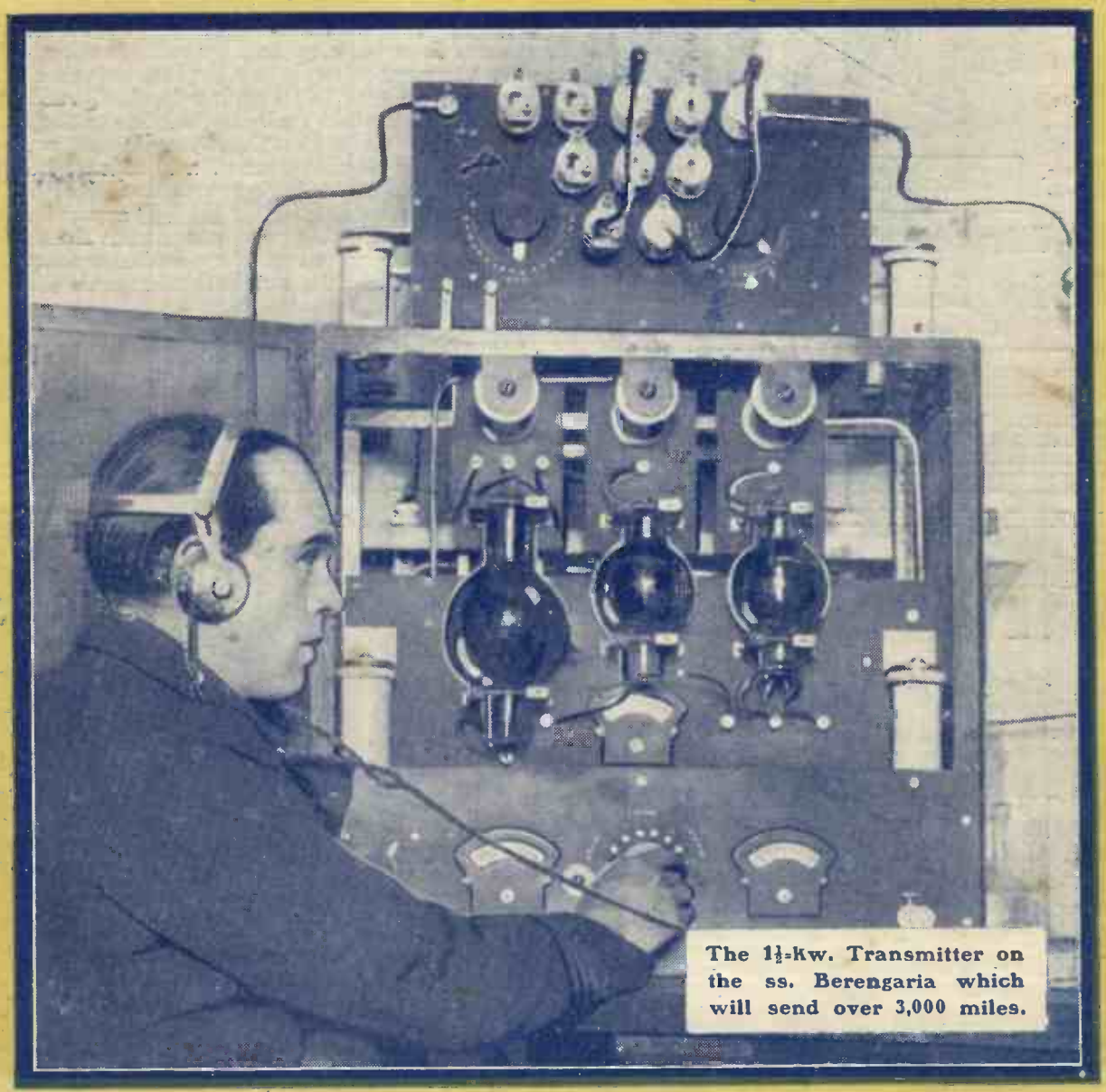
POPULAR WIRELESS WEEKLY, APRIL 14th, 1923. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

DISTORTING INFLUENCES IN WIRELESS.

Popular Wireless

No. 46. Vol. III. PRICE THREEPENCE WEEKLY. April 14th, 1923.



The 1½-kw. Transmitter on the ss. Berengaria which will send over 3,000 miles.

FEATURES IN THIS ISSUE.

A New Use for Fountain Pens.
History of Wireless Transmission.
Making Plugs and Jacks.
The Telegraphone.
A Unit Receiver.
Ether and Ether Waves.
Constructional Hints on Loud Speakers.
A Novel Tuning Device.

POPULAR WIRELESS

April 14th, 1923. SCIENTIFIC ADVISER, SIR OLIVER LODGE, F.R.S., D.Sc. [Every Friday

TOPICAL NOTES AND NEWS.

A First Night.

I HEAR that on April 16th, Act 2 of "Battling Butler" will be broadcast from 2 L O. The other evening the B.B.C. broadcast for the first time in history a "first night" performance, "Marriage by Instalments." The only drawback was the fact that we had the play, also, in instalments, but that's only a pathetic attempt to try to be funny. Seriously, though, the transmission was O.K. Let's have some more of a like ilk.

* * *

New Musical Director.

I HEAR that Mr. Stanton Jefferies has been appointed musical director of the B.B.C., and that in future he will be in charge of the musical items of all the B.B.C. stations. This does not mean, however, that provincial stations will not be allowed to exercise their own ideas in arranging the musical part of the programme. Mr. Jefferies is out to encourage initiative all he can, and I wish him the best of luck.

* * *

An Uncontrollable Factor.

A SCHEME has been evolved for the employment of the broadcasting stations at certain hours during the day for communicating with the moving motor vehicles belonging to the larger road transport companies. It is suggested that arrangements should be made with the Post Office so that telegrams addressed to motor vehicles could be handed in at any post-office and forwarded to the most convenient broadcasting station. On paper, the idea might seem quite workable, but there is one uncontrollable factor to be dealt with, and this is the time factor in the transmission of land line messages. Electricity might travel many thousands of miles per second, but I somehow am inclined to think that a motor vehicle—even a ten-ton lorry—would reach its destination before any special telegram. Anyway, neither the B.B.C. nor P.O. have yet been approached with regard to this scheme.

* * *

Centralising Broadcast Programmes.

NOT many listeners-in in the Manchester area are aware of the fact that at times they are listening to the London and Birmingham broadcasting stations' concerts which are received on a special receiving aerial and re-transmitted by the Manchester station. The success of such experiments, which have been conducted several times, indicates that there are great possibilities of the practicability of such a scheme whereby only one broadcasting station—say, at Birmingham—would be necessary, the other stations acting merely as relays. Thus the B.B.C. would be able to concentrate on such a centralised programme, and the best of the leading artists could be engaged. I need hardly dwell on the advantages of such an arrangement, as they are more than obvious.

* * *

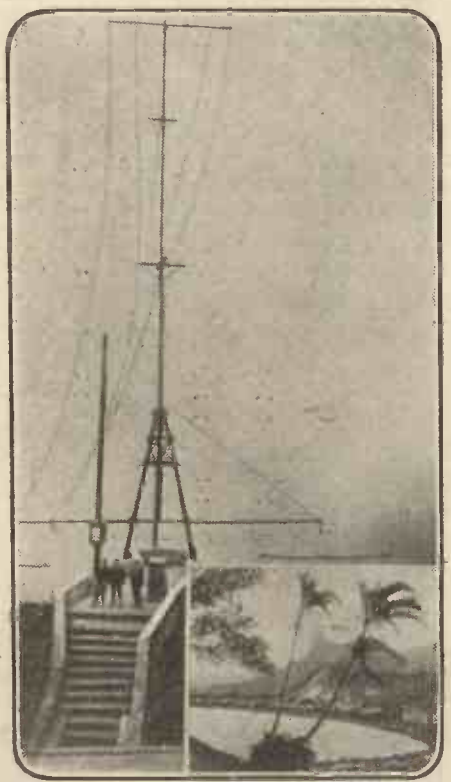
The Children's Hour.

I AM glad to learn from Captain Eckersley, who is now in charge of the children's hour from all the broadcasting stations, that he intends to thoroughly reorganise this part of the evening programmes. I understand that both the tiny tots and the older kiddies will be catered for, and that the items will be more varied in nature. The material for these will be distributed to the various stations in advance.

* * *

Controlling a Battleship.

THE possibilities of wireless control in naval warfare were strikingly shown in recent manœuvres of the United States fleet. The battleship Iowa, steaming full-speed without a soul on board, was made to simulate an enemy vessel attempting to escape the fire of the battleship Mississippi. The Iowa was steered by radio from the shore several thousand yards away, and was at all times perfectly under control.



This is the highest broadcasting station in the world, being 2,175 feet above Boteford Bay Station, which is now operated as a feature of the Brazilian Centennial by the Westinghouse Electric International Company, which broadcasts Grand Opera direct from Rio de Janeiro.

* * *

America's Silent Nights.

"SILENT NIGHTS," inaugurated in Chicago, when local wireless broadcasting stations forego the presentation of programmes, have resulted in many feats of long-distance reception.

A plan whereby "silent nights" would be adopted by broadcasting stations throughout America is being discussed. Under this plan stations in a certain district would not broadcast on Monday night, another district would not send on Tuesday night, and so on throughout the week. In this way the entire country would have a silent night once a week.

* * *

Aerials Across Streets.

FOUR applications were received by Newcastle Corporation Town Improvement Committee for permission to allow wireless aerials to cross public streets in different parts of the city, but they were all refused on the ground that, should the wires break, they might be a source of danger to the public.

* * *

Warning to Motorists.

THERE seems to be quite an epidemic of petty pilfering by people obviously wireless enthusiasts. Receivers and wire have disappeared in alarming quantities from public telephone call-boxes, and a motorist dare not leave an inch of copper wire exposed when he leaves his car momentarily unattended. I, personally, witnessed the lamentations of a holiday motor-cycle tourist who was stranded in a lonely Devonshire village with his motor-bike, minus all its H.T. cable and rear and headlight wiring, and this occurred during just a few moments' call at the village inn. Unfortunately, I could not help him, except with six inches of H.T. cable, by shortening my own. I left him stringing hairpins together and insulating the resultant "cable" with valve rubber, spare tyre patches, and perfectly good three-halfpenny stamps.

* * *

P.M.G. and "Home-made" Sets

POSSIBLY, by the time these words are read, Sir William Joynson-Hicks, the Postmaster-General, will have announced his decision in regard to that problem of the hour, the question of the home-made set. The other day he received a deputation representing 4,000 manufacturers of wireless apparatus.

(*Continued on next page.*)

NOTES AND NEWS.

(*Continued from previous page.*)

The Shysters.

AS a Business Nation—are we narrow-minded? Upon my soul, I am almost inclined to believe so when I hear all this talk about broadcasting doing the theatres harm. Where is the imagination of our theatrical magnates? Are they so despondent about the quality of shows they put on that they don't like the idea of them being broadcast? Read the following, which I clipped from the "Daily Mail" the other day:

"Opera companies and theatres give broadcasters every facility, as they also have profited immensely from the publicity accorded their performances by radio. The Manhattan Opera House (New York City), for instance, was playing to half-filled houses until the management permitted one of the large stations to broadcast 'Tristan and Isolde.' The very next evening the house was filled by owners of receiving sets and their friends."

* * *

Over There and——

IT is estimated that the "invisible audiences" of the United States number 20,000,000. Throughout the country more than 600 broadcasting stations are in operation. The authorities have licensed 25,000 owners of sending sets. The owners of receiving sets require no licence as in Great Britain; but it is known that they exceed in numbers the 14,000,000 people who subscribe to the telephone or 12,000,000 who possess motor-cars or lorries.—"Daily Mail."

* * *

Over Here.

ALTHOUGH it is estimated that there are about 200,000 listening-in sets in use in the country, less than half of these are licensed. If these figures are correct, the first year's loss to the Broadcasting Company is more than £60,000 and to the Government £25,000.—"Daily Mail."

* * *

Another Stunt.

THE "Daily Express" had a loud shout the other day about the Broadcasting monopoly. This paper wants the P.M.G. to select "ten firms of repute," etc., to run broadcasting, and offers to do the trick itself for nothing. If the latter suggestion was adopted, the "D. E." would simply be cutting its own throat as regards a monopoly. As for the poor news bulletin, the daily press are to blame for that. Their objections to a full broadcasting news service are well known.

The attitude of POPULAR WIRELESS in this attack on the B.B.C. is given on the Club Reports page.

* * *

Great Tenor at 2 L O.

ONE of the most enjoyable items that I have yet listened-in to was the recent broadcasting from the London station by Mr. Mischa-Leon, the great operatic tenor who has just returned from Prague. A wonderful voice most wonderfully suitable for wireless transmission was the opinion of everyone who listened-in on this occasion.

Marconi's Cruise.

SENATORE MARCONI will have probably set sail on his yacht Elettra for an extended cruise by the time these words are read. He intends carrying out a series of experiments connected with the problems of interference, and will doubtless have some interesting results to show when he returns.

* * *

Various Items.

DURING the concert at the Albert Hall to-morrow, Saturday, Madame Lily Payling will visit the London Station, broadcast a song which will be reproduced at the Albert Hall by means of loud speakers, and then return to conclude the concert in person.

* * *

The Yorkshire and District Electric Lamp Repairing Co., Ltd., ask me to point out that they are the actual repairers of broken valves. Their agents are Messrs. G. W. I., Ltd.

* * *

Will the amateur who wrote to the Editor saying he had heard V T C (Basra) on a crystal set come and have lunch with me one day. I do admire imagination.

To Assist Progress.

WITH a view to exploring the possibilities of developing wireless telephony over long distances, the Postmaster-General has appointed a Committee "to consider in the light of recent progress in wireless science the possibility from a technical standpoint of transatlantic wireless telephony of sufficient reliability for commercial use, and to advise what practical steps, if any, can at present be taken to develop this means of communication." The Committee will be constituted as follows:—

ADMIRAL of the FLEET SIR HENRY JACKSON, G.C.B., K.C.V.O., R.N. (chairman); MAJOR-GENERAL SIR F. H. SYKES, G.B.E., K.C.B., C.M.G., M.P.; Mr. R. A. DALZELL, C.B.E., Director of Telegraphs and Telephones, General Post Office; PROFESSOR W. H. ECCLES, D.Sc., F.R.S.; Mr. F. GILL, O.B.E., president of the Institution of Electrical Engineers; Mr. E. H. SHAUGHNESSY, O.B.E., Engineer-in-Chief's Department, General Post Office; with MAJOR A. G. LEE, M.C., of the Engineer-in-Chief's Department, as secretary.

ARIEL.

Broadcasting Programmes

What you can hear every evening of the week on your set.

TELEPHONY AND MUSIC TRANSMISSIONS

Station.	Call sign.	Wave-length in metres.	Remarks.
London Broadcasting Station, Strand ..	2 L O ..	369 ..	11.30 to 12.30 every morning and usually every evening, 5 to 5.45 p.m.; 7 and 9.30, News; 7.15, Orchestra; 8.25 to 10.30, Music. Sundays from 8.30 p.m.
Newcastle Broadcasting Station	5 N O ..	400 ..	As a rule from 7 to 10 p.m.
Manchester Broadcasting Station	2 Z Y ..	385 ..	Every evening usually from 4.30 to 10 p.m.
Birmingham (Witton) Broadcasting Station	5 I T ..	425 ..	Every evening usually from 6.30 to 10 p.m. (News, Concerts, etc.).
Glasgow Broadcasting Station	5 S C ..	415 ..	5 to 10 p.m.
Cardiff Broadcasting Station	5 W A ..	353 ..	5 to 10.30 p.m.
Croydon	G E D ..	900 ..	Throughout day to aeroplanes
Paris	F L ..	2,600 ..	11.15 a.m., Weather Report; 6.20 to 7 p.m., Weather Report and Concert; 10.10, Concert.
Königswusterhausen ..	L P ..	2,800 ..	4 to 6.30 p.m.
The Hague	P C G G ..	1,085 ..	Sundays, 3 to 5 p.m. (Concert).
Haren	O P V H ..	1,100 ..	12 noon and 4.50 p.m. Telephony.
Radio-Electrique, Paris	—— ..	1,565 ..	5.5 p.m., News Items; 5.15 to 6.10, Concert; 8.45 p.m., News Items; 9 to 10 p.m., Concert.
School of Posts and Telegraphs Paris ..	—— ..	450 ..	Every Tuesday and Thursday, 7.45 to 10 p.m. Saturdays, 4.30 to 7.30 p.m.

Note.—See announcements in daily Press for last minute alterations in times of Broadcasting Programmes. No Broadcasting during hours of public worship on Sundays.

NOTE.—The Bar Lightship, Liverpool, sends telephony at 7 a.m., 9 a.m., 11a.m., 12 noon, 1 p.m., and every two hours until 9 p.m. Calls "Dock Office" Liverpool answers "Bar Ship."

