AMERICAN AMATEURS ON SHORT WAVELENGTHS.

Some interesting results in Transatlantic reception are reported by Mr. H. E. Williams, of Holyhead.

"No doubt you will be interested," he writes, "to hear that several American amateurs are heard on wavelengths between 30 and 38 metres. The following have been heard between midnight and 1 a.m. (B.S.T.): 1 CQK, 2 ADU, 1 XM, 1 XW and 2 UAV. These stations come in stronger than I have heard them on much higher wavelengths during the winter months."

ANGLO-FRANCO-AMERICAN RADIO CLUB.

Mr. Reginald Gouraud, the American amateur working in Paris, reports excellent progress in the organisation of his Anglo-Franco-American Radio Club.

The new venture is under distinguished patronage, for Mr. Herrick, American Ambassador in Paris, has accepted the position of Hon. President. It is even reported that the Prince of Wales has intimated his willingness to become an honorary member.

Names of well-known social, political and scientific leaders also figure on the membership roll.

VIENNA'S BROADCASTING STATION.

Propos of our reference in our issue of July 30th, to the new "Radio-Hekaphon" broadcasting station in Vienna, we have received some useful information from the Editor of "Radio-Rundschau für Alle." It is pointed out that at present the possibility of this station being heard by British listeners is exceedingly remote, as the power used is only 100 watts. Owned by Czeija, Nissle & Co., Vienna, "Radio-Hekaphon" uses Western Electric apparatus, but at the time of writing is conducting only test transmissions. A definite series of programmes under the direction of "Radioverkehrs A.G." will begin in September, when a 1 kW. Telefunken transmitter will be employed. The wavelength will be about 770 metres.

POZ SHORT WAVE SCHEDULE.

We are indebted to Mr. L. Boedo Tanez, of Brooklands, Cheshire, for the following particulars of short wave transmissions from Nauen, from information supplied to him by the authorities at the station.

Nauen (POZ) conducts regular daily tests with Buenos Aires, on a wavelength of 70 metres, at the following times:—0300 to 0615 and 2100 to 2345 (B.S.T.). Transmissions are generally broken up into periods of a quarter of an hour, *i.e.*, 15 minutes' transmission and 15 minutes' silence.

Reports on these tests will be welcomed by the "Telefunken Gesellschaft für Drahtlose Telegraphie, M.B.H.," Den Hallesches Ufer 12, Berlin, S.W.11.

Our correspondent mentions that he has received the signals at quite uncomfortable strength, using three valves with an indoor aerial.

SLOW MORSE TRANSMISSIONS.

An extremely useful series of signals to those learning Morse is regularly transmitted from GGB, the army station at Aldershot, on 1900 metres.

The transmissions, which take place daily, except on Saturdays and Sundays, occur as follows :

Monday, Wednesday and Friday.

2000-2004 (B.S.T.)	Call up CQ de GGB.
2004-2022	Transmission at six words per minute.
2022-2023	Interval for changing operators.
2023-2041	Transmission at ten words per minute.
2041-2042	Interval.
2042-2100	Transmission at 14 words per minute.

SHORT WAVE RECEPTION FROM FL.

Having been successful in receiving all the short wave signals transmitted from the Eiffel Tower during July, Mr. Vyvyan A. G. Brown, 6 JZ, sends a short summary of the conclusions arrived at.

The signals were sent on four different wavelengths, viz., 115, 75, 50 and 25 metres, and transmissions were of two kinds (1) F where the aerial functions at its natural wavelength, and (2) H where the aerial functions at a harmonic.

Our correspondent noticed particularly (1) Day strength was always less than night strength; (2) The ratio of strength of F to strength of H was inversely proportional to the wavelength, unity being at about 50 metres; (3) Strength greater when there were more atmospherics; (4) Noticeable impurity of wave and a spacing wave present on 50 and 25 metres.