In addition to the regular transmissions carried on between the British amateur stations, much telephone conversation may be heard from St. Inglevert (A M), Le Bourget (Z M), and Brussels (B A V). These stations are quite powerful, but they call for a little extra care in tuning. Wave-length, 900 metres.

All times given at G.M.T.

SOME DISTORTING INFLUENCES IN RADIO-BROADCASTING.

By Dr. N. W. McLACHLAN, M.I.E.E. (of the Marconi Research Works, Chelmsford).

Each week I hope to publish special articles for the advanced amateur and experimenter. Further articles by Sir Oliver Lodge, and contributions by Major-General Squier, Dr. Lee de Forest, and others, will shortly appear.—THE EDITOR.

THE object to be attained in the complete system of a broadcasting transmitter and receiver is a linear control. That is to say, if the musical sounds have a certain wave-form before broadcasting, the sounds issuing from the reproducing device at the receiver should have the same wave-form, but, in general, a different amplitude. Owing to the fact that the currents in the various parts of the system depend upon the frequency, the intensity of a sound in the receiver will vary according to its pitch, although in the concert-room all the notes sound equally loud. This means that if a curve is plotted showing the relation between frequency and output intensity for equal input intensity, it will take such a form that it will be evident that both the higher and lower musical tones are reduced considerably in comparison with those in the middle register.

Action of Diaphragms.

In speech and in music, it is the upper tones which determine the interpretation of the sounds, and are responsible for their discriminating properties. Thus a system whose complete characteristic is akin to that shown by such a curve will give distortion, and the sounds will be muffled owing to the dearth of higher harmonics.

Telephonic systems can be severely tested when reproducing the jingling of coins, the high notes of a violin or piano, the high hiss of the sibilants, drums and the clapping of hands. Some good test words are, "sink," "ships," "five," "thrive," "invaluable," "Mississippi," "thistle."

We will now indicate briefly the chief causes of this effect of selectivity. The first instrument in which this occurs is the microphone, and it is a property peculiar to all vibrating systems. In a microphone the vibrating member is usually a circular diaphragm. When reproducing the piano, the action on the diaphragm is a percussive or impulsive one, and in addition to reproducing particular pianoforte notes, the diaphragm superimposes a vibration of its own. The frequency of this vibration depends upon the diameter, thickness, and material of the diaphragm, and is known as the resonant or free note of the diaphragm. For example, in a telephone receiver, this resonant point occurs at about 800 cycles per second.

Superimposed Frequencies.

Usually iron-cored transformers are employed between the microphone and transmitter to step up the voltage of the microphonic currents. The windings of these transformers have both inductance and capacity, and will exhibit the same phenomenon of resonance as a telephone diaphragm at a certain frequency. This will again introduce the problem of selectivity, and, in order to obtain approximately uniform transforming action over the audio-frequency range, a damping or high-resistance rod should be connected across high-inductance windings.

In the transmitter itself, the main oscillator is usually coupled to the aerial, and it is well known that since any wireless circuit can be tuned, it exhibits the phenomenon of resonance to which we have just alluded. Now, when the carrier wave is modulated by the currents induced in the microphone system, there are two additional high-frequency oscillations created for each audio-frequency component of the sound. If the carrier wave has a frequency of 750,000 cycles per second, and one of the audio components has a frequency of 10,000 cycles, the frequencies of the two additional vibrations will be $750{,}000 - 10{,}000$ and $750{,}000 + 10{,}000$. There are thus three high-frequency oscillations associated with each tone in a musical sound. If the tuning of the transmitter is very sharp, there will be a reduction in the intensities of the two side frequencies, and the degree of reduction will increase with increase in the frequency of the musical sound. The ideal selectivity curve of the transmitter will clearly cause no reduction in intensity; that is, the musical scale will be uniform. The selectivity or resonance curve should, therefore, have a flat top over the range 740,000 to 760,000—that is, a compass of 20,000 cycles.

Distortion due to Rectification.

In the receiver there is also a series of tuned circuits, and these circuits should, therefore, not be too selective. Much has been written on the subject of reaction, and we are now in a position to examine why it causes distortion in radio-telephony. The chief object of using reaction is to receive signals with the least number of valves. When reaction is not employed, more valves are required, owing to the comparatively large resistance of the receiving circuit. The effect of reaction is to reduce the resistance and therefore the damping of the receiving circuit, so that currents due to the feeble influence of the electromotive forces in the aerial are comparatively large. When the resistance of an oscillatory circuit is reduced considerably, as is the case when reaction is employed in a high degree, the resonance or selectivity curve of the circuit becomes very peaked, and the top of the curve is far from being flat. Bearing in mind that we ought to be able to receive equally well a band of frequencies from 740,000 to 760,000, it is clear that with a highly selective circuit this is impossible, and the higher audio frequencies in speech and music which are responsible for their interpretational qualities are reduced to such an extent that the sound is muffled and hollow.

In all receivers there is incorporated a rectifier. Let us see what distortion may arise from the operation of rectification. We have already shown that a musical sound in radio-telephony consists of a very large number of high-frequency vibrations on each side of the carrier wave. During rectification, the heterodyning effect which takes place between these frequencies themselves, and between them and the carrier wave, creates, in addition to the original musical frequencies, a whole host of others. These others represent double the frequencies of the components of the musical sounds and their sums and differences. The proportion of these alien frequencies to those from which they are produced depends upon the degree of control applied to the oscillation valves of the transmitter—*i.e.*, the depth of modulation. If this exceeds a certain amount, the sounds produced in the telephones or loud speaker are particularly distressing.

Moderation of Signal Intensity.

Passing from the rectifier to the speech magnifiers, there may be distortion caused by iron-cored transformers due to resonance effects in the windings, but the remedy for this disease has already been cited. A further source of distortion may be due to the use of unsuitable valves, and the variation of voltage on the grid of the valve may be such that it reaches its rectification and saturation boundaries. A valve should always be worked on the sensibly straight portion of its characteristic curve. Valves used for speech amplifiers should, therefore, be capable of dealing with a comparatively large voltage variation on the grid without rectifying or saturating.

In either H.F. or L.F. amplifying valves it is eminently desirable to avoid a current from the grid to the filament during operation. When this occurs, the valve acts partially as a rectifier, and the wave form of the incoming oscillations is altered. To obviate "grid current," as it is termed, the H.T. voltage should be increased, and a suitable negative potential applied to the grid of the valve.

The final source of distortion to which we will refer is inherent in the telephones or loud speaker. In treating microphones and tuned circuits, we have already shown that the response or amplitude of the vibration depends upon the frequency. This is also the case in all the usual forms of telephones and loud speaker. With almost all varieties of loud speaker, the best quality is obtained when the intensity is moderate. When the sounds are very loud, the effect is to introduce in the loud speaker, owing to the large movement of the vibrating system, tones which are not present in the incoming radiation.

Regarding Linear Control.

In a loud speaker there are other sources of distortion due to the horn and to the influence of the room where the reproducer is situated. In conclusion, considering the question of distortionless reproduction, *i.e.*, linear control, it is essential to distort the input at the transmitter in such a manner that the selective influences which operate throughout the complete system apply the necessary degree of correction. At the moment there is no system which will give perfect linear control—*i.e.*, there is no perfect system—but the timbre in the telephone or loud speaker, although somewhat different to that at the input, can be made comparatively pleasing, and the pleasure is enhanced if the issuing music is taken at its absolute value, and the hearer is not absorbed in making mental comparisons between it and the original.

A NEW USE FOR FOUNTAIN PENS.

If you have any old parts of fountain pens, this article will tell you how they can be made to serve several useful purposes in your wireless set.

ONE can nearly always find an old decrepit fountain-pen "knocking around" at home, and it can be used for many pieces of wireless apparatus, where insulation is required, fountain-pens being made of a highly insulating material. Here are a few suggestions.

An excellent lead-in tube may be constructed from the barrel of a fountain-pen,

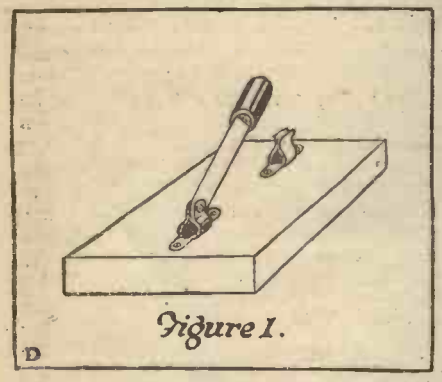


Figure 1.

when the closed end has been either cut off or drilled through.

Switch Handles.

Fig. 1 shows a simple home-made knife switch, the handle of which is the cap of a fountain-pen. The method employed to fix on the handle is to make a plug of soft wood to fit inside the cap; then split the

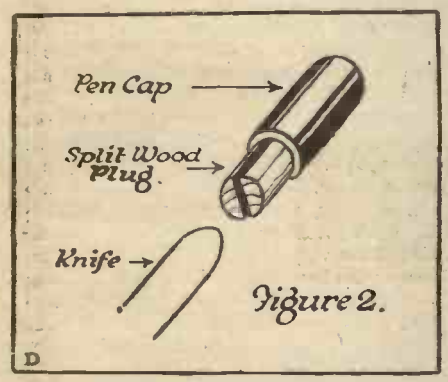


Figure 2.

plug of wood longitudinally and push in the knife of the switch between the two halves of the plug. Fig. 2 shows the way this is done, quite clearly. If necessary, shellac or seccotine can be used to keep the plug firmly fixed.

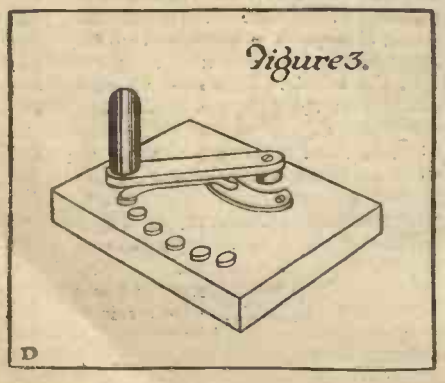


Figure 3.

Fig. 3 shows a stud switch, of the simple form described in No. 12 of POPULAR WIRELESS. The base is of ebonite, and so the arm may be of hard wood. The handle of this is a fountain-pen cap, plugged with soft wood, and is fixed to the arm by a slender brass screw passing up through the arm and into the plugged cap. The screw expands the wooden plug slightly, and in consequence, the pen cap is gripped perfectly rigidly in its place. The whole of the construction of this switch may be clearly seen from Figs. 3 and 4.

Contact Sliders.

Fig. 5 shows a fountain-pen cap made into a contact slider for a cylindrical inductance coil or resistance. For this a good fat solid fountain-pen cap is necessary, with a

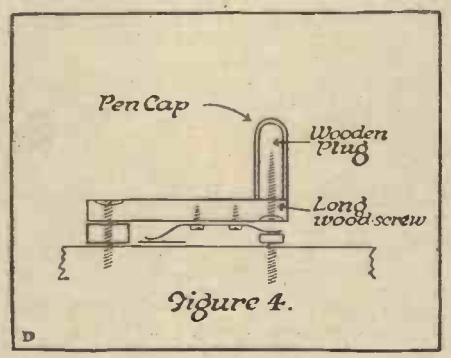


Figure 4.

diameter of not less than ½ inch, if the slider rod to be employed is of a ¼ inch square section. If a large-enough cap is unprocurable, a thinner rod may be employed, say $\frac{3}{16}$ inch square section. The square hole through which the rod passes is made by drilling two holes in the pen cap directly opposite each other; then gradually widening them with a file into the requisite square shape. The plunger is a piece of circular brass rod of suitable size to slide easily within the pen cap, the end with which contact is to be made being fashioned slightly convex.

The assembly is shown sectionally in Fig. 6. The plunger makes contact with

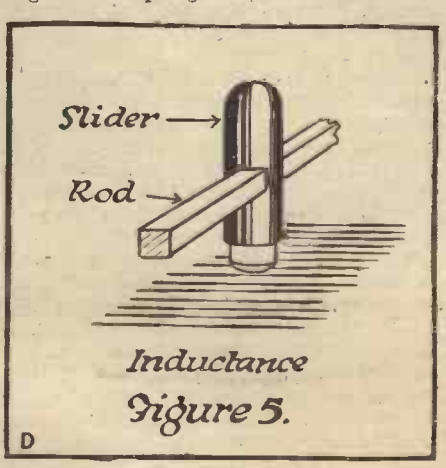


Figure 5.

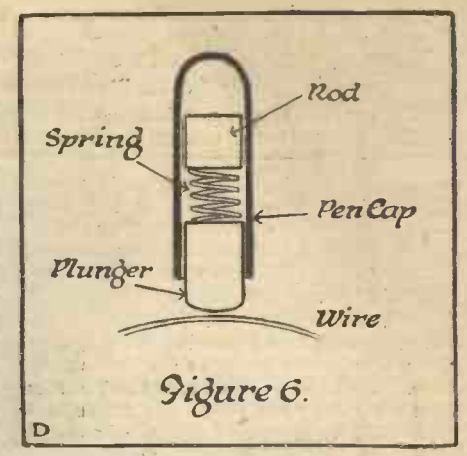


Figure 6.

the wire on the inductance; the plunger is kept pressed on to the wire by a strong spring, which makes contact with the plunger and the rod going through the slider. No fixed dimensions are given, these being determined by the amateur to suit his own apparatus or fancy. This remark also applies to the other apparatus here described.

Extended Controls.

Fig. 7 shows a very effective and easily made extension handle, for the accurate control of condensers, slab-coil inductances used in holders, etc. The drawing is self explanatory and needs no further comment.

In manipulating the vulcanite, a sharp knife or a file may be used for trimming, and a hack-saw for cutting. Great care is necessary, as the vulcanite is very liable to crack.

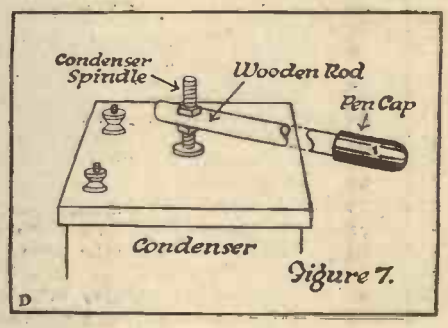


Figure 7.

Writing for "P.W."

If you contemplate writing articles for "Popular Wireless," make sure that your themes are bright, generally useful, and as original as possible.

Short constructional articles and details of interesting experiments are well paid for if accepted for publication; good, clear photos, the larger the better, are also welcome, and will be paid for at the rate of 10s. 6d. if published in "Popular Wireless."

Diagrams accompanying articles may be drawn in rough in pencil; our draughtsman will do the rest.

If articles are not typed, only ONE SIDE of the paper used should be written on.

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ONCE you have installed a GECoPHONE in your home, dullness and ennui will disappear.

This supreme achievement in Wireless will unfailingly make your evenings in the home circle a real joy.

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Volumes of unsolicited testimony from satisfied users all over Great Britain.

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Complete with one pair double headphones and aerial equipment.

Approx. range—25 miles.

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Complete with one pair double headphones and aerial equipment.

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A Cabinet set in polished mahogany, of handsome appearance, complete with valves, all batteries, and one pair double headphones.

Approx. range—100 miles.

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"LISTENING-IN" SETS

Fully approved by H.M. Postmaster-General. Comply in all respects with Broadcasting Regulations.

OBTAINABLE FROM ALL PRINCIPAL ELECTRICIANS, STORES AND WIRELESS DEALERS.

Sole Selling Agents for the Music Trades in Great Britain and Ireland: Columbia Graphophone Co., Ltd., 102-108, Clerkenwell Road, London, E.C.1.

(Manufacturers and Wholesale only.)
THE GENERAL ELECTRIC CO., LTD.
Head Office: Magnet House, Kingsway, London, W.C.2.

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BASKET COILS, RADIAX, most useful, set of 7 4/6
BATTERY, H.T., 54 volt, in wood case .. 10/6
CABINETS, handsome oak polished, 10 by 6 .. 7/6
7½ by 5½, 6/3; 3⅝ by 3⅝ by 4½ deep, 3/6; many others in stock. .. .. ..

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.. large, 0-180; coupling tight-loose 5d.
DIAL PLATES, ebonite, engraved and polished 1/3
CONDENSERS, part boxed with scale, knob, pointer, ends, bushes, vanes, spindles, nuts and screws.; ·001, 7/6; ·0005, 5/6; ·0003, 4/6; Vernier, 3/3. Also with oak case, or built complete.

RADIAX UNIT SYSTEM for Experimenters and Constructors. Enables any type of set to be easily and cheaply built up. For those preferring to work under the B.B.C. licence we have a splendid range of complete Receiving Sets.

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Glowing accounts are received daily of the wonderful performances of our Special Line in Valves. Hard or soft. Sample one at 10/9. Three for 30/- Six for 57/6. All post free.

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SILVER ECHO.—A silver finished instrument of perfect tone, with magnet adjustment, 8½ in. by 13 in. 55/-

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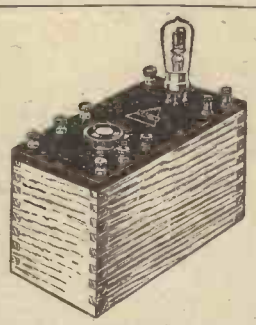

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British Super Sensitive, 2100 ohms. 25/-
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"Excelsior," a very powerful Continental, equal to much more expensive phones, 4000 ohms. .. 25/-
"Lady," a single receiver with cord and handle, 2000 ohms. 10/6
Brown's A adjustable, 150 ohms. Wonderful for crystal sets. With valves are best with transformer, but can be used without. With cord .. 35/-

SWITCH ARMS, complete, best quality, laminated .. 1/6
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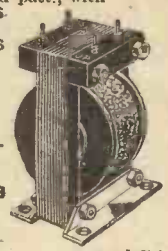

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LEAD-IN TUBES, 6 in., 1/3; 9 in., 1/6; 12 in., 2/-
LEAD-IN WIRE, heavy rubber insulated .. .. yard 5d.
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YOUR SET for any and every kind of work may be two or more of the following units. And you can add to it at any time.

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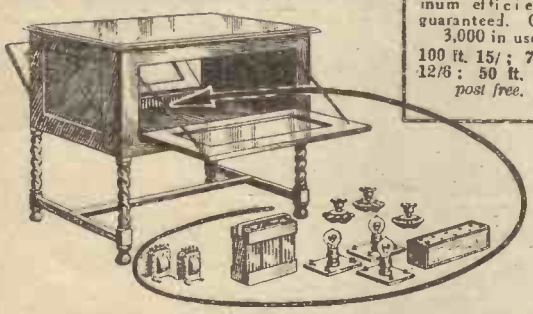

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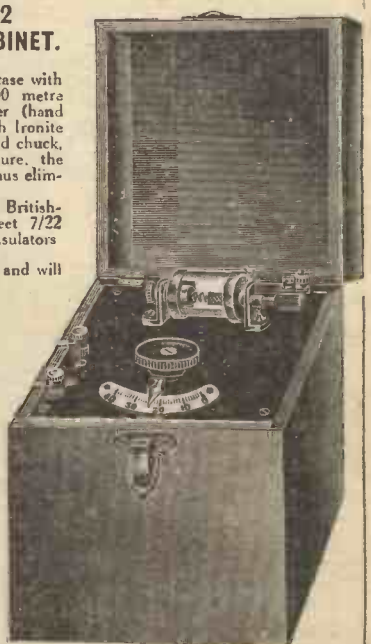

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A UNIT BROADCAST RECEIVER.

By H. G. HERSEY (Member of the Wireless and Experimental Association).

Further comprehensive details are given in this article for the construction of a complete Broadcast Receiver. All the apparatus described by Mr. Hersey has actually been made and tested before being described in these articles.

Part II.—THE DETECTOR PANEL AND TELEPHONE TRANSFORMER.

FOLLOWING on from the last article, in which details were given for the construction of a broadcast tuner, I am now about to describe a single-valve detecting panel for use with the tuner. This panel will be a simple detector built upon standard lines, and to be used at the present stage without reaction, although reaction terminals are provided in order

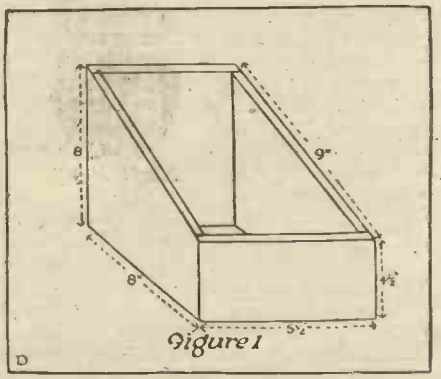


Figure 1

that we may make use of it a little later on, when a high-frequency valve is placed before the detecting valve; also, it will be useful should the panel be used for the reception of long waves where reaction is allowed directly coupled to the aerial circuit. When used as a detector only, without reaction, the reader is advised to use a fairly soft valve.

The Filament Resistance.

In order to match the tuner and present a neat appearance, the panel cabinet should be built upon similar lines, although it is admitted a considerable amount of space will be left beneath the ebonite front. This is, however, unavoidable in order to bring the panels upon the same level, and the space will be required when dealing with the high-frequency panel. The cabinet should be built up in accordance with Fig. 1 from some suitable wood, and then well papered and polished or stained, etc.

A piece of ebonite 5½″ by 9″ by ¼″ is next purchased, and marked out as in Fig. 2. The panel should be drilled around the edges for the ten terminals, the holes drilled being in size according to the type of terminal used by the reader. In the position "A" four holes should be drilled to take the pins from the valve holder, the latter being secured to the panel by the nuts provided upon the pins. If the type of holder with a flange be purchased, it should be secured to the panel by three screws and nuts passed through the flange and the panel. A filament resistance, skeleton form for panel mounting, is next required. This should be mounted in the position "B."

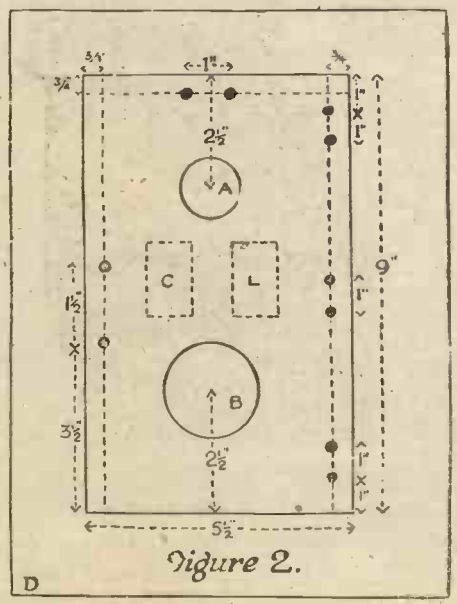


Figure 2.

Mounting Incidental Parts.

The most convenient type available consists of the usual circular spiral resistance in an ebonite groove, the spindle from the contact arm being passed through the panel in order to mount the same. The ebonite knob and pointer should first be unscrewed. The spindle is now passed through a hole drilled in the panel. The ebonite of the resistance is now screwed permanently to the panel by two screws provided for the purpose, passed through the panel from the front. The knob and pointer may now be replaced upon the spindle, and, should the reader so desire, a scale may be fitted.

The grid leak and grid condenser call next for consideration. For the former the reader may purchase a leak and two brass clips, or he may construct the leak according to instructions given in previous articles in POPULAR WIRELESS. If the leak be purchased, the reader may either mount it upon the top side of the panel to come midway between the valve holder and the filament resistance, or under the panel in the position "L." When mounted above the panel, between clips, the reader has the option of trying various leaks with different valves. Should the leak be made up upon slate pencil, it should be clamped against the under-side of panel by a strip of fibre and two screws.

Grid Condenser.

The grid condenser is the next component for mounting. The condenser, about ·0002 mfd., may be purchased in a neat ebonite mould ready for mounting, or it may be made up upon the lines described recently in POPULAR WIRELESS. When ready, the condenser should be mounted under the panel in the position "C." The ten terminals should now be screwed to the panel in the positions shown in Fig. 2.

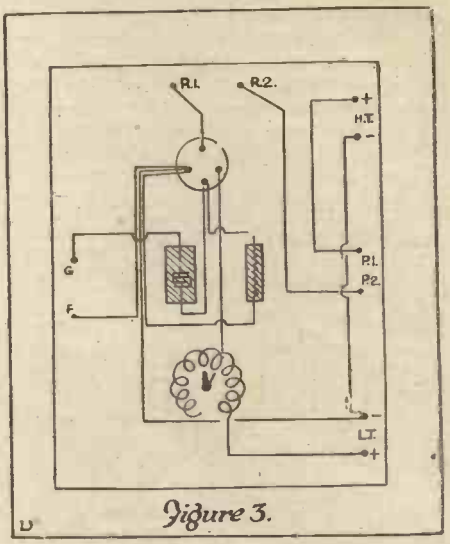


Figure 3.

The panel is now ready for wiring. The wire used should be about 22 or 24 S.W.G. copper wire, and if covered with coloured systoflex will present a very neat appearance, and the insulation be the best. The low tension side should be wired first.

From LT solder a lead to filament resistance. From resistance spindle to right-hand filament leg of valve holder. From LT to left-hand filament leg. Place a valve in position and connect up LT terminals to accumulator. All being well, the valve should light up and be adjustable by the resistance. HT—and LT—should now be connected together.

Continuing the Wiring.

From the plate leg of valve holder a lead is taken to terminal R1. From R2 take a lead to P2, and from P1 to HT, completing the HT supply circuits. From the grid leg take two leads, one to the grid condenser and the other to the grid leak. From the other side of condenser take a lead to terminal "G." From the other side of leak take a lead to the negative filament leg. The grid leak, you will

(*Continued on next page.*)

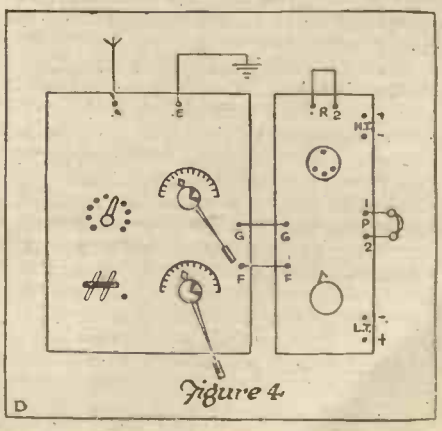


Figure 4.

A UNIT BROADCAST RECEIVER.

(*Continued from previous page.*)

observe, is placed between the grid and the filament direct, and not across the grid condenser, as is usual. This is because, in a later article, a high-frequency tuned rejector circuit is to be employed, and the HT through the rejector coil would place a high positive potential direct through the leak on the detecting valve grid.

This panel, used as a simple detector, should have the terminals R1 and R2 shorted by a piece of wire. They are

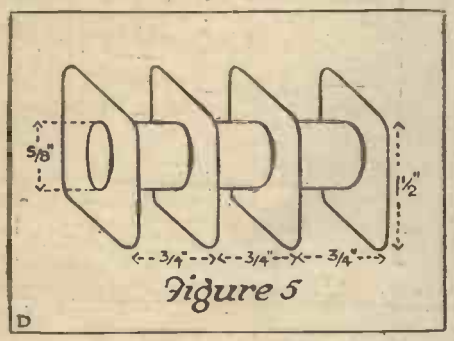


Figure 5

provided for reaction to be introduced at a later stage. The panel, now completely wired, should be screwed to the cabinet by counter-sunk screws around the edge. The panel should be connected to the tuner as per Fig. 4. This detector, being standard as regards connections, may be used in any circuit where a detector is required.

Telephone Transformer Construction.

With the telephones connected direct in the HT circuit, certain disadvantages appear; more so should your phones have faulty insulation, for you may experience nasty shocks when touching terminals. Capacity effect is most pronounced, also, when you place your hands or body nearer the instruments. Again, a steady plate current, although small, passing through the telephones, will, if connected the wrong way round for polarity, tend to decrease the strength of the magnets, thereby decreasing the efficiency of the phones.

Where valves are used, I always advocate the use of a telephone transformer. This may be of various ratios, according to the resistance of the phones in use. For all-round purposes, I have found a telephone transformer constructed upon the lines of the ex-service transformers most useful, the ratio being 2-1 step down. Readers unable to obtain one of these from the various disposals stores may make the transformer up in the following manner.

A former in which to wind the wires should be made up according to Fig. 5. There are three sections, the centre to be secondary and the two outside to be the primary. The former should be made of cardboard, the flanges which form the partitions being glued and the whole waxed with paraffin wax. The reader should next purchase a small quantity of No. 42 S.W.G. D.S.C. wire. A short length of rubber-covered flex should be soldered to the fine wire for the inside connection, and placed in the centre of the first section, leaving several inches to spare. The end may now be bent over the flange out of the way of winding.

Now wind on as near as possible in layers the wire until the section is almost full, and solder a length of flex, binding the latter to the coil and leaving a few inches protruding for connection. Continue in the same manner to wind the centre section and the other outer section, winding each section in the same direction and noting the inside from the outside ends of each winding. The two outside sections should now be connected together in series by connecting the outside end of the first section to the inside end of the last section, or vice-versa. The connection should be soldered and well-insulated with tape. The two centre coil ends should now be marked in some way to denote them from the other pair.

A quantity of soft iron wire, about 28 to 30 gauge, should be purchased and cut into 4½ inch lengths. These are placed through the centre of the coils, the coils being first well-bound with waxed tape. The ends are now bent over as the inter-valve transformer described in POPULAR WIRELESS, page 813, No. 35. The transformer may now be bound with tape and mounted in a suitable cabinet with ebonite top and four terminals. The approximate resistance of this transformer is primary 2,000 ohms, secondary 1,000 ohms.

FRAME AERIALS.

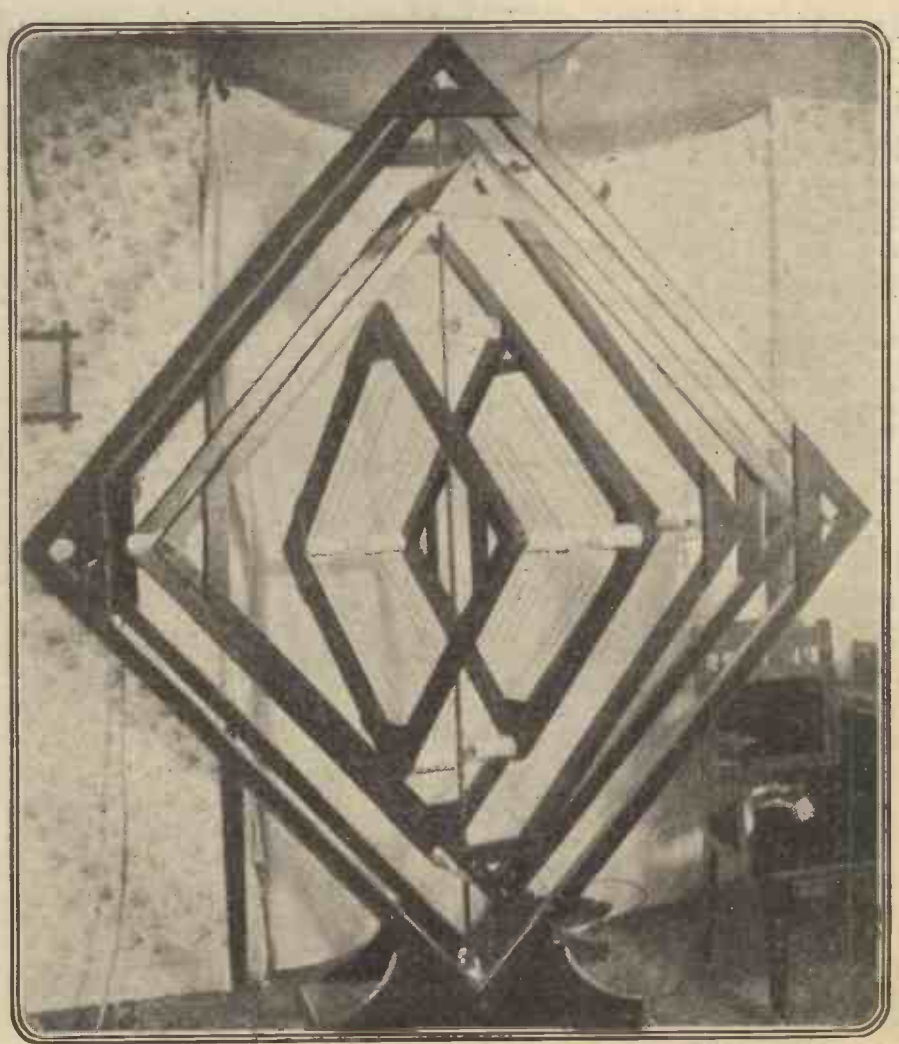
By C. ERIC EXLEY.

WITH this frame aerial, and using only three Marconi panels, Nos. 3, 4, and 5—that is, one H.F., one detector, and one L.F., I have been able, in Hull, to receive telephony broadcasted from London, Manchester, Birmingham, and Cardiff.

The large outer frame is mounted on a base board 2 ft. square, and revolves on casters; the two smaller inner frames are seated on pins and washers, attached to a central iron rod. By this means each frame rotates independently of the other, and the two inner frames can be completely taken out in less than one minute.

On the large outer frame there are four turns of wire, and on the two inner frames eight turns. The outer frame is coupled to the primary circuit, and the other two to the secondary and reaction. Height of frames over all, 7 ft. 9 in.; width, 6 ft. 6 in.; length of sides of outer frame, 5 ft.; the two inner ones, 3 ft. 10 in. and 2 ft. 6 in. respectively.

If any readers would care to communicate with me at Sunny Bank, Hull, I should be pleased to hear and receive their comments on this frame and the results which I have received.



The frame aerial constructed by Mr. Exley and described in the article above.