When fading was present it was less on the shorter

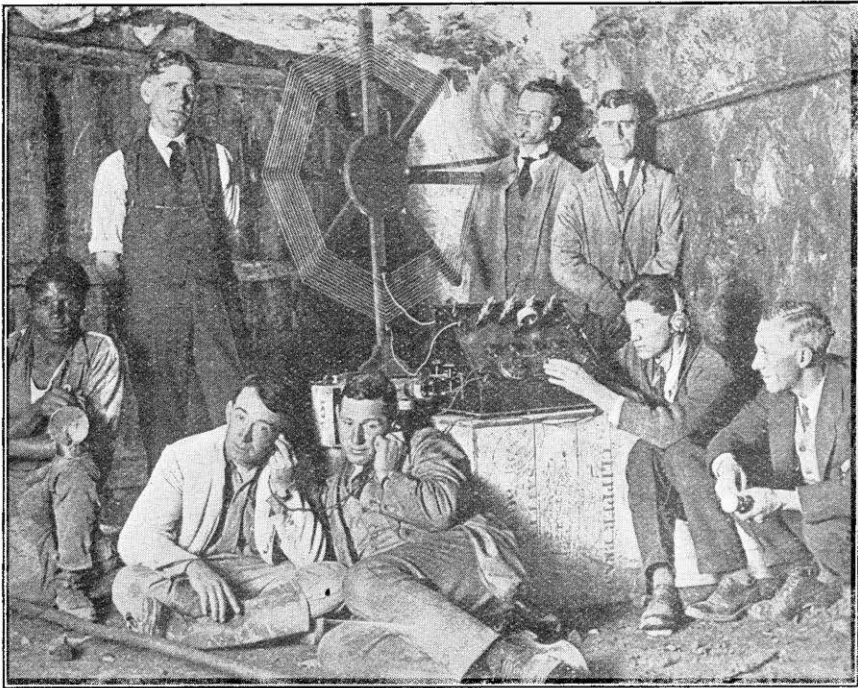


Photo: Topical.

A number of enthusiasts recently tuned in the Johannesburg broadcasting station while in a gold mine. The photo shows the party with their apparatus 400 feet below the surface.

Tuesday and Thursday.

2000-2004 (B.S.T.)	Call up.
2004-2022	Transmissions at 8 words per minute.
2022-2023	Interval.
2023-2041	Transmission at 12 words per minute.
2041-2042	Interval.
2042-2100	Transmission at 16 words per minute.

wavelengths, being absent below 50 metres. It was also noticed that the tendency to fading was more pronounced when atmospherics were prevalent.

WANTED—REPORTS.

Reports on his transmissions are welcomed by M. Ateliers Lemouzy (F 8 EK), of 42 Avenue Philippe-Auguste, Paris, XIe. M. Lemouzy transmits every Wednesday from 9 p.m. to midnight on wavelengths between 80 and 150 metres, using a power of 50 watts.

PARIS RADIO EXHIBITIONS.

The famous "Concours Lepine," at which a number of recent radio inventions will be exhibited, is to take place this year in the Champ de Mars (Paris) during September.

An exhibition, at which the more prominent manufacturers will be represented, is to be held in the Grand Palais from October 22nd to October 31st.

LONG DISTANCE WIRELESS PHOTOGRAPHY.

Death rays having been adequately exploited in France, attention is now being turned to a system of long distance photography by means of electromagnetic waves. The invention of such a device is claimed by Mr. Richard Clegin, formerly known as a boxing manager.

Mr. Clegin reports that he can take pictures at 30 miles distance, from the top of the Eiffel Tower, by the application of a hitherto unknown phase of the high frequency wave scale.

The inventor ridicules the statement of Prof. Wood to the effect that all properties of the spectrum are known to science.

"FIELD DAY" ON THE RIVER.

A new idea for a "Field Day" was carried out at a recent open-air meeting held by the Société Française d'Etudes de la T.S.F., when a special boating trip was organised. While the party sailed down the Seine the club set received and transmitted signals.

Club Activities

Enquiries regarding membership, etc., of the various Societies should be addressed to the Hon. Secretaries concerned. In cases where the name and address of the Hon. Secretary is unknown, letters may be sent via the office of this Journal, whence they will be forwarded.

PREPARING FOR THE WINTER SESSION.

The task of arranging an attractive programme of events for the coming winter session is already being approached by a number of club secretaries.

An excellent list of fixtures has been prepared for the Bournemouth and District Radio and Electrical Society, with the opening meeting on September 4th.

Transmitters in the Manchester district will be interested to know that at the next meeting of the Manchester and District Transmitters' Society, to be held at 7.30 p.m., at the Grand Hotel, Aytoun Street, Piccadilly, on September 2nd, the first of a series of lectures by well-known transmitters will be given. The lecturer on this occasion will be Mr. Gerald B. Marcuse (2 NM), who will speak on "My Tour of American and Canadian Amateur Stations."

The Newcastle Radio Society will open its session on September 1st, when the Annual General Meeting will be held at the Club Room, 5 Charlotte Square.