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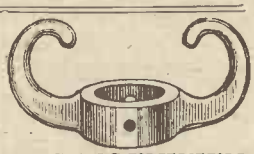

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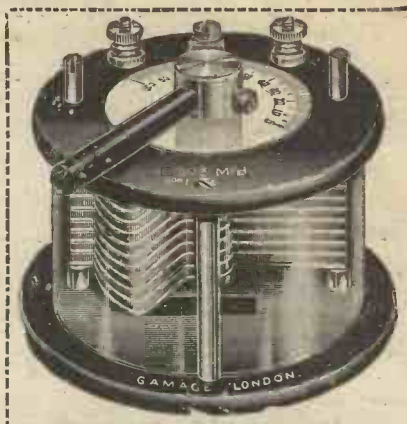

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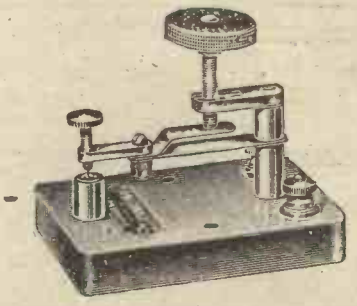

London made. Silicon and Cats, Whisker Base 3½ x 3 x ⅝ in., of Polished Mahogany, Burnished and Lacquered Brass work, Ebonite knob. Price **4/6** Post 4d.

High Class SWITCH

Beautifully finished in burnished brass and ebonite. Contact made by laminated spring. Post 4d. Price **3/9**

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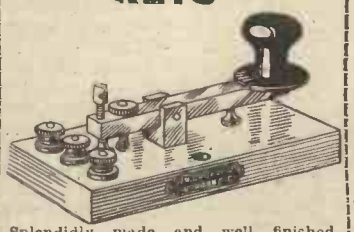

Splendidly made and well finished. Fitted with ebonite protector and knob for wireless work. Highly burnished and lacquered metal parts, mounted on mahogany base. Silver contacts. Base 5½ x 3 ins. Post 6d. Price **7/6**

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with 4-leaf Spring, Spindle and Lock Nuts. **1/6** Post 3d.

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Low-frequency intervalve transformer is for use when signals require amplifying by a valve. The primary is connected in the plate circuit of a rectifying valve, and the secondary across the grid and filament of a valve used as an amplifier. It may be used as the initial transformer, or between the valves in a low-frequency amplifier. A two-valve low-frequency amplifier would require two of these transformers in the ordinary way, or one only if the valve receiver used in conjunction is provided with an amplifying valve. The windings and general manufacture are the outcome of much experimental work, and their efficiency cannot be improved upon.

Mounted in polished mahogany container, filled with best paraffin wax thereby insuring perfect insulation. Core of best quality stalloy iron. This type is specially recommended. Size 3½ by 2½ by 3 ins. Price **25/-**

ROTARY POTENTIOMETER

An exceedingly neat and efficient instrument with the windings completely enclosed to ensure good insulation. It is fitted with an engraved ivorine scale enabling comparative readings to be taken, and has a very smooth contact point. Resistance: —Zero to 800 ohms. Size 3½ ins. x 3½ ins. x 2½ ins. Price **21/-**

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LOOKING AHEAD

THE QUESTION OF RELIGION AND BROADCASTING

By C. L'ESTRANGE MALONE, F.R.Aë.S., etc.
(Chairman of the Executive Committee of the Radio Association).

THE question of religion and broadcasting is most engrossing, its possibilities are so numerous, its scope is so wide.

There are certain material reasons which account for the fact that such a large proportion of people never go near a church. There is the trouble of getting to and from church, the trouble of getting up and dressing on Sunday morning—a morning often set apart for a licenced "lie in"; many might wish to hear a sermon, but do not like to sit through a service in that particular church or chapel, or there are others who do not care for the preacher in the only church of their denomination within reach.

So the Sunday broadcast sermon will fill a great gap, it can reach every home. It can be heard by everyone who for whatever cause, cannot get to church. But as the "broadcast congregation" will include members of almost every known creed, the utmost care must be taken as to what is broadcasted.

Detecting the presence of dirt by using wireless valves and telephones

Christianity Without Sectarianism.

There is a great move amongst the different churches for a reunion. The broadcast pulpit can well be arranged so that the sermons preached and the doctrines propounded are purely Christian, and of as undenominational and non-sectarian nature as possible. The director of programmes of the B.B.C. should get into touch with the leaders of the wonderful movement which is known as the Christian Conference, which is presided over by the Bishop of Manchester.

The churches might say that broadcasting will keep the congregations from coming to church. It will not. It will reach a far wider field, a field untouched at present; it will reach people who do not dream of going to church to-day. There is too much in the ritual, in the building, in the atmosphere which cannot be transmitted by radio, and therefore radio is an addition and not a substitute to the churches.

Loud speakers ought to be fitted in every church and chapel so that congregations can listen to preachers of renown who are so sought after that they cannot possibly undertake all the engagements they are invited to. The bishop of the diocese, or even the archbishop, can be brought into closer touch with the people. If this is done, so far from depleting the churches, broadcasting will provide new life and vigour.

The advent of radio telephony is one of the greatest developments reached in the cause of humanity and real Christianity.

Broadcasting and the Press.

One of the biggest developments in the future is along educational lines. Broadcasting has now reached a point of reliability that there need be no hesitation in scheduling lectures to be given by radio. I expect that before very long it will be possible to make some arrangements whereby universities and colleges will find it their duty to broadcast extension courses which will encourage home study.

Broadcasting is the most serious challenge to the power of the Press that our present day newspaper magnates have ever experienced.

Man requires to know what is going on in the world around him. This information is collected by the reporter, telegraphed or posted to the newspaper office, passed by the staff, sub-editor and editor. Then comes a long and expensive mechanical process before the news item reaches your breakfast table in a presentable form.

Meanwhile the news is getting stale.

All this mechanical process, this expense and delay is rendered unnecessary by broadcasting the news.

Fresh from the reporter, checked and censored by the editorial staff, the news can go at once into the ether.

Much of broadcasting work is essentially journalism pure and simple. Broadcasting can only be a success by making use of the years of experience which has raised modern journalism to its present position.

The Press organisations can only retain their influence by adapting themselves to modern inventions. Worked in conjunction with each other both will enlarge their scope.

As I have already said, it is very unlikely that the present arrangements whereby the whole monopoly for broadcasting rests in the hands of a single group will continue for very long. Sooner or later the important London dailies will have their own transmitting arrangements. In the United States of America at least seventy-three journals have their own stations.

An efficient news agency or newspaper needs to have built up behind it a world-wide organisation. Will the B.B.C. attempt to build up such an organisation?

I doubt that any page in a modern newspaper in this country is more widely read than the sporting page. Much of this interest is due to what is termed the Englishman's love of sport, much is due to "economic" considerations. Broadcasting will never appeal to certain sections of the community unless the world of sport is fully dealt with.

Radio Sporting News.

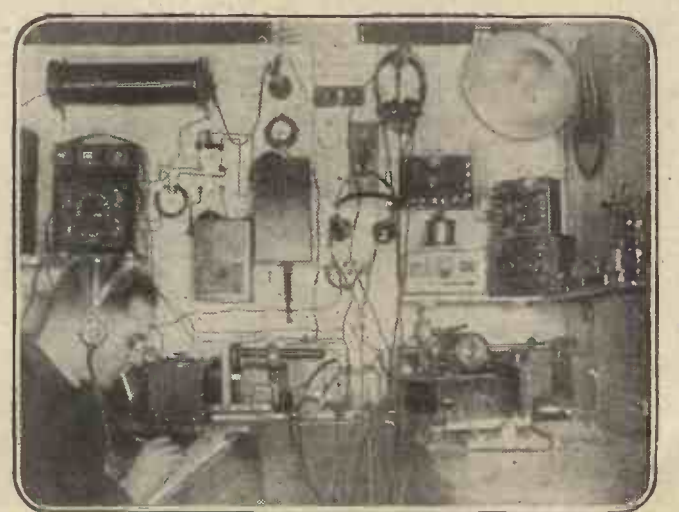
I look to the time when all important sporting results will be "put into the ether."

It is not the bare results, or even the half-time scores, which will be given, but a whole match or race can be followed and so much local colour given that you will be almost compensated if you lose.

A microphone will be connected by land-line to the nearest transmitting station. A master of ceremonies will be near the touch-line with the microphone.

He will tell us when the team come on to the field, who they are, why someone is not there, who the substitute is, and where he has played before. He will describe the kick-off, he will let us follow the ball closely, he will describe a brilliant run up by Jones, who was unfortunately tackled and brought down by the famous back, Brown, of the other side; we shall actually hear the whistle of the referee, we shall hear some shouts against the referee's decision, we can almost imagine that we see the trys obtained and the goals scored. Special microphones placed round the stadium will enable the master of the ceremonies to switch on when necessary the roars of the vast cup-tie crowd, and finally perhaps we shall hear the speech of the Prince of Wales when he presents the cup.

Again, if we cannot get down to the Derby, let us hope that a representative of the director of programmes will be there. Here, too, he can send us a very vivid picture of the scenes from the Downs leading up to his first bulletin from Tattenham Corner.



Mr. W. Scott Hay's experimental station, Barrhead Road, Renfrewshire, Scotland.

A HISTORY OF WIRELESS TRANSMISSION.

BY SEXTON O'CONNOR.

PART 2 (Conclusion).

BEFORE leaving the spark systems mention must be made of the "quenched" gap, or "singing" spark system so called because of the peculiarly penetrating quality of the emitted note as heard in the receiving phones.

The chief object in "quenching" is to make each spark last for as short a time as possible. In the first place this allows a greater number of discharges to be fed

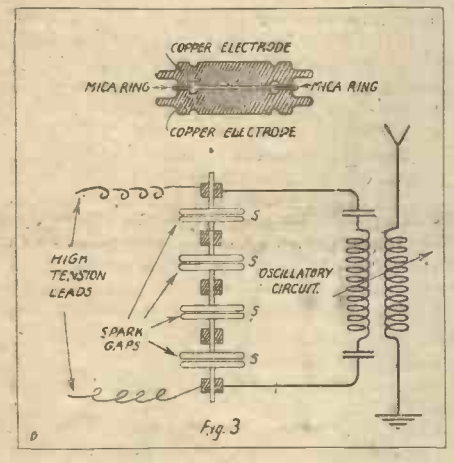


Fig. 3

into the aerial in each second, which naturally increases the output of signalling energy into the ether.

In the second place a serious loss of power is avoided by preventing what is called "back transfer" of energy from the aerial to the closed circuit during the persistence of the spark.

The quenched spark system invented by Wien in 1906, and adopted by the Telefunken Company is shown diagrammatically in Fig. 3. It consists essentially in the use of a number of separate spark gaps placed in series, each spark electrode being separated by less than a millimetre from its fellow. The main spark is thereby split up into a large number of small discharges, which are very rapidly quenched or extinguished, owing largely to the cooling action of the massive plate-electrodes.

Much the same effect is assured by the Marconi rotary spark-gap shown in Fig. 4. Here a series of projecting lugs C are mounted on a rapidly rotating wheel B, and the sparks pass between these and two slowly rotating discs AA placed at right-angles.

Owing to the speed of the wheel B, the sparks occur in very rapid succession, and each is automatically quenched by the widening of the gap as the projecting lugs C move away from the discs B. This is sometimes called "mechanical" quenching.

About 1900 Professor Duddell discovered that it was possible to create high frequency oscillations by shunting a tuned circuit across the electrodes of an ordinary arc lamp. In 1906 Poulsen developed this idea into the system of continuous wave transmission bearing his name. His arrangement is shown diagrammatically in Fig. 5.

The Arc System.

The arc electrodes, of copper and carbon, are contained in a water-cooled chamber filled with hydrogen gas, and are connected to the high tension mains. In addition a pair of electromagnets (not shown) provide a transverse magnetic field which serves to steady the arc. A parallel circuit containing inductance and capacity is connected across the arc.

The varying voltages set up across the arc give rise to continuous high-frequency oscillations in the tuned Duddell circuit.

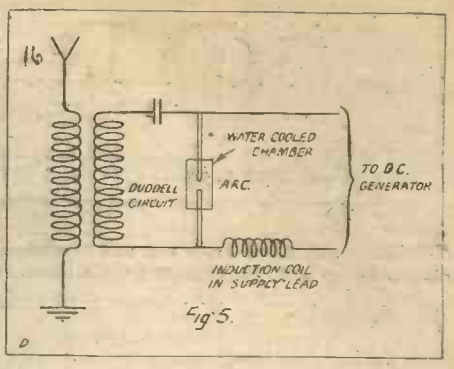


Fig. 5.

These are transferred to the aerial and are thence radiated outwards as an unending stream of ether waves.

As soon as the problem of emitting such a stream of continuous waves from the aerial had been solved, the wireless transmission of speech and music became possible.

In addition to the Poulsen or arc system, the use of high-frequency alternators has also been suggested for the same purpose, i.e. to radiate an unbroken stream of ether waves upon which speech variations could be imposed.

High-Frequency Alternators.

As early as 1890, Elihu Thomson and Nikola Tesla had designed such machines. Alexanderson, and later Goldschmidt (1907) and Fessenden (1908) actually succeeded in constructing alternators capable of supplying continuous oscillations direct to the aerial at a frequency varying between 100,000 and 1,000,000 per second.

All previous methods of radio transmission will, however, probably be replaced in the near future by the discovery made in 1913 of the capabilities of the thermionic valve as a generator of high-frequency energy.

By linking together the input or grid circuit with the output or plate circuit, the valve can be caused to produce continuous oscillations of practically any frequency, with a constancy and efficiency far superior to any other means at present known.

It is capable at present of giving an output varying from a few watts to some hundreds of kilowatts, and the limit of its possibilities in this direction remains still to be seen.

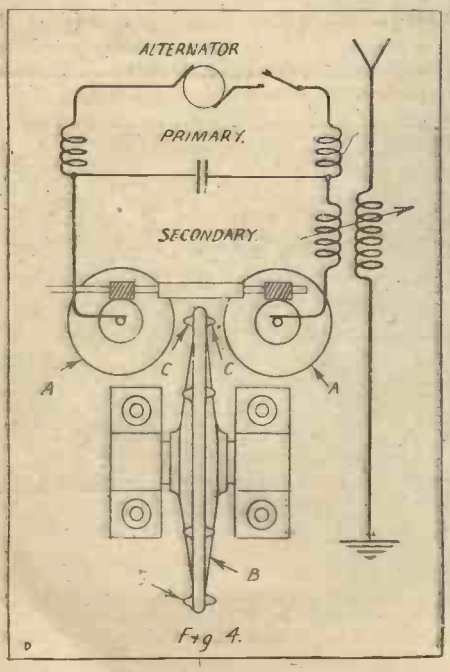


Fig 4.


The Battery Supply Department for Radio use on an American Express Train.

GEARY DISCOVERS AMERICA.

By HIGHAM BURLAC.

Another Geary Adventure which cannot fail to bring a smile to the face of the most perfervid of experimenters.

THE biggest mistake Geary every made, in a life consistently devoted to error, was his trip to America. No, gentle American reader, this is no unpleasant insinuation directed against that fair land of yours which, I am credibly informed, "licks creation." Geary went to America because the ship went there, and he could not leave the ship except for a supreme feat of natation for which he has not the proper specific gravity.

The Potent Draught.

Geary's employer sent him to Liverpool with an important document to deliver into the hands of Hiram P. Buckeye, of Boomville, Pa., who was returning to New York by the s.s. Berengaric; but long before Geary arrived at Prince's Pier, Hiram was well bedded down in the Berengaric's bar, beginning his long farewell to cocktails. Geary felt confused after ten minutes aboard. He thought a ship consisted chiefly of a bosun's mate, a binnacle, and a cabin, and began to lose his bearings after he had plodded along a mile of alleyways, through three palm gardens, and two swimming pools. Somewhere between the fourth-class squash racquets saloon and the third-class gymnasium he was hopelessly lost, and wandered about till he came to anchor in the steerage knife-and-boot-cleaning hole, and was run in by a quarter master as a stowaway.

Learning that Geary knew something of wireless, the skipper handed him over to the Marconi operators, who were kind to him, and permitted him to sort out the contents of the tool chest. After three days he was rescued by Hiram, who on receiving the precious document took Geary to the bar, and poured into him four fluid ounces of devilment called "Angel's Kick." That was the beginning of Geary's metamorphosis.

So Geary came back from America wider in soul but clad in unfamiliar raiment, conspicuous by the absence of a waistcoat, with his watch poked down the front of his trousers, and fifteen of his teeth patched with golden plates. I found him chewing gum meditatively at the foot of his wireless mast, and clapped him on the back with a hearty:

Matter of Opinion.

"What ho, old chap!"

He turned round upon me with a startled air and said:

"Aw, nix on the gumshoe work, Kelly!"

"Beg pardon?" I gasped.

"I said, cut out the 'mits up' dope, and come across with some of the home burg glad news. How's the folks?"

"Er—very well, thanks."

"That's the shout. How's *raddio?*"

"Oh, wireless is booming here just now."

"Bueno! Say, what's the load now in this half-acre lot?"

"Say it again—slowly."

"Stiffen it! I said, how many watts of Wattville do you boys shake into the wires hereabouts?"

"Ah! I gather dimly—by the way, do you speak like that to Mrs. Geary?—that you wish to know the aerial input affected by wireless amateurs in this country?"

"Yep!"

"Well, I don't know. Since you took up *raddio* I've rediscovered my affection for stamp collecting and the intensive culture of white mice."

"Say bo, *you don't say!* I was just dinging to pass you the latest guff about *toobes* and ground wires, and here you backstep like a third-storey, honest-to-goodness,

Miss Cecil Dixon, "Aunt Sophie" of 2 L O

dyed-in-the-wool bootlegger, when he feels the bottle break in his pants. Have a heart, old timer!"

"Sorry! What's that about boots and wool?"

"You pass! Say—what about that son-of-a-gun of a Broidcasting Company? It don't amount to a hill of beans s'far's N'Yark's concerned."

"Ah, we think it's the—pardon me—the whole cheese—not being concerned with what hill of beans New York is concerned with. The London station gets over the Atlantic, anyhow."

A "Super" Needed.

"Sure thing! We took it for static at *fyist*, till old man Armstrong hooked up his go-getter circuit, and piped what your game was. Believe me or believe me not, stranger, there warn't a *toobe* 'n N'Jersey but didn't register pained surprise when li'l ole 2 L O lit out for the tall grass, I'll tell the woild."

"Well, now you are back where you belong, you have jolly well got to toe the line, and sub up to the B.B.C., and listen-in like the rest of us. By the way, did you like Ellis Island?"

Radio from the Cradle.

"Nope! But I'm a fly guy, and I passed the buck to the President of the *Raddio* Rioters who spilled the beans by Special Expedited Relay *Raddiogram* on Eli K. van Hucklebaumerblitzen, Vice-President of the *Fyist* National Group of *Raddio Toobe* Twisters. Eli no sooner lamped this S.O.S. than he switched his Heaviside-scraper on to Judge Schwarzenheimer at Washington, D.C., and jammed him good and fine till he had gotten a check for my egress. Some boy!"

"Who's a boy? Huckle, etc, or the judge, or the president of the thingummy-bob?"

"You don't get me. Use your harkers! I said he was the goods with an upper-case G, and then some."

"Quite so. I must have missed that. Well, so you got away from Ellis Island by *raddio* influence. Have a good time?"

"Bully! Strength ten. I was the little bit of hog in the hull can of beans. *Raddio?* My good sirree, we Briddishers are the last hair in the broncho's rudder in *toobe* work. We are—why, in Amurrca the babes yowl for "B" batteries in their cradles; at the age of three they can repeat Richardson's emission formula, and at eight are getting through to the next but one State on *toobes* saved from candy money. Talk about a good time—they handed me the joy clutch. Do much listening-in? Nary listen. You don't listen, you hear! You push the button in N.J., and read off every *raddio* riot's far's the Panhandle. It's laid on to every apartment, son, like the card of rules in a dime dosshouse. Man I met on Forty-first told me he could mow his tennis-court with *Chaykoffski's* "1812," and I believe um. Yessir!"

A Sudden Return.

"Very interesting indeed. Anything else? I asked.

"Man I met on Twenty-third allowed he could strip off wallpaper by spraying it with *Vargner's* Overture to *Tanhorser*, as played in Schenectady, and toast bread by holding it against a Magnavox while Mrs. Walla Bella Silcox recites her Bedside Stories. Say, what about two spots of snake-juice?"

I was just opening my mouth to accept this strange invitation, when Mrs. Geary called from the house:

"Aloysius, come in at once. Catching your death of cold!"

"Yes, my dear, certainly. I'll come at once," replied Columbus the Second.

"Thank goodness!" I muttered, as Geary steered towards the house. "English at last!"

THE TELEGRAPHONE

By SEXTON O'CONNOR

THE principle of the phonograph is familiar to most people. It can be described as a machine for "storing-up" the human voice in permanent form ready for reproduction as desired. The "dictaphone" is a somewhat elaborate form adapted for the business man so that he can dictate at his leisure to a machine which will presently repeat his accents to the willing typist.

One of the difficulties experienced in providing a thoroughly representative Broadcast programme is to persuade the right people to come to the microphone "torture chamber" at the radiating station. In certain cases "Mahomet has gone to the mountain," and special cables have been laid down in order to connect the Broadcasting depot with the centre of attraction. This has been done recently in the case of Covent Garden, the Hippodrome, and other theatres, but the process is troublesome and expensive.

An Instrument with Possibilities.

It may be asked why not use the phonograph recorder as a convenient method of bringing a wider circle of prominent—but somewhat inaccessible—artistes and other notable personalities into touch with the growing army of listeners-in?

Whatever may be the objections to this course in practice, the suggestion seems worthy of full consideration. With the perfected type of recording and reproducing instruments now available, there should be little difficulty in ensuring good results in the quality of speech or song so transmitted.

As an alternative to the use of the phonograph for this purpose, there is available a most ingenious form of speech recorder, which, though not so well-known, has certain decided features of advantage and is capable of development to a high level of efficiency.

The instrument referred to is called the "telegraphone" and is an invention of Valdemar Poulsen of "Poulsen Arc" fame. It is free from many of the obvious objections that might be urged against the use of the phonograph for Broadcasting. There is no necessity, for instance, to make a permanent "record" involving delicate questions of copyright, and correspondingly high fees. Further there is practically no limit to the length of the speech or other entertainment that can be stored up. At the same time the "record" can be retained for several months, if necessary, unimpaired in quality.

A Magnetic Impression.

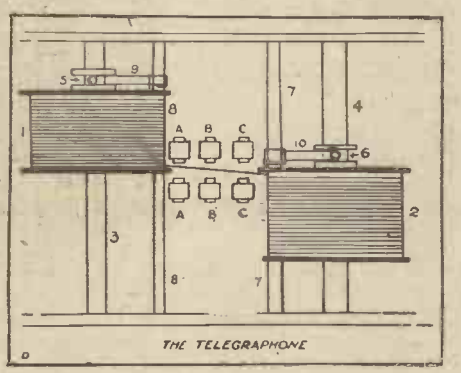
The telegraphone may perhaps be best described as a magnetic phonograph. It depends for its action upon the peculiar properties of a magnetised wire.

Those familiar with the action of the Marconi magnetic detector will remember that when a strip of wire is passed near two reversed magnets, a "delicate" magnetic condition is set up which is amazingly sensitive to the impact of wireless signals.

Poulsen found that when a strip of unmagnetised wire is passed near to the poles of an electromagnet, which is wound with coils forming part of a local microphone circuit, a peculiar magnetic "condition" results. This magnetic condition is confined to the part of the wire in close proximity with the poles of the magnet, but it is of a more complex nature than in the case of the Marconi detector. Instead of being subjected to a uniform magnetic field, the wire is also influenced by the varying voice currents flowing in the windings that form part of the microphone circuit.

The result is that the wire receives a magnetic impression which faithfully "reflects" the voice at the microphone.

Not only does it store up the spoken



word, but it does so in a semi-permanent form. That is to say, the magnetic record will remain available until it is deliberately effaced, which, however, can readily be done by passing the wire across the poles of a second magnet. Once it has been so "cleaned," the wire is ready to receive another "impression" which, in turn, can be destroyed, and so on, the same piece of wire being used as often as desired.

How Signals are Recorded.

Once a wire has been impressed with "magnetic" speech in this way, all that is necessary to "repeat" the record is to pass the prepared wire in front of the poles of a second magnet, in which, this time, the windings are in series with a telephone receiver.

The lines of magnetic force from the wire then induce currents in the receiver which vary in strength precisely in the same way as the original magnetising currents, and therefore repeat in the telephones the words originally spoken into the microphone.

A simple diagram of the apparatus is shown in the Figure. The wire strip is slowly unwound from a spool, 1, and is taken up by a second spool, 2. Both spools are mounted on pillars 3, 4 respectively, and are arranged to be slowly moved in opposite directions along the pillars by means of screw shafts 7, 8, which carry arms, 9, 10, engaging collars, 5, 6, secured to the spools.

This ensures that the uncoiled straight strip of wire lies always in a straight line, passing between the electromagnets A B C. Only the electromagnet B is actually used for recording or repeating. If, for example, the apparatus is being used for recording, the microphone circuit is connected to the electro-magnet B, and impresses the speech magnetically upon it in the manner previously described.

Reproduction of Signals.

If the wire is travelling in the direction from the spool 1 to the spool 2, the electromagnet A is used simply to obliterate any traces of former impressions that may remain, so that the wire is presented to the recording magnet in a "clean" condition ready to receive the new impressions. The third magnet C is in this case idle.

If on the other hand it is desired to reproduce speech from a prepared record, a telephone transmitter is connected across the magnet B. The first magnet A is in this case inoperative, and has no effect upon the strip.

The second magnet is affected by the varying lines of force springing from the magnetised wire, and speech currents are accordingly produced in the attached telephones. The third magnet may, if desired, be strongly excited so as to wipe out the magnetic "traces" from the wire, thereby destroying the message and rendering the wire ready for use again for a subsequent message.

Useful in the Home.

It is obvious that this feature of automatically obliterating the record as soon as it has been transmitted may appeal to a certain class of artiste. They may be prepared to offer their services for a single performance or a "one use" record at a figure much below that which they would expect to receive for work which is multiplied, as in the case of a phonograph record and sold to hundreds of thousands. At the same time, the performance could be given wherever they might chance to be, thus avoiding personal attendance at the Broadcasting station and the unaccustomed ordeal of facing the microphone, where nervousness or an involuntary mistake may spoil the effect as heard by the listener-in.

With the facilities afforded by an instrument like the telegraphone, it should be possible to increase very considerably both the scope and variety of the somewhat restricted Broadcasting service at present available.

From another point of view the telegraphone could easily be adapted to serve the convenience of individual Broadcast receivers. It is not always possible to be "on guard" at the phones, or even at home, when an especially interesting item is being transmitted.

How convenient it would be in such circumstances to have an inexpensive automatic "recorder" hitched on to the receiving set, from which one could extract, at leisure, say next morning, the entire programme of the night before.

THE CONSTRUCTION OF PLUGS AND JACKS

ORDINARY telephone jacks and plugs often prove to be very useful fitments to the wireless experimenter. The operation of inserting or withdrawing the plug forms a very easy method of connecting or disconnecting various pieces of wireless

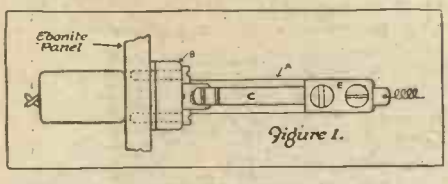


Figure 1.

apparatus; it is far easier than having to screw up or unscrew a whole collection of terminals which, if often necessary, becomes very troublesome.

In addition to being useful, a well-made jack and plug fitted to a set enhances its appearance to no little extent. The jack to be described, while somewhat different to the usual type, is not difficult to construct and, providing it is carefully made, works quite as well as the orthodox article. This jack should appeal to those amateurs who wish to make as much of their own apparatus as possible.

Fig. 1 is a plan of the jack with the plug inserted; Fig. 2 a side elevation with plug inserted—the plug is in section to show the method of construction; Fig. 3, side elevation with plug out.

The construction is as follows: The piece marked A, which carries the contacts, is cut out of sheet brass $\frac{1}{16}$ in. thick to the shape shown in Fig. 4. A $\frac{5}{8}$ in. diameter hole is

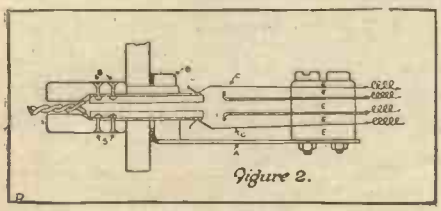


Figure 2.

cut through the large end, as shown, so that when in position the plug will not make connection with the brass. The six other holes are drilled to take $\frac{1}{8}$ in. Whitworth (or an equivalent B.A. size) brass screws. B is a piece of ebonite $\frac{3}{8}$ in. thick and 1 in. square. A $\frac{3}{8}$ in. diameter hole is drilled through the ebonite panel of the set on which it is intended to mount the jack; four $\frac{1}{8}$ in. diameter holes must be drilled and tapped to take the four screws which hold the jack in position. The contacts CC and DD are cut to the shape shown in Fig. 5. They are held in place by two $\frac{1}{8}$ in. diameter bolts; strips of ebonite (E) are interposed between the brass strips in order to separate them the correct distance, and to insulate the one from the other; $\frac{1}{4}$ in. diameter holes should be drilled through the contacts CC and DD where the bolts pass through so that they do not touch the bolts.

Careful Insulation Required.

When assembling, care must be taken that the contacts do not touch the bolts; if ebonite washers $\frac{1}{4}$ in. diameter and the same thickness as the contacts are inserted, all risk of "shorts" is avoided. The contacts CC are made of spring brass $\frac{1}{64}$ in., or slightly more, thick; DD are made of $\frac{1}{32}$ in. thick sheet brass. An insulated connecting lead should be soldered to each contact-piece where it projects from the ebonite strips as indicated in the figures.

To Prevent "Shorts."

The plug is made from a piece of brass tube $\frac{3}{8}$ in. diameter and $1\frac{3}{4}$ in. long. The handle is a piece of $\frac{3}{4}$ in. diameter ebonite rod $1\frac{1}{4}$ in. long. A $\frac{3}{8}$ in. diameter hole is drilled half-way through the ebonite, and the tube inserted in it. Four $\frac{1}{16}$ in. diameter countersunk screws (S in Fig. 2) are then fitted in the positions shown in Fig. 2. The tube is removed and split

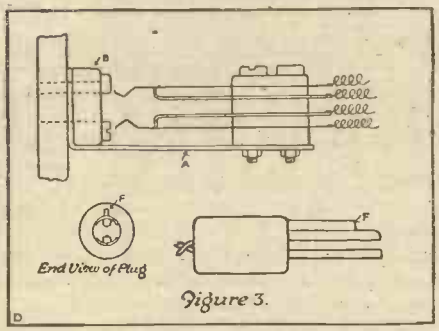


Figure 3.

along its centre with a hacksaw; each half should then be filed until both pieces of tube, when in position in the handle, are separated by a gap of about $\frac{1}{8}$ in.

The nuts of the countersunk bolts are then soldered in their correct positions on the inside of each piece of tube which now form the plug contacts. At the same time must be soldered the "feather" (F in Fig. 3), which is a strip of brass $\frac{1}{16}$ in. thick, and $\frac{1}{8}$ in. wide. A slot or "keyway" must be cut out of the panel and out of the piece B to accommodate the feather. The object of the feather is to ensure that the plug is inserted with the right side up, otherwise it might inadvertently be plugged in upside down, thus reversing the connections with perhaps disastrous results.

The slot or "keyway" can be cut to the required depth with a piece of broken hacksaw blade, and trimmed with a thin file. A length of twin flexible wire is inserted through a hole drilled in the plug handle,

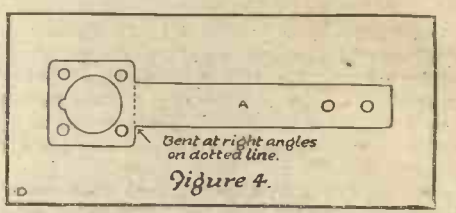


Figure 4.

one wire of which is soldered to one piece of the tube and the other wire to the other piece of tube; it will probably be easiest to do all the soldering at the same time.

Application to Valve Circuits.

The whole should then be carefully assembled, due care being taken to prevent short circuits; liberal use of shellac will probably improve the insulation. All sharp edges and corners should be neatly rounded off. The contacts can then be adjusted to make proper contact; when the plug is in position the contacts CC should be well separated from DD; when the plug is withdrawn, then CC should make contact with DD, but CC must, of course, not touch each other. A good plan is to solder small pieces of platinum wire where the contacts are made and broken, as if any sparking takes place a coating of oxide is apt to form and so impair good connection. The contacts from an old electric bell would do excellently for this purpose.

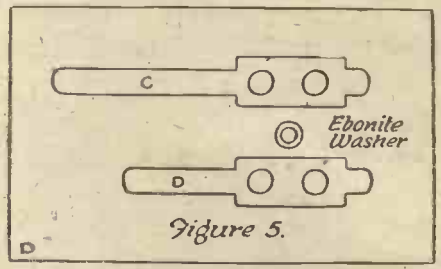


Figure 5.