In spite of the long summer evenings, several clubs have continued to hold highly successful meetings. Among these are the Hackney and Tottenham Societies. At the weekly meeting of the former Society on August 14th, Mr. Bell wired

up some simple circuits on the club experimental panel, and comparative tests were made with two well-known makes of coils. The Society is drawing up a good programme for the winter.

A bumper meeting of the Tottenham Wireless Society is expected on October 1st, the occasion of the second anniversary of the Club. A feature of the proceedings will be the presentation of a cup by the President, Dr. A. M. Low, to Mr. Holness, for the best lecture of the year.

The last meeting of the North Middlesex Wireless Club was devoted to "Doubts and Difficulties." One subject of debate was the circuit best suited to cut out 2 LO, and a Flewelling receiver was suggested. A discussion on the most preferable method of L.F. coupling resulted in a vote in favour of the resistance-capacity method.

On the occasion of the opening session of the Bexhill Radio Society, on Wednesday, August 6th, Mr. J. Denton, A.M.I.E.E., Director of Physics, Morley College, S.E., gave an interesting lecture on "Progress in Wireless Research." The lecturer dealt with the developments of radiant energy research from the time of Michael Faraday, concluding with some informing remarks on the various systems of television.

A NEW SOCIETY.

A well-attended meeting on August 12th saw the formation of the South Croydon and District Radio Society. The opening meeting of the winter session is to be held during September, when it is hoped to arrange an attractive programme, details of which will be published in due course. Applications for membership will be welcomed by the Hon. Secretary, Geo. H. Tozer, 218 Brighton Road, South Croydon.



Wembley (since May 10th).
 2 AG, 2 CA, 2 CC, 2 DF, 2 DQ, 2 DR, 2 EA, 2 FA, 2 JU, 2 KF, 2 MD, 2 MG, 2 OD, 2 PY, 2 RB, 2 RZ, 2 ST, 2 SX, 2 TB, 2 TO, 2 YQ, 2 ZT, 2 ZU, 2 AGT, 2 AIU, 2 AKS, 2 ANY, 2 APE, 2 BCF, 2 XAA, 5 AL, 5 AX, 5 BS, 5 BV, 5 DN, 5 FF, 5 GF, 5 LF, 5 LP, 5 LS, 5 MA, 5 MQ, 5 NW, 5 OX, 5 QV, 5 RF, 5 RZ, 5 SI, 5 SO, 5 TZ, 5 UL, 5 UO, 5 BBC, 6 AL, 6 CS, 6 CT, 6 EC, 6 EX, 6 IH, 6 PE, 6 PI, 6 PZ, 6 QB, 6 QZ, 6 RY, 6 TD, 6 TM, 6 XX, 6 BBC. French: 8 AE, 8 AG, 8 BF, 8 CA, 8 CM, 8 CN, 8 DF, 8 EM, 8 EN, 8 ES, 8 EO, 8 EU, 8 FU, 8 GG, 8 JC, 8 JL, 8 MN, 8 NO, 8 PP, 8 QQ, 8 RO, 8 RV, 8 TV, 8 VW, 8 XY. Dutch: 0 AB, 0 AG, 0 BS, 0 CM, 0 FN, 0 GC, 0 NN, 0 OX, 0 US, 0 XF. Luxembourg: 0 PG. Finnish: 1 NA. Unknown: 8 CA, 1 HT. (o-v-o). (A. L. Carrad.)

Glasgow (May 18th-July 20th).
 British: 2 AG, 2 CC, 2 GO, 2 KF, 2 LZ, 2 MG, 2 NA, 2 NO, 2 TR, 2 WJ, 2 XG, 2 XY, 2 ZU, 2 ARX, 2 ATL, 5 BH, 5 CU, 5 DN, 5 KO, 5 MA, 6 MO, 5 NH, 5 NW, 5 PU, 5 QV, 5 RZ, 5 SI, 5 SZ, 5 UQ, 5 US, 5 VN, 5 WI, 5 WV, 6 AL, 6 CV, 6 FG, 6 LC, 6 NF, 6 OB, 6 TM, 6 UD, 6 XX, 6 ZZ. French: 8 BF, 8 BN, 8 BX, 8 CA, 8 EM, 8 JC, 8 LO, 8 MW, 8 SSU. Dutch: 0 AB, 0 BA, 0 GC, 0 NN, 0 NY. Finland: 1 NA, 2 NM, 3 NB. Various: 7 EC, 1 CF, W, 2, SMZV, SMZZ, ABC, ARRL, X, Z, XR, 8. (o-v-o and i-v-o). (J. G. Ritchie.)

Glasgow (July 3rd to 16th).
 2 AKS, 2 LU, 2 OF, 2 RB, 2 UF, 2 YQ, 2 XP, 5 BE, 5 LF, 5 MA, 5 NW, 5 RB, 5 TG, 5 TZ, 5 UQ, 5 VN, 6 AH, 6 EA, 6 IK, 6 QB, 6 UD, 6 US, 6 ZZ, 8 BV, 8 CA, 8 DI, 8 DP, 8 EE, 8 EM, 8 EN, 8 EU, 8 EX, 8 PA, 0 AB, 0 GC, 1 NA, 1 CF, 7 EC, 7 ZM. *Telephone. (i-v-i receiver). (A. Ballantyne.)

Herne Hill, London S.E.24.
 2 AU, 2 AIU, 2 ARW, 2 CA, 2 FK, 2 FM, 2 FP, 2 HS, 2 KF, 2 KG, 2 KT, 2 KV, 2 LT, 2 OM, 2 PX, 2 PY, 2 QQ, 2 TA, 2 TI,

2 TK, 2 VW, 2 XO, 2 XP, 2 XZ, 2 ZA, 5 AC, 5 BV, 5 DT, 5 FL, 5 HI, 5 LE, 5 LP, 5 OX, 5 UO, 5 XN, 6 NF, 6 GH, 6 RM. (o-v-o.)
(K. C. Wilkinson.)

La Blancat, Gan, B.P., France.

British: 2 AA, 2 ACU, 2 AD, 2 AP, 2 AW, 2 BD, 2 CC, 2 CW, 2 DR, 2 FN, 2 FG, 2 FU, 2 GH, 2 HF, 2 JU, 2 KF, 2 KG, 2 KW, 2 NM, 2 OD, 2 OG, 2 PC, 2 SH, 2 SX, 2 SZ, 2 TA, 2 TO, 2 UF, 2 WA, 2 WJ, 2 XJ, 2 YQ, 2 YT, 2 ZL, 2 ZT, 2 ZU, 5 AW, 5 FD, 5 MO, 5 NN, 5 NW, 5 OC, 5 OV, 5 PU, 5 QV, 5 SL, 5 TG, 5 US, 6 AH, 6 EM, 6 NF, 6 NI, 6 NO, 6 RY, 6 TD, 6 UD, 6 VP, 6 XX. (r valve Reinartz and i L.F.).
(J. L. Ménars, 8 FJ).

West Norwood, S.E.27.

2 CC, 2 FK, 2 IL, 2 KG, 2 LD, 2 OF, 2 OQ, 2 SO, 2 UC, 2 XG, 2 XY, 2 ATI, 2 ARW, 2 BBN, 2 BCF, 5 BBC, 5 BN, 5 FL, 5 LS, 5 NP, 5 JP, 5 TZ, 5 UQ, 5 VN, 5 WL, 5 WM, 6 BBC, 6 GH, 6 IV, 6 JW, 6 OM, 6 RM, 8 BX, 8 CN, 8 EN, 8 ER, 8 EU, 8 EX, 8 LMT, 8 MN, 8 MP, 8 TK, 8 VG, 8 VW, 0 CM, 0 MS, 0 PC, 0 XF, 0 XQ, GB 4, 4 QS, 4 WR, 4 C 2, 1 CF, 1 NA, 2 NM, FN. (o-v-o.)
(L. F. Aldous, 2 ACX.)

Norrviiken, near Stockholm, Sweden.

0 XX, 2 XG, 3 NB, 5 GH, 6 XX, 7 EC, 7 ZM, 8 RO, BCV, SMZV, W 2. (G. Fant, SMZZ.)

Shoreham-by-Sea, Sussex June 15th to 30th).

Morse: 2 AT, 2 ARX, 2 GG, 2 NM, 2 OF, 2 OD, 2 SX, 2 WJ, 2 XAA, 5 BH, 5 BV, 5 DN, 5 MU, 5 NH, 5 NU, 5 TJ, 5 UC, 5 VN, 6 IV, 6 IY, 6 QZ, 6 XJ, 0 AG, 0 BA, 0 FN, 0 MR, 0 NN, 0 QW, 8 EX, 8 BP. Telephony: 2 KF, 2 VS, 2 HF, 6 NF. Receiver (o-v-i).
(A. G. Wood, 5 RZ.)