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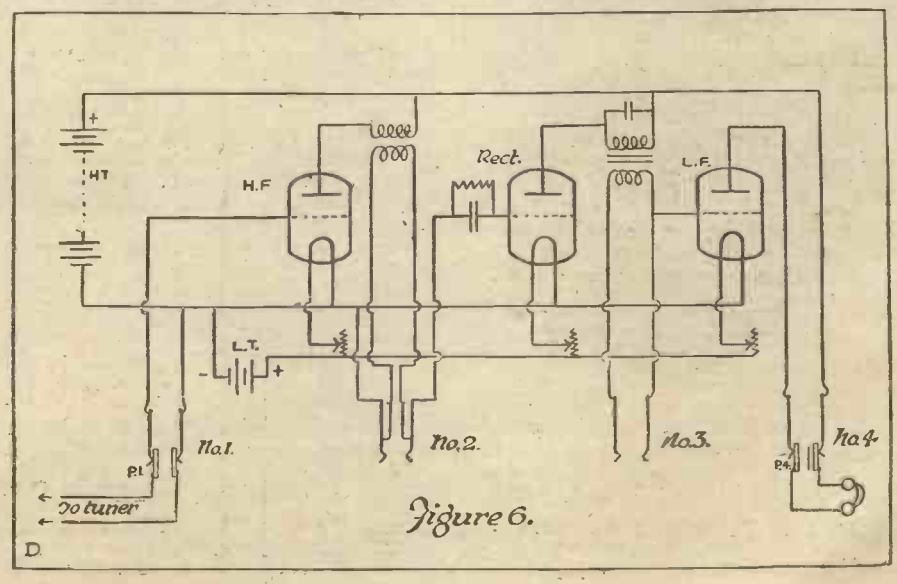

Figure 6.

2 K O

A VISIT TO A WELL-KNOWN MIDLAND STATION

ONE of the pleasures of the present stage of radio-telephony is to meet a veteran, or, in other words, an amateur whose licence to experiment has not been renewed just once or twice, but many times. Usually the call-sign concerned is something of a classic, and when the station itself is visited there are found all the traces of careful building up and of happy ideas which have led to fruitful results.

In any district it will be found that the best-known call-signs still indicate the "old guard," and to them wireless owes much. For example, among the well-known call-signs of the Birmingham area are 2 N V, 2 O X, 2 L G, 2 K O, 2 R G, 2 F H, 2 I Y, to mention those that occur to mind.

Broadcasting a Charity Appeal.

Among the foregoing a station that is particularly prominent for reasons of its excellent transmissions is 2 K O, which, for example, became well-known last October when it provided the Lord Mayor of Birmingham with the opportunity of being the first Lord Mayor to broadcast an appeal on behalf of charities. On this occasion the wireless amateurs and their invited friends who listened-in were appealed to on behalf of the Birmingham hospitals, and the latter benefited considerably as a result. For that occasion, Mr. C. S. Baynton, the man behind 2 K O, was granted a special broadcast licence by the Post Office authorities.

An early interest in microphones—an interest which still survives and which accounts for a good deal of the remarkable excellence of 2 K O's transmissions together, of course, with an interest in telephones and electro-magnetism, led to wireless telephony, and when the removal of the war-time ban gave wireless experimenters a real chance of getting going again, 2 K O came into being.

The first set installed was a valve set, of which every part was made at home, and it is suggestive to note that telephony was the only concern. For the first three months Mr. Baynton and his son—Mr. Gerald Baynton—tested and listened-in, built anew, tested and listened-in again, and then they picked up their first message.

Profiting by Experience.

"I made every mistake that it was possible to make," Mr. Baynton told a POPULAR WIRELESS representative, "but we stuck it out. We worked together a good deal with 2 F H and 2 L G transmitting and receiving. The ether was very free in those days—we had it all to ourselves."

"In 1919," he continued, "the stations in Birmingham were less than half a dozen in number.

"Every kind of coil imaginable was made even to the winding of 'pancake' coils, two feet in diameter, as well as others twenty times smaller."

So 2 K O grew up until it is certainly one of the best equipped of amateur transmitting stations. For wireless work, Mr. Baynton's house is ideally situated. Four hundred and fifty feet up above the sea-level in the first place, and plus the height of the masts, there is stretched the maximum span of a single strand aerial leading into the instrument room on the first floor. From this room connections seem to run to all parts of the house, so that it

Making Tuning Coils in one of the new Radio Factories.

is possible to have a loud speaker anywhere. It is not unusual for three to be in use at the same time, and when Birmingham is being received two valves suffice for this purpose, while London or Manchester can be picked up on three valves when Birmingham is in full blast. The Hague on a loud speaker is heard on two valves without amplification.

Ingenious Arrangement of Microphones.

Apart from the transmitting and receiving panels, 2 K O contains various "gadgets" mention of which cannot be other than interesting. The microphones for music transmissions, for example, are unique. Three separate microphones—each ball-socketed to give the ideal angle for successful picking up of the sound waves—on arms which slide up and down on a centre piece, are used outstretched for piano items. The left microphone takes in the lower octaves, the centre the middle, and the right the higher octaves. Thus there is no possibility of any difference in the collecting of the sounds.

If, however, a vocal item with accompaniment is being broadcast, one arm is dropped into the piano and the singer directs the voice between the other two which are brought together. This reference to transmission draws attention to an effective means employed to gauge the flow of the current into the aerial. This is an ammeter fixed on the transmission panel in series with the microphone current. The broadcaster who marks the regular beat of the needle is thus assured that he is transmitting efficiently.

One other striking point must be mentioned and that is in regard to the change over. In this matter 2 K O can almost be said to have solved the problem of an effective duplex system, for conversational telephony can be carried on with ease so simple are the arrangements for the change over. One movement of the switch arm is all that is necessary. Worked on three relays this lights the filaments, switches on the microphone current, puts on excitation current, and starts the generator.

CONSTRUCTION OF PLUGS AND JACKS

(*Continued from previous page.*)

Before putting the jack into use, the insulation should be tested with a dry cell and a pocket galvanometer. It should be made sure that CC and DD are thoroughly insulated from each other, and that no "shorts" exist.

If the experimenter intends building a multi-valve set, then the jack comes in very useful. He can at will disconnect any valve with very little trouble. Fig. 6 shows the connections for a 3-valve set, H.F., rectifying, and L.F. In this case four jacks are required; three of them need not have the inner contacts, since only the outer ones are made use of. The diagram shows all three valves in circuit. If now the plug P1 is inserted into jack No. 2 the H.F. valve is cut out of circuit. Similarly the L.F. valve may be disconnected, or both L.F. and H.F. can be cut out. Only two plugs are needed for the above arrangement.

Fig. 7 illustrates how the jack can be used to earth the aerial when the set is not in use; in this case three contacts are used, two being connected together. When the plug, to which the set is attached, is withdrawn, the aerial is automatically earthed. It should be mentioned that in this case the insulation should be very good, and the connecting wires should preferably be composed of high-tension cable.

There are many ways in which this accessory can be used, but it is left to the individual reader to think out additional applications to suit his own particular case.

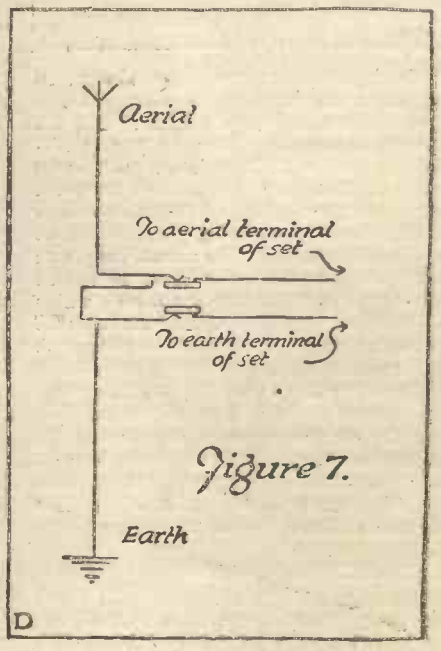

Figure 7.

PATENT RIGHTS AND THE VALVE

SOME REMARKS ON THE MARCONI-MULLARD CASE

By A BARRISTER-AT-LAW

THE recent litigation between the Marconi Company and the makers of the Mullard valve has been followed with great interest by the wireless public. The question of patent rights in the thermionic valve—probably the most important appliance in the whole industry—has for some time been an outstanding bone of contention, and the present action, which is in the nature of a test case, will, it is hoped, throw some much-needed light upon the whole situation.

The importance of the questions at issue may be judged by the determination shown by both sides to fight the matter out to a finish. The result of the first action in the High Court went in favour of the Mullard Company so far as it decided that they had not infringed the Marconi patents, whilst at the same time the Marconi Company secured a judicial certificate to the effect that their patents were valid—so far as they went.

The Marconi Company appealed against this decision. They allege that the Mullard valve infringes two of their patents, viz., one granted to Captain Round in 1913; and another granted to two Frenchmen named Peri and Biguet, which dates from 1915.

In the first, Captain Round claims "a vacuum tube containing a hot filament, a grid *formed as a closed cylinder completely surrounding* the filament, and a third electrode (plate) in the form of a cylinder *surrounding* the grid."

Capt. Round's Invention.

Most of the legal arguments concerning this patent centred around the precise meaning to be given to the italicised words. On behalf of the Marconi Company it was argued that, before Captain Round's invention, there were no three-electrode valves known in which the grid was made to *surround* the filament, nor in which a cylindrical plate was used to enclose both the filament and grid.

It was pointed out that in the De Forest or Audion type of valve, the grid was made in the form of a *flat* sieve or mesh placed between the filament and a *flat* plate or anode.

At the time in question, i.e. 1913, the modern type of "hard" valve, in which the air pressure in the tube is reduced to the neighbourhood of one-millionth of a millimetre, was unknown. All the valves then in use contained a comparatively large amount of residual gas, the presence of which affected the "steadiness" of the valve in operation.

This trouble arises from the following causes: (1) A certain proportion of the electron stream from the filament fails to strike directly upon the plate, which, being flat, only covers a comparatively small area. The electrons missed by the plate find their way to the inside surface of the glass vessel and lodge there, with the result that the glass surface becomes negatively charged and thereby effects the normal potential on the grid. (2) In addition, some of the electrons, as they shoot outwards from the filament, collide with the free molecules of gas. The impact is sufficient to disintegrate the gaseous molecule, knocking away some of its associated electrons, and leaving a positively charged "ion" free to wander about inside the tube.

These vagrant "ions" are inimical to the proper working of the valve for two reasons. In the first place, they are apt to "bombard" the filament with such force as finally to break it, and so shorten the working "life" of the valve. In the second place, some of them are from time to time drawn into the negatively charged walls of the tube. Each positive ion, as it strikes against the glass surface, naturally diminishes the degree of negative electrification, and therefore upsets the normal grid potential. This action is intermittent and, in consequence, the working of the valve becomes erratic. The only remedy is a constant readjustment of the valve of the grid potential by means of an external potentiometer circuit.

The Main Points at Issue.

By using a cylindrical plate instead of a flat one, Captain Round sought to trap the *entire* stream of electrons. If none of the electrons can escape from the attraction of the plate, there will be no negative charge set up on the inside walls of the tube to interfere with its steady working.

A "cylindrical" grid was employed in order to secure a uniform "control" of the electron stream on all sides of the filament. It was obviously the most suitable form to use in conjunction with the cylindrical plate.

Mr. Hunter Gray, for Messrs. Marconi, pleaded that the improvement made by Captain Round was of the first importance. He claimed that any three-electrode valve containing a cylindrical plate and a "closed" grid was an infringement of the Marconi patent rights. It was immaterial whether the improvements were applied to a "hard" or to a "soft" valve. The "greater included the less," and as Captain Round had solved the more difficult problem of controlling the working of the "soft" valve he ought not to be robbed of the fruits of his invention merely because his improvements were subsequently applied to the more easily controlled "hard" valve. He asked the court not to follow the wording of the patent claim too literally, but to say that the words which described the grid as "completely surrounding the filament" meant that the filament was "*electrically* closed or surrounded" by the grid. It was obvious that the words in question could not mean that the grid must "physically" surround the filament on all sides so as literally to encase or box it up. Such a construction was impossible in practice.

Sir Duncan Kerley, for Messrs. Mullard, urged that, whatever were the merits of Captain Round's invention, it did not cover the valves made by his clients. The Round patent applied only to the particular difficulties met with in "soft" valves. The Mullard valve was a "hard" or highly exhausted tube. There were no positive ions to be contended with. Surface electrification of the glass walls of the valve was present, in actual fact, both in hard and in soft valves. In the case of hard valves, such as the Mullard type, this charge did not affect the steadiness of the instrument in operation. It was counterbalanced by the initial adjustment of the grid potential, and did not thereafter have any injurious effect upon the working of the valve.

How Judgment was Delivered.

Whatever was the nature of the invention which Captain Round intended to protect, he asked the court to confine it to the arrangement actually described in his patent specification, which laid down that the grid must "completely surround" the filament. His client's grid was in the form of an open spiral of wire, which could not in any way be said to fall within the words of Captain Round's claim.

The second Marconi patent which it was alleged had been infringed by the Mullard Company related to the well-known "French" valve, in which all the electrodes are carried by leading-in wires supported from a common base at the bottom of the valve casing. The defendants maintained that this particular patent covered only a precise arrangement or combination of well-known parts, and that there were sufficient differences in the actual construction of the Mullard valve to take the latter outside the scope of the Marconi patent.

Judgment in the Appeal was delivered on March 23rd by the Master of the Rolls and Lord Justices Warrington and Younger. The court held that the invention protected by the Round patent applied only to a valve in which the grid was formed as a cylinder closed in the "physical" or geometrical sense, i.e. having ends. The grid in the Mullard valve did not fall within this definition, and there was consequently no infringement. Further, the Mullard valve did not infringe the narrow construction covered by the Peri and Biguet patent (i.e. the French valve).

The question as to the validity of the Marconi patents remains as it was left by the court below. In other words, they are valid for the construction of valves which they actually describe.

BOOK REVIEW

Your Broadcast Receiver and How to Work It. A want long felt by those who have just taken up wireless has been supplied by Percy W. Harris, Editor of "Conquest," in his book entitled "Your Broadcast Receiver and How to Work It." (Wireless Press Ltd.).

Containing eleven chapters, this little book deals very conclusively with all the problems that beset the beginner, taking the various parts of the instrument separately and thoroughly, explaining their construction and manipulation. A useful chapter deals with the care and management of accumulators; while a final chapter discusses concisely the question of reaction, its use and abuse. Amateurs with B.B.C. sets should certainly get this book.

CORRESPONDENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I think that the following extract from my log book might be of some interest to your readers.

Monday, March 13th, 1923, I was listening to 5 S C (Glasgow) on a crystal set to-night, and was getting it very well. During a two-minute interval I was surprised to hear a woman singing very faintly; I immediately tried to tune in better, and in doing so, tuned in another station in time to hear the "wireless orchestra will now play," followed by distinct though faint music. The time was about 19.30, and the wave-length and items pointed out that the two stations were Newcastle and Birmingham respectively. Feeling rather pleased and very optimistic, I tried lower down, and was rewarded by hearing a man speaking; this I took to be Manchester. I then tried for London, but by this time 5 S C was on again.

At 21.30 I again tried the crystal set and heard chimes, but before they were finished a man commenced talking. I am quite sure that the man talking was at Manchester, but whether the chimes came from there or 2 L O I cannot say.

For the benefit of your readers I may state that my distances from the stations mentioned are as follows: 5 S C, 30 miles; 5 N O, 150 miles; 2 Z Y, 200 miles; 5 I T, 280 miles; and 2 L O. 380 miles. My aerial is a single wire, 40 ft. high and 60 ft. long, and pointing in an easterly direction.

To those who would suggest re-radiation as the cause of this, I would mention the fact that there is no wireless experimenter within a five-mile radius, though there is a "broad-catcher" about a quarter of a mile away. Also, there is the fact that at present most people are listening to Glasgow, as it is impossible to tune it out in this district. There is also the fact that I heard several different stations to disprove this theory.

Trusting that the above may be of interest, and wishing your paper every success.

I am, yours truly,

ALEX. A. M. TURNBULL.

Ruberslaw, Innellan.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue, in the article by A. H. Daly, he states that Leafield, Oxon, can be heard clearly in Melbourne, Victoria, the distance being 11,000 miles.

Leafield can be heard there, but it is not 11,000 miles in distance.

I am a professional operator on the Australian run, and regularly receive Leafield up to 9,500 miles, which is a point around the coast between Melbourne and Sydney, passing through the Bass Straits.

The question of reflection can be doubted to some extent by the fact that the signals from Leafield remain a constant strength from Port Said to Sydney, N.S.W. I speak of the 8 p.m. press transmission.

With the same single valve set, Annapolis, U.S.A., has been received up to 10,500 miles, the farthest point possible on the route.

This will make amateurs wonder a little, but it is perfectly true.

To those who grumble of Leafield's harmonics, let them remember that the press being sent out is being received half the world over, and by ships who otherwise are isolated from the outside world.

Leafield is a station to be proud of, and our government has surely achieved something when it is possible to transmit to Australia, our farthest dominion of the Empire, whenever it chooses to do so.