Stockton-on-Tees.

British: 2 CC, 2 YG, 5 CU, 5 MO, 5 MQ, 5 NH, 5 WL, 6 NF, 6 RY, 6 TD, 6 UD. French: 8 AG, 8 AU, 8 BN, 8 CT, 8 DA, 8 DC, 8 DO, 8 EM, 8 GG, 8 JG, 8 JL, 8 LD, 8 LT, 8 PX, 8 TK, 8 ZM, 8 ZY. Dutch: 0 BA, 0 FN, 0 MR, 0 XF. Rhineland: 1 CF, 8 SSU. Luxembourg: 1 JW. Sweden: SMZV.
(J. W. Pallister, 2 AUH.)

Address Required.

If M. R. Pirotte, of Verviers, France, will kindly forward us his full address, we shall be pleased to insert his list of "Calls Heard."

BROADCASTING.

REGULAR PROGRAMMES ARE BROADCAST FROM THE FOLLOWING EUROPEAN STATIONS:—

GREAT BRITAIN.

GHELSMIFORD 5 XX, 1,600 metres. Tests. **ABERDEEN** 2 BD, 495 metres; **BIRMINGHAM** 5 IT, 475 metres; **GLASGOW** 5 SC, 420 metres; **NEWCASTLE** 5 NO, 400 metres; **BOURNE-MOUTH** 6 BM, 385 metres; **MANCHESTER** 2 ZY, 375 metres; **LONDON** 2 LO, 365 metres; **CARDIFF** 5 WA, 351 metres; **PLYMOUTH** 5 PY (Relay), 335 metres; **EDINBURGH** 2 EH (Relay), 325 metres; **LIVERPOOL** 6 LV (Relay), 318 metres; **SHEFFIELD** 6 FL (Relay), 303 metres **LEEDS-BRADFORD** 2 LS (Relay), 346 and 310 metres. Tuesdays, Thursdays and Fridays, 1.0 p.m. to 2.0 p.m. (2 LO only). Regular daily programmes, 3.0 to 7.30 p.m., 8.0 to 11.30 p.m. Sundays, 3.0 to 5.0 p.m., 8.30 to 10.30 p.m.

FRANCE.

PARIS (Eiffel Tower), FL, 2,600 metres. 7.40 a.m. Weather Forecasts, 11.0 a.m. (Sunday); 10.45 a.m. Cotton Prices; 12 noon, Market Report; 12.15 to 12.30 (Weekdays), Time Signal and Weather Forecast; 3.40 p.m., Financial Reports; 5.30 p.m., Bourse Closing Prices; 6.15 p.m., Concert; 8.0 p.m., Weather Report; 9.0 p.m. (Wednesday and Sunday), Concert; 10.10 p.m., Weather Forecast.

PARIS ("Radio Paris"), SFR, 1,780 metres. 12.30 p.m., Cotton Prices, News; 12.45 p.m., Concert; 1.30 p.m., Exchange Prices; 4.30 p.m., Financial Report; 5.0 p.m., Concert; 8.30 p.m., News and Concert.

PARIS (Ecole Supérieure des Postes et Telegraphes), 450 metres. 3.45 p.m. (Wednesday), Talk on History; 8.0 p.m. (Tuesday), English Lesson; 8.30 p.m., Concert; 9.0 p.m., Relayed Concert or Play.

PARIS (Station du Petit Parisien), 340 metres; 8.30 p.m., Tests.

BELGIUM.

BRUSSELS, BAV, 1,100 metres. At 2.0 p.m. and 6.50 p.m., Meteorological Forecast.

BRUSSELS ("Radio-Belgique"), 265 metres. Weekdays, 5.0 p.m. to 6.0 p.m., and 8.0 p.m. to 10.0 p.m.; Sunday, 5.0 p.m. to 6.0 p.m., and 8.30 p.m. to 10.0 p.m.

HOLLAND.

THE HAGUE, PCGG, 1,070 metres. 4.0 to 6.0 p.m. (Sunday), 9.40 to 11.40 p.m. (Monday and Thursday), Concerts.

THE HAGUE (Heussen Laboratory), PCUU, 1,050 metres. 10.40 to 11.40 a.m. (Sunday), Concert; 9.40 to 10.40 p.m., Concert; 8.45 to 9.0 p.m. (Thursday), Concert.

THE HAGUE (Velthuisen), PCKK, 1,050 metres, 9.40 to 10.40 p.m. (Friday), Concert.

HILVERSUM, 1,050 metres. 9.10 to 11.10 (Sunday), Concert and News.

IJMUIDEN (Middelraad), PCMM, 1,050 metres. Saturday, 9.10 to 10.40 p.m., Concert.

AMSTERDAM, PA 5, 1,050 metres (Irregular), 8.40 to 10.10 p.m., Concert.

AMSTERDAM (Vas Diaz), PCFF, 2,000 metres, 9.0 a.m. and 5.0 p.m., Share Market Report, Exchange Rates and News.

DENMARK.

LYNGBY, OXE, 2,400 metres. 8.30 to 9.45 p.m. (Weekdays), 8.0 to 9.0 (Sunday), Concert.

SWEDEN.

STOCKHOLM (Telegrafverket), 440 metres. Daily, 12.45 to 1.0 p.m., Weather Report and Nauen Time Signal; Monday, Wednesday and Saturday, 8.0 to 9.0 p.m., Concert and News;

Sunday, 11.0 a.m. to 12.30 p.m., Divine Service from St. James Church.

STOCKHOLM (Radiobolaget), 470 metres. Tuesday and Thursday, 8.0 to 9.30 p.m., Concert and News.

GOTHENBURG (Nya Varvet), 700 metres. Wednesday, 7.0 to 8.0 p.m.

BODEN, 2,800 metres. Tuesday and Friday, 6.30 to 7.30 p.m., Sunday, 5.30 to 6.30 p.m., Concert and News.

GERMANY.

BERLIN (Koenigswusterhausen), LP, 680 metres. Sunday, 10.50 to 11.50 a.m., Concert; 2,800 metres, Sunday, 11.50 a.m. to 12.50 p.m., Concert.

EBERSWALDE, 2,930 metres. Daily, 1.0 to 2.0 p.m., Address and Concert; 6.0 to 7.30 p.m., Address and Concert; Thursday and Saturday, 7.20 p.m., Concert.

BERLIN (Vox Haus), 430 metres. 11.0 a.m., Stock Exchange; 1.55 p.m., Time Signals; 5.40 to 7.0 p.m., Concert; 7.0 to 8.0 p.m. (Sunday), Concert.

BRESLAU, 415 metres.

HAMBURG, 392 metres.

STUTTGART, 437 metres.

KONIGSBERG, 460 metres.

FRANKFURT AM MAIN, 467 metres. 7.30 to 10.0 p.m., Tests, Gramophone Records.

LEIPZIG (Mitteldeutsche Rundfunk A.G.), 452 metres.

MUNCHEN (Die Deutsche Stunde in Bayern), 485 metres.

AUSTRIA.

VIENNA (Radio-Hekaphon), 600 metres. Monday and Friday, 8.0 to 8.30 p.m.

CZECHO SLOVAKIA.

PRAGUE, PRG, 1,800 metres. 8.0 a.m., 12.0 a.m., and 4.0 p.m., Meteorological Bulletin and News; 4,500 metres, 10.0 a.m., 3.0 p.m., and 10.0 p.m., Concert.

KBELY (near Prague), 1,150 metres. Weekdays, 7.15 p.m. and 10.0 p.m., Sundays, 11.0 a.m. to 12.0 noon, Concert and News.

BRUNN, 1,800 metres. 10.0 to 11.0 a.m., Concert; 2.30 p.m., News.

SWITZERLAND.

GENEVA 1,100 metres. Weekdays, 1.15 and 8.0 p.m., Concert or Lecture.

LAUSANNE, HB 2, 850 metres. Daily, 9.15 p.m., Concert and Address.

SPAIN.

MADRID, PTT, 400 to 700 metres. 6.0 to 8.0 p.m., Tests.

MADRID (Radio Iberica), 392 metres. Daily (except Thursdays and Sundays), 7.0 to 9.0 p.m. Thursdays and Sundays, 10.0 to 12.0 p.m., Concerts.

MADRID, 1,800 metres. Irregular.