Thinking this little correction is necessary, and a little sidelight to the amateur of many valves, of what the professionals do with only one, and no reaction.

Yours truly,

G. E. BAKER.

Two young American amateurs with their home-made sets. Note the American type of gear

The Editor, POPULAR WIRELESS.

Dear Sir,—I am heartily in accord with the views expressed by Mr. C. A. Sheldrick in your issue dated March 3rd, wherein he thinks that the trouble he is experiencing in obtaining a licence is shared by scores of other "unfortunates."

At the present time 2,000 applications for experimental licences are received daily by the G.P.O., and, to my mind, this fact alone should convince the B.B.C. that there are thousands of people willing to pay their share towards the cost of the excellent entertainments that are broadcasted nightly.

Moreover, seeing that the B.B.C. receive 50 per cent. of the licence revenue, are they not "robbing" themselves of £500 daily by refusing to grant permits to these amateurs, myself included, who are at present forced to forgo the pleasure of listening-in owing to their inability to purchase expensive apparatus whereon the royalties imposed are already paid?

It certainly behoves the B.B.C., in conjunction with the G.P.O., to issue a permit that will cover the amateur who has made his own set, and I think, by so doing, the revenue of which they seem to be sorely in need will be forthcoming to an extent that will exceed their expectations.

Yours faithfully,

F. C. L.

Thornton Heath, Surrey.

The Editor, POPULAR WIRELESS.

Dear Sir,—In reading some of your articles, I see that in the Old Country the experimenter has been putting up some records in low-power transmission, and perhaps that your readers would be interested in some of the doings of amateurs in far-away Australia.

Up till a month ago experimenting in Australia was not all milk and honey for amateurs, but now we have a new set of regulations which are pretty liberal. The licence fees are £1 for receiving and transmitting, and 10s. for receiving only.

Power of from 5 watts to 250 watts is allowed, according to distance from a Government station, and there is no restriction on the size of aerials.

The biggest slug out here now is the high price of apparatus. For instance, the "Ora" valve costs 30s., and is the cheapest obtainable. I have to content myself with a crystal set, but intend to build a valve set as soon as finances will allow.

With my loose coupler set I have had good results, getting land and ship stations up to 2,000 miles on a three-wire aerial, 110 ft. long and 45 ft. high, the spreaders being 12 ft. long. I also get the concerts which the Amalgamated Wireless Co. send out now and then. It is their intention to start a proper broadcasting service at an early date.

I might add that I have been a reader of POPULAR WIRELESS ever since No. 1, and I think we have had 23 copies so far. We have two publications, printed in Sydney, devoted solely to amateur wireless, the "Wireless Weekly" and the "Australian Wireless Review," published monthly

I am, yours faithfully,

JOHN E. JUNG.

"Newport," George Street,
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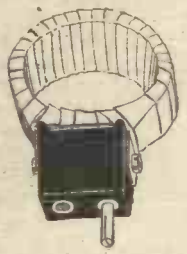

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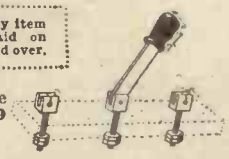

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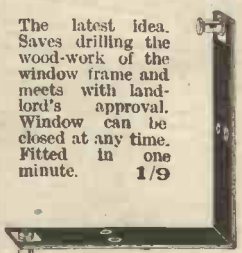

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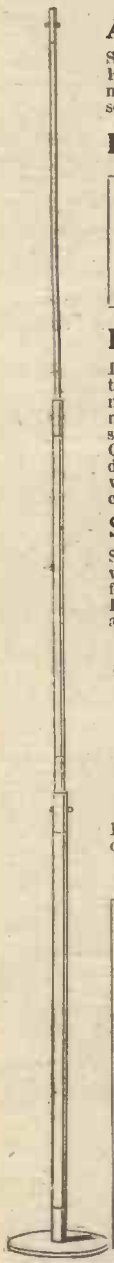

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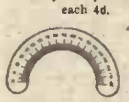

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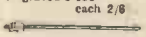

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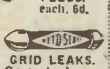

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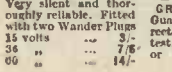

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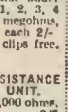

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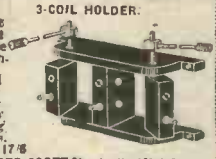

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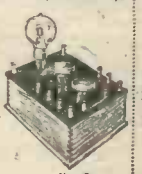

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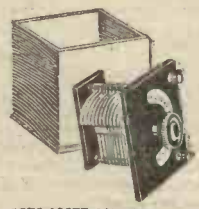

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Totally enclosed and mounted on polished Ebonite and all fittings plated 5/6

EBONITE SLIDER.
As shown, each 5d.

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MK III. pattern. Small, 2/3 doz. Large, 2/6 doz.
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SWITCH STOPS.
Brass, fitted with two nuts.
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Brass, fitted with two nuts.
per doz. 9d.

VALVE SOCKETS.
Brass, fitted with two nuts ... ... each 1½d.
per doz. 1/4

THE "PETO-PAN," LOUD SPEAKER.
A superlative Loud Speaker. Fitted with adjustable diaphragm which controls pitch of note. Price 50/-
Broadcast Co.'s Seal, extra 3/-

CRYSTAL RECEIVER.
(De Luxe pattern).
Complete with best quality phones, aerial wire and insulators. Nothing more to buy.
Price, £6 6s. 0d.

WIRELESS CLUB REPORTS.

The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An Asterisk denotes affiliation with the Radio Society of Great Britain.

The Stratford-on-Avon and District Radio Society.

The fifteenth general meeting of the above society was held on Monday evening, February 19th, at the Rother Street headquarters. The report of previous meeting being read, the secretary explained the construction of a variometer and its use, various parts of the instrument being passed round for inspection. The next item consisted of the winding of "Honeycomb" inductances, both by hand and machine. A receiving set made by one of the members was brought along for inspection and test, and after a brief explanation of the apparatus it was coupled to the aerial and good results obtained.

Hon. sec., Mr. E. W. Knight, 17, Park Road, Stratford-on-Avon.

Isle of Man Radio Society.

A meeting was held on February 19th at the Secondary School, Douglas. Mr. H. Colebourne presided, and there was a good attendance. After the opening business the chairman called upon Mr. P. J. Johnson to address the meeting on "The Valve as a Detector." The speaker explained the action of the original two-electrode Flemming valve. Dealing with the three-electrode valve he showed the action of the grid as a controlling electrode, producing variations in the anode current which affected the telephones. Mr. Johnson illustrated his very capable address by a large number of very clear diagrams which reflected the thoroughness and excellence of his effort. Some discussion took place, and a vote of thanks to Mr. Johnson was proposed by Mr. Gillmore, seconded by Mr. Denny, and carried unanimously.

Joint hon. secs., Mr. J. S. Craine, 6, Belmont Terrace; Mr. J. P. Johnson, 16, Hildesley Road, Douglas.

Guildford and District Wireless Society.

On Monday, February 19th, the club assembled for the first regular meeting at their new premises (148, High Street) to hear a paper read by Mr. P. K. Turner on aerials and aerial circuits. Mr. Turner went considerably into detail on the matter, devoting the vast majority of the available time to considering the outside aerial only.

The Fulham and Putney Radio Society.*

The above society has been reorganised and a new committee formed, who intend to run the society on up-to-date lines and give the members something of interest at each meeting.

At a meeting held at headquarters on Friday, February 16th, amongst other business, R. H. Redmond, Esq., T. Hart Smith, Esq., and E. M. Wolfe, Esq., M.B.E., were elected vice-presidents.

A very interesting demonstration was given by Mr. Pincott with his four-valve set and loud speaker made by himself, and at 9.30 p.m. Mr. Hubbard, 2 X O, a member, transmitted speech and music from his station, which was rendered very loud and clear to the members through Mr. Pincott's loud speaker.

The membership has greatly increased, and now that the society is well established and bright, instructive meetings promised, the membership should still increase.

Hon. sec., J. Wright Dewhurst, 52, North End Road, West Kensington, London, W. 14.

The Hinckley and District Radio Society.

The Hinckley and District Radio Society, which was formed in December last, continues to make progress. The membership exceeds thirty, and includes several ladies. Messrs. Pickering & Sons, printers, have given the free use of a room in their premises, and an aerial has been erected by members of the society. Application has been made for a licence for reception, and in the meantime a sub-committee is undertaking the construction of a five-valve instrument. A Morse class has been formed with Mr. Elliot as instructor.

Sec., W. Bliss, The Haven, Cleveland Road, Hinckley.

South Shields Y.M.C.A. Wireless Society.

The above society gave a demonstration of wireless telephony on February 3rd at the Sunday evening concert held in the Y.M.C.A. Hall, and aroused considerable interest.

Hon. sec., Mr. G. G. Busbridge, 25, The Crescent, Cleadon Estate, South Shields.

THE ATTACK ON THE B.B.C.

AS we go to press with this issue the "Daily Express" has created some interest in the Wireless World by a whole-hearted denunciation of the B.B.C. and the present broadcasting arrangements.

"Popular Wireless," at the moment of writing, will adopt an impartial attitude until the "Daily Express" give some indication that they have a practical alternative scheme for "running" a broadcasting service.

At the moment their criticisms are more destructive than constructive; they suggest their readiness to carry out a broadcasting service on their own—another monopoly, and one which would only set the rest of the Press in an uproar.

In their issue for April 6th the "Daily Express" says:

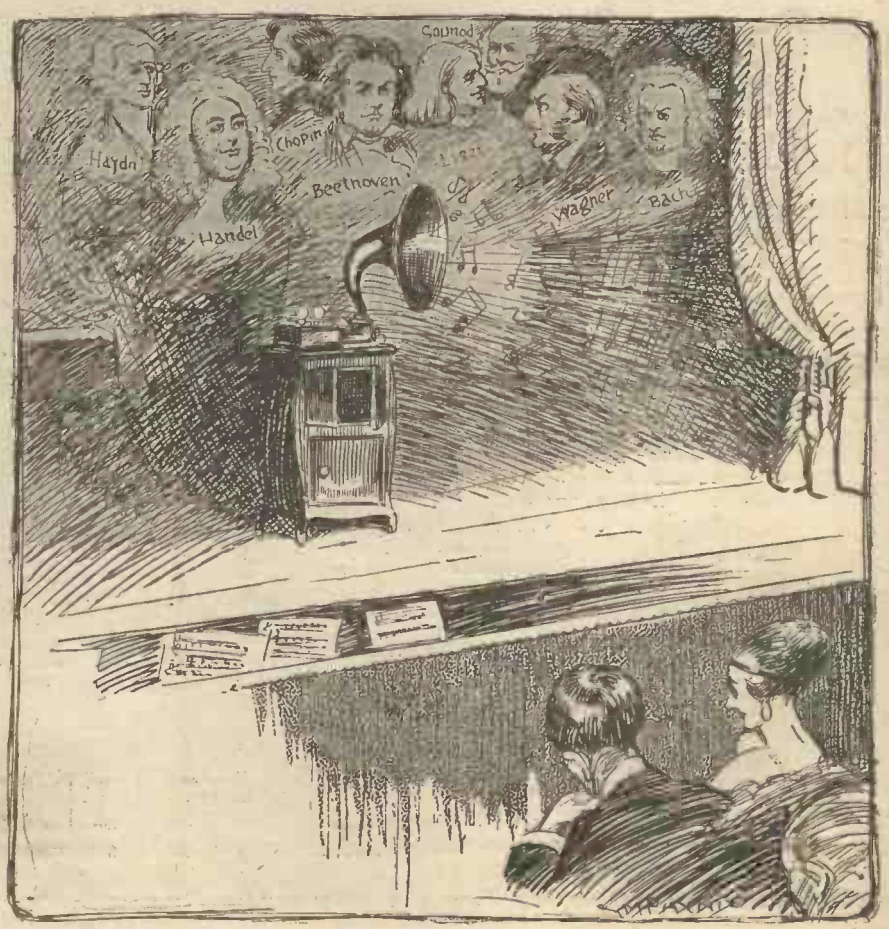
"Several firms are prepared to follow the lead of the 'Daily Express,' which has offered to begin broadcasting at once for nothing and provide programmes that will rescue listening-in from the boredom of the lustreless programmes sent out by the British Broadcasting Company.

This would, of course, be a very nice little scoop for the "Daily Express"—but there is not much chance of it coming off. On the other hand, the "Daily Express" has undoubtedly a very good case against the present broadcasting system. "Popular Wireless" agrees that the programmes are not as good as they might be, and that the exorbitant charges for receiving sets are a direct result of the present monopoly.

The Radio Association has cast in its lot wholeheartedly with the "Daily Express" — but although "Popular Wireless" is the official organ of that Association, its views are not necessarily the same as those expressed by the Radio Association.

"Popular Wireless" prefers to withhold a definite opinion until further details are forthcoming.

THE GHOSTS LISTEN IN.



RADIOTORIAL

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

Readers have probably noticed how all the daily papers have just lately taken up the slogan, "Another class of licence is wanted." The "experts" employed by the various newspapers have at last realised the importance of encouraging the amateur to exercise his ingenuity in making his own apparatus, and although they have been a long time following the lead given by POPULAR WIRELESS, I am glad to see that a good deal of publicity is being given in the daily press to this important question. As I have said before, things move slowly in the official world, but no one doubts that the home-made set licence is now a foregone conclusion, and before long the thousands of P.W. readers who have been chafing under the narrow restrictions resulting from a hasty G.P.O., will have been relegated to the scrap heap, and amateur initiative will at last be able to work in the light without detriment to the revenue of the B.B.C.

But, as I have said before, even when this desirable state of things has come to pass, there will still remain a few "dodgers," gentlemen who feel a moral objection to paying even a yearly licence fee.

Every reader who loves fair play will agree with me when I say this type of dodger deserves no sympathy, and that if he is caught out he has only himself to blame if he gets severely dealt with.

THE EDITOR.

Questions Answered

Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, I have temporarily decided to limit the number of questions sent in by one reader to three. Readers are asked to keep their questions as short and as concise as possible in order that the minimum of delay can be exercised in answering queries. Until further notice three questions from one reader will be the limit for one letter. All questions should be addressed to POPULAR WIRELESS Queries Department, Room 138, Fleetway House, Farringdon Street, London, E.C.4.

Readers are requested to send the necessary postage for reply.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

M. C. H. (Antwerp).—What are the millimetre dimensions of the most used gauges of copper wire?

20 S.W.G. is ·9144 mm; 22, ·7112; 24, ·5588; 26, ·4572; 28, ·3759; 32, ·2743; 36, ·1930; 38, ·1524; 40, ·1219; 44, ·0813; 46, ·0610; 48, ·04064.

* * *

D. E. R. (Harlow).—I am thinking of using dull emitter valves on my three-valve set, shall I need to alter the wiring at all?

No, practically the same circuits will be quite suitable, but you may find that a grid leak of different value will be necessary for the best results. Your present filament resistance will be O.K. If you use dry cells or a 2 volt accumulator. It would be best to add a separate filament resistance for the detector valve, as a great deal depends upon the filament control, and it is not always convenient to have the detector and L.F. working off the same control.

* * *

A. T. C. P. (Catford).—I have been told that to decrease the wave-length of my aerial I must connect a small capacity condenser in series with it, but also that the smaller the condenser the more decrease in wave-length will be obtained. Is this correct?

Yes, quite correct. You are probably familiar with the fact that a capacity in a series decreases the capacity of the aerial, and also that to add a condenser in series with another condenser will decrease the capacity of the circuit. This is easily shown, and the actual values obtained can be worked out by the formula $\frac{1}{K} = \frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}$, etc., where K is the resultant capacity, and K1, K2, K3, etc., are the respective capacities of the various condensers connected in series. Suppose, for the sake of argument, that the capacity of your aerial is 2 mfd.—it is much less really—and that you are adding a capacity of 3 mfds. in series with it. The resultant K is found by the above formula; so we have $\frac{1}{K} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$; therefore $K = \frac{6}{5} = 1\frac{1}{5}$ mfd., which is less than that of the original aerial. Now, if we add a *smaller* capacity to the aerial we shall find that the capacity of the aerial is still further reduced. Using a capacity of 1 mfd. we have $\frac{1}{K} = \frac{1}{2} + \frac{1}{1} = \frac{3}{2}$, so that $K = \frac{2}{3}$, which is much less than $1\frac{1}{5}$. Thus it is seen that the smaller the capacity in series with another capacity, the smaller is the resultant capacity. Now, if we decrease the capacity of an aerial we decrease its wave-length, so, therefore, by adding a small capacity we decrease the wave-length of the aerial by a larger amount than if we added a large capacity in series with the aerial.

* * *

"Spider-Web" (Northampton). I have wound some spider-web coils, using 9 spokes and 26 D.S.C. wire, but find it very difficult to keep the coils from falling to pieces when the spokes are removed. Can I soak them in paraffin wax?