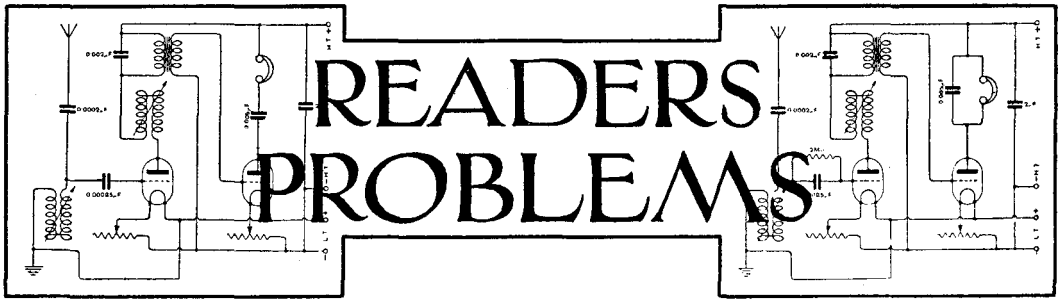
CARTAGENA, EBX, 1,200 metres, 12.0 to 12.30 p.m., 5.0 to 5.30 p.m., Lectures and Concerts.

PORTUGAL.

LISBON (Aero Lisboa), 370 to 400 metres. Wednesdays and Fridays, 9.30 to 12.0 p.m., Irregular Tests.

ITALY.

ROME, ICD, 3,200 metres. Weekdays, 12.0 a.m. 1,800 metres, 4.0 p.m. and 8.30 p.m., Tests, Gramophone Records.



Readers desiring to consult the "Wireless World" Information Dept. should make use of the coupon to be found in the advertisement section.

SWITCHING L.F. VALVES.

A REQUEST from a reader for a modification of the four-valve circuit given on page 499 of the issue of this journal for July 23rd, 1924, raises the question of the best method of switching the L.F. amplifying valves in a multi-valve receiver. For this purpose a double pole, double throw change-over switch has generally been used in conjunction with each valve in the L.F. amplifier, one set of contacts being used to control the filament current and the other set to connect the telephones

a special rectifying valve is used requiring a normal plate voltage for rectification as high as that of the amplifying valves, loss of efficiency and distortion will result.

Separate H.T.appings should therefore be provided for each valve if the best results are to be obtained from the receiver. The use of separate tappings with double pole switches would result in the detector valve receiving the H.T. voltage intended for the last L.F. valve when all the amplifying valves were switched off. In order to

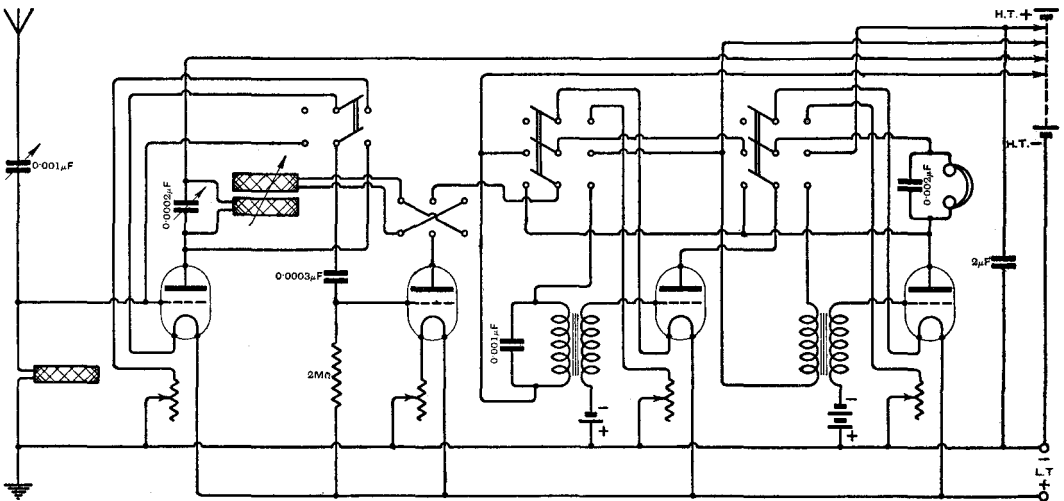


Fig. 1.

with the plate of the appropriate valve. The disadvantage of this scheme is that the detector valve must be supplied with the same H.T. voltage as the amplifying valves. In fixing the value of this voltage a compromise has to be effected between the best voltage for rectification and the best voltage for amplification, so that unless

overcome this difficulty, three pole switches should be connected in the manner indicated in Fig. 1. The additional set of contacts on each switch adjusts the H.T. supply so that the voltage applied to each valve remains constant and is independent of the number of note magnifiers in circuit. The same object can be achieved by the use of telephone

plugs and jacks but the change-over switch method is given here for the benefit of those who prefer it.