The coils may be soaked in paraffin wax, but on removal should be shaken so that all surplus wax is thrown off. Before removing the spokes tie each part of the coil where the wires cross with string. This will prevent the coil collapsing when the spokes are removed. Remember that not more paraffin wax should be used on the coils than is necessary to keep them fairly rigid, as the whole idea of the basket or spider-web coil is to avoid too much self capacity, and if you fill up the air spaces between the turns with paraffin wax you will increase the capacity of the coil.

* * *

M. A. M. (Torquay).—How does a hot-wire ammeter function?

This type of ammeter is used when alternating or high frequency currents have to be measured. Owing to the fact that these currents are always rapidly changing in direction, the ordinary coil type of ammeter would not be able to register. In this case the hot-wire ammeter is used. A special platinum wire, which expands evenly is employed, and this is attached to the pointed and calibrated scale. The heat evolved by the current surging through the wire causes the wire to expand and sag, and this in turn operates a pointer controlled by a small spring. Thus it is the heating effect of the current which operates the instrument, and from this is registered the flow of current in amperes.

* * *

P. T. D. (Winchester).—Is there any fuse on the market which can be used to protect a valve from the H. T. battery?

You will find that a 2·5 volt pocket-lamp bulb placed in series between the high-tension battery and the positive H.T. terminal of the set will protect the valve quite successfully against any wrong connection that may endanger the filament. Normally, only a few milliamps. will be flowing through the small bulb, so that it will not form any appreciable resistance in the plate circuit. Any sudden discharge of the battery will have to pass through the lamp, and will blow the filament before damage is done to the valve.

* * *

"Dull Emitter" (Plaistow).—Are there any dry cells that will successfully light a dull emitter valve for a fairly long period of time?

Yes, the ordinary pocket-lamp cells will do it if a very low consumption valve is used, such as the ·1 amp. type. If the ·3 amp. valve (D.E.R.) is employed, you will find that the Hellesen batteries of large capacity will last a considerable time. Such types naturally cost rather more than the ordinary small cell, but will be worth the extra outlay in the end.

* * *

"Condenser" (Manchester).—What are the specific inductive capacities of plate-glass, paraffin wax, ebonite, mica, air, shellac?

(*Continued on next page.*)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from previous page.*)

The specific inductive capacities or dielectric constants are as follows: Plate-glass, 5.8 to 8.5; paraffin wax 1.9 to 2.3; ebonite, 2.2 to 3.2; mica, 5.0; air is taken as unity; shellac, 2.74 to 3.73.

* * *

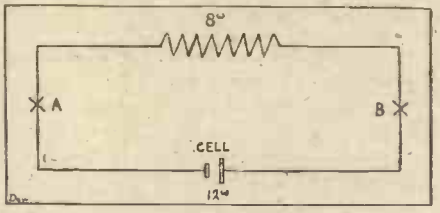
M. A. P. (Godalming) asks for a criticism of his four-valve set.

Firstly, your grid is wrongly connected. You are using I.H.F. valve and a L.F. with the detector between them, therefore the grid leak and grid condenser should be connected to the second, or detector, valve, not to the first valve, which is to act as an H.F. amplifier. Your H.T. battery should have a condenser connected across it, about ·02 will be O.K., and the phone transformer should be shunted by a ·001 mfd. condenser. Yes, we advise the tuned anode type of H.F. plate tuning for wave-lengths below 1,500 or 2,000 metres; but you should certainly use reaction. The reaction can be coupled with the tuned anode coil very easily, especially if you use basket of honeycomb coils for both.

* * *

F. L. (Teignmouth).—How can I measure the internal resistance of a battery?

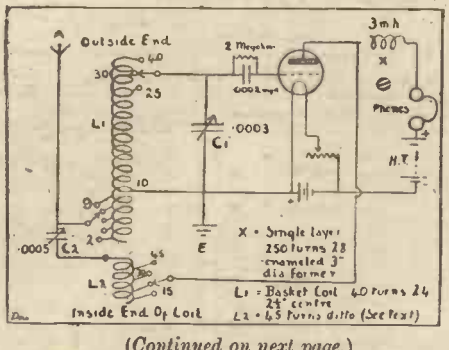
There are numerous methods, most of which call for the employment of a standard cell; but the possession of a voltmeter and a known resistance will suffice in the following case. From a knowledge of the voltage of a cell on open circuit, and the difference of potential across its terminals when connected up with a known resistance, the value of its internal resistance can readily be calculated. For instance, we will presume that the voltage registered across the cell terminals on open circuit is 2 volts, but when the circuit is closed through an 8-ohm resistance, as shown in the diagram, the difference of potential across points A and B drops to ·8 volts. Therefore it shows that 1·2 volts have been lost in the battery itself. Now the current flowing through the battery and the external resistance will be, naturally enough, the same, therefore it follows by Ohm's Law that ·8 is to 1·2 as 8 is to the internal resistance of the battery, which is obviously 12 ohms.



* * *

B. N. (London) and others ask for particulars of the Reinartz receiver.

The Reinartz receiver designed by Mr. J. L. Reinartz is the combination of inductive and capacity reaction, and is said to be one of the most suitable circuits for the reception of short-wave C.W. yet devised. It is not suitable for the reception of telephony. Most of the details are embraced by the accompanying diagram, with the exception of the coils L1 and L2. These are constructed in the following manner. On a former 2½ ins. in diameter with 9 spokes, 45 turns of 24 gauge wire is wound



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RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from previous page.)

leads being taken to studs at the first, fifteenth, thirtieth, and last turns. Above this coil on the same former is then wound a further 40 turns of the same wire, tappings being taken at the points shown in the diagram. This latter is L1, whilst the first coil of 45 turns is L2 in the diagram.

* * *

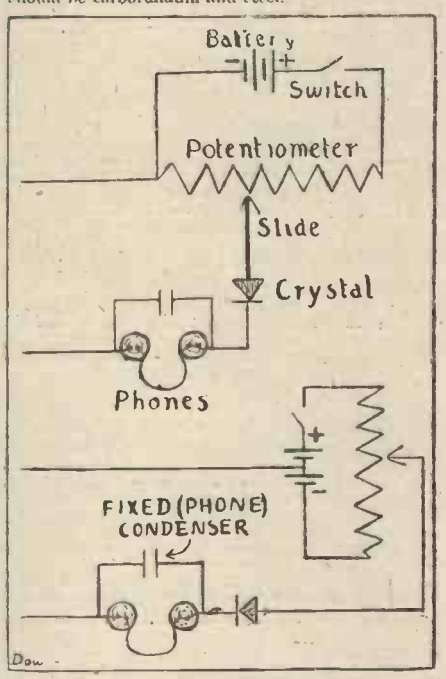
P. W. R. (Nottingham).—Is there any advantage in using an earth arrester?

Yes. It does away with the need for an earthing switch for protection against lightning and other heavy discharges. The earth arrester provides a by-pass for such heavy discharges, which will spark across the small gap in the arrester rather than take the path of high impedance through the coils and windings of the set.

* * *

"CARBO" (Glasgow).—How do I put a potentiometer and battery into circuit if I change my crystal for carborundum, which I believe must have such additions?

See the accompanying diagram. You will note that two methods are shown, the bottom one allowing for the varying of a potential through the detector circuit in either direction. Although an extra battery may be required, this latter arrangement is very advantageous, as it prevents the necessity of changing leads over arising. Don't forget to leave the switch open when the set is not in use, otherwise the battery will be slowly running down all the time. The potentiometer should have a resistance of some 400 ohms, the battery a pressure of 4 volts or so. A dry battery is all that is required, and the detector should be carborundum and steel.



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RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from previous page.)

F. E. (Peterboro').—Why is a short aerial advisable for broadcast reception? You tell me that a 60-ft. single aerial will be more suitable than one that is longer, and also a single 60 ft. will be better than a twin aerial 60 ft. long. Why is this?

In the first place, an aerial has fundamental wave-lengths, and to tune to stations sending on various W.L.'s, it is necessary mostly to loud inductance on to it in order to increase its wave-length and bring it to that value, where it will correspond or be in tune with that of the desired station. If the natural wave-length of the aerial system is above that of the transmitting station, then the capacity factor must be attacked and reduced by placing a condenser in series. The next point to consider is that of potential. A detector is a potential operated device, and therefore it is as well to tap the detector circuit off across points of greater difference possible. Therefore, the inclusion in the aerial circuit of a reasonably sized inductance is advantageous. Further, the introduction of capacity is, as is well known, disadvantageous, owing to the damping that results. Therefore, a moderate aerial with a fair amount of inductance in the set is necessary for obtaining efficient results on the shorter and broadcast wave-lengths. It must be added that height is *the* important factor in aerial efficiency.

* * *

"AMATEUR" (Broad Oak).—What are the most important points that determine the power of a wireless receiver?

The efficiency of the aerial and earth system, sharpness of tuning, sensitivity of the detector and telephone receivers, and degree and extent of amplification if employed. There are other points no less important, but will be efficient in standard design and construction of apparatus.

* * *

L. C. (Bristol).—I have a crystal set ranging from 300–600 metres, with two sockets for plug-in loading coil. What size coil should I need to increase the range to 2,600 metres?

Provided you do not wish to tune in stations between 600 and 2,000 metres or so; a 150-turn honeycomb coil would be quite suitable. Use 26 D.S.C. on a 2-in. former, about an inch to an inch and a half wide, with 15 spokes each side. Tappings could be taken from this coil to provide for wave-lengths between 600 and 2,000 metres, though for those lengths it would be more advisable to use various sized coils for plugging in. A set of honeycomb coils of 35, 50, 75, 100, and 150 would meet your requirements quite well.

* * *

"ENQUIRER" (Barnes).—How does one work out the inductance and capacity of an aerial?

The formula for working out the inductance of an aerial is as follows. In the case of a single wire:

$$L = \frac{2l}{1000}\left(2.3 \times \log. \frac{4l}{d} - 1\right) \text{ mhys.,}$$

and in the case of two parallel wires,

$$L = \frac{4l}{1000}\left(2.3 \times \log. \frac{D}{d}\right) \text{ mhys.}$$

For mathematically determining the capacity of an aerial:

$$C = \frac{1}{4605\left(\log. \frac{4h}{d}\right)900{,}000} \text{ mfds.}$$

l = length of wire; D = distance between parallel wires; d = diameter of wire; h = height. All, as usual, in cms. Results will be approximate.

Another and simpler method, which will give results almost as accurate as the above is likely to be, is to multiply the length of the aerial in feet by 1·5, call the capacity factor ·0002 for a small aerial and ·0003 for a larger, and apply the formula

$$L = \left(\frac{1{\cdot}5 \times l}{1885}\right) \div {\cdot}0002 \text{ or } {\cdot}0003$$

in order to obtain the approximate inductance of the aerial in mhys.

* * *

E. E. P. (Axmins er).—I find difficulty in polishing ebonite. Can this be done successfully by an amateur?

Yes, but why polish it? In the case of panels, though a highly polished surface certainly gives the instrument a smart appearance, we prefer a matt surface when the insulating properties are taken into account. You will find that moisture is apt to condense on the surface of the polished panel, and thereby give rise to a certain amount of leakage. The necessary treatment of ebonite in order to get that fine polish is rather tedious, but if carefully carried out will be

(Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from previous page.)

found to be quite effective. If a lathe is handy, the procedure will be considerably shortened, though just as fine a surface can be obtained by hand. First of all the ebonite is treated with water and finely powdered Bath brick until all the rough scratches and surfaces have disappeared. Then rub the surface carefully with a mixture of soft soap and rotten stone until the desired smoothness has been obtained. Rinse with petrol and polish with a dry chamois leather cloth. This latter can be greatly facilitated if a lather with a high-speed revolving buff is used.

* * *

F. H. T. (Pitsea).—What materials are used in lacquer, and how is it applied?

A very good lacquer can be made up from about 1½ lbs. of seed lac—as clean as you can possibly get it and free from all black specks—and a quart of rectified spirits. The two are shaken up together and kept warm until all the solid has dissolved. When lacquering see that the brass is perfectly clean and free from grease, and apply the solution with a fine camel-hair brush. It is usually found more effective if the lacquer is applied to the object when cold, instead of warming the brass, as is often recommended. When a fairly even coat has been put on warm the article gently until the lacquer melts. Remove the brass from the flame as soon as it becomes bright, when it will be seen that the lacquer has run slightly and formed an even coat over the surface of the metal. Needless to say, the portions of terminals, switches, etc., which have to make electrical contact with wires or one another should not be lacquered.

* * *

K. N. T. (Harringay).—Up to the last few days my set has been working quite well, but lately results have been very faint. Is my valve burning out?

No; the valve will keep up its efficiency to the last, though it may become a trifle soft. In all probability either the H.T. or L.T. batteries are at fault. See that the L.T. accumulator is not sulphated and is registering its correct voltage (1.8 or more per cell) while on discharge. Try a new H.T. battery. If this does not clear up the trouble, test the phones on someone else's set and see that they are O.K. Next have a look at all connections, especially the switches, and make sure that they are clean. A tiny coating of oxide will be quite sufficient to cause decreased signals or even complete failure. It will be just as well to clean all connections and terminals and thoroughly overhaul the set.

RECENT WIRELESS INVENTIONS.

The following abstracts are published by arrangement with our Patent Adviser, Harold J. C. Forrester, Chartered Patent Agent, of Jessel Chambers, 88-90, Chancery Lane, W.C.2.

Grant of the following Patents can be opposed, and printed copies of the full specifications, with drawings, can be purchased from the Patent Office, Chancery Lane, W.C. 2.

192,342.—NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN.—RECTIFIERS.—A screen of mica is placed between the electrodes of a two electrode rectifier to prevent disintegration and deposits of one upon the other.

192,404. — SIGNAL GES. — TELEPHONES.—Diaphragms have radial and concentric corrugations or inclined slots to prevent buckling under temperature changes which would affect tuning and air gap.

192,429.—J. SCOTT-TAGGART & RADIO COMMUNICATION CO.—RECEIVING APPARATUS.—For receiving continuous waves a valve has its anode at zero, negative, or slightly positive potential, and a local current of audio frequency or a slightly different frequency from the received waves is impressed upon the anode of a two electrode valve or upon the grid of a three electrode valve. The anode potential prevents current flow in the anode circuit except when signals are received. In one arrangement, the grid of one valve receives the incoming oscillations, the plate and filament are bridged by the grid circuit of a generating valve, the oscillatory circuit of which may be tuned to give oscillation at nearly the incoming frequency. The telephones are inserted in the anode circuit of the second valve, and fluctuations of conductivity of the first valve cause variations in the current flow through the second.

192,460.—C. LORENZ AKT.-GES.—ALTERNATING CURRENTS.—For converting low to high frequency, the iron cone of a transformer in series with an alternator is arranged to be readily saturated, and the circuit tuned to the alternator frequency. The high frequency circuit comprises an aerial and inductance connected to earth through the transformer, and tuned to an odd multiple of the low frequency.

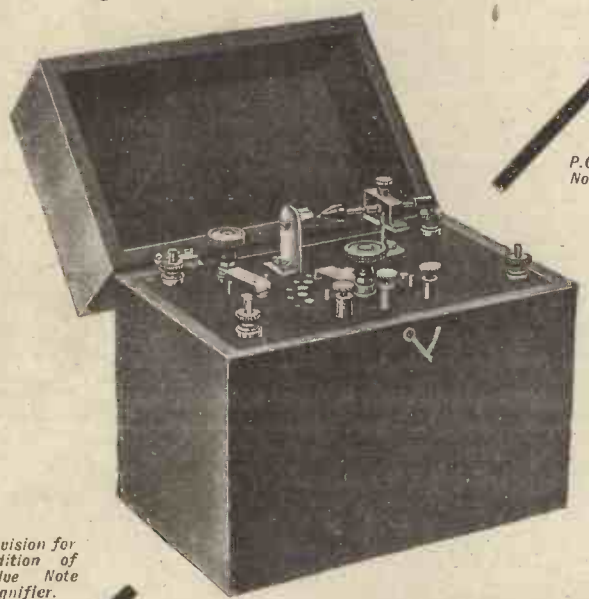
192,461.—C. LORENZ AKT.-GES.—ALTERNATING CURRENTS.—An oscillatory circuit tuned to a harmonic of a low frequency source is connected in parallel, and a large inductance in series with a transformer coil. An aerial may be directly or inductively connected to the transformer winding.

192,464. — W. R. BULLMORE. — VALVES. — The electrodes are made spherical or egg-shaped, and arranged one inside the other, the grid being wound about the filament upon a removable hollow mould, and the plate formed of two hemispherical stampings of sheet metal or fine gauze.

We have arranged for Patent Enquiries addressed to our Patent Adviser to be answered direct by post, any enquiries of general interest being also answered in our columns.

The Ediswan Model · 1923 B Crystal Set

The Set that is bang up-to-date and bristling with good features. Selling like hot cakes. Supplies being turned out at rate of one every 6 minutes. Shoals of enthusiastic reports from users everywhere. Acknowledged to be the "best crystal set yet."



P.O. Reg. No. 433

Provision for addition of Valve Note Magnifier.

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