In the switching of the H.F. valve the H.T. supply does not present any difficulty and a double pole switch may be employed. It should be noted that a reaction reversing switch has been introduced, since the direction of reaction is reversed whenever the H.F. valve is switched in or out of circuit.

in the case of the water pipe. There would be a risk of bursting a leaden pipe, and even if the pipe were of iron it would be necessary to arrange to run out the water in order to obtain sufficient heat to make a proper joint.

Undoubtedly the best method is to use one of the many earthing clips at present on the market. The earthing clip manufactured by Messrs. Burndeft, Ltd., is very satisfactory, as the clamping screw is provided with a special tip which ensures

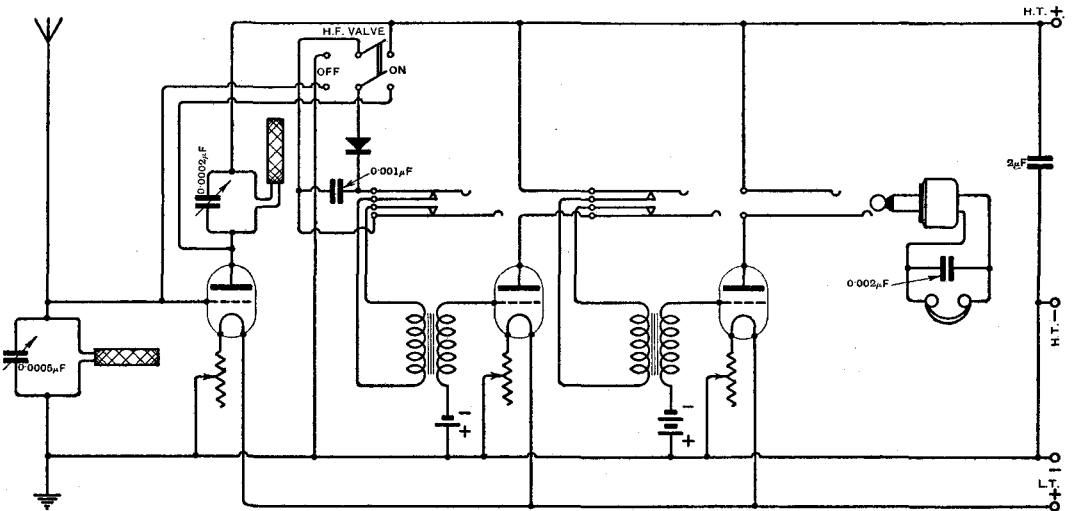


Fig. 2.

A THREE-VALVE RECTIFIER WITH CRYSTAL RECTIFICATION.

THE diagram in Fig. 2 shows the method of connecting a receiver so that the crystal detector may be used with or without the addition of amplifying valves. The first valve operates as a high frequency amplifier and the second and third valves amplify the rectified output from the crystal detector. The H.F. valve is brought into operation by means of a double pole change-over switch, while the L.F. valves are controlled by telephone plugs and jacks. The filament current to valves not in use should be switched off by means of the appropriate filament resistances.

WATER PIPE EARTH CONNECTION.

ONE of the best earth connections which it is possible to make is to a water pipe buried in the ground and running underneath the aerial for a certain distance. A reader who intends to make an earth connection of this type has written asking what is the best method of making sound electrical contact to the pipe.

Soldering the wire directly to the pipe is, of course, out of the question. To make a satisfactory soldered joint, both pieces of metal to be joined must be raised to a temperature approximating to that of the melting point of the solder. Obviously, this cannot be done without considerable difficulty

a firm biting contact with the pipe. The pipe must be thoroughly cleaned with a smooth file or coarse emery cloth before the clip is put on, and the earth wire should, if possible, be soldered to the earthing clip. After the clip has been tightened up, the whole joint should receive a coating of tar before filling in the earth.

LOSS OF EMISSION IN DULL-EMITTER VALVES.

A READER writes to say that one of the dull-emitter valves used as a note magnifier in his receiver will not function properly unless 1.5 volts is applied to the filament, whereas originally the voltage of 1.1 specified by the makers was quite satisfactory. He asks if the valve would recover if used for some time as a detector.

It often happens that the filament of a dull-emitter valve is rendered inactive by a temporary increase in the filament current above its normal value. At a high temperature the evaporation of the thorium or other active material from the surface of the filament is greater than the rate of diffusion from the interior of the filament to the surface. The remedy is to run the valve for about half-an-hour with the normal filament voltage specified by the makers and with the H.T. battery disconnected.