

# A CHRISTMASSY NUMBER

NEW IDEAS IN COMPONENTS

# Amateur Wireless And Electrics

Vol. V. No. 133.

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Price 3d

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WIRELESS HUMOUR

PRACTICAL ODDS &  
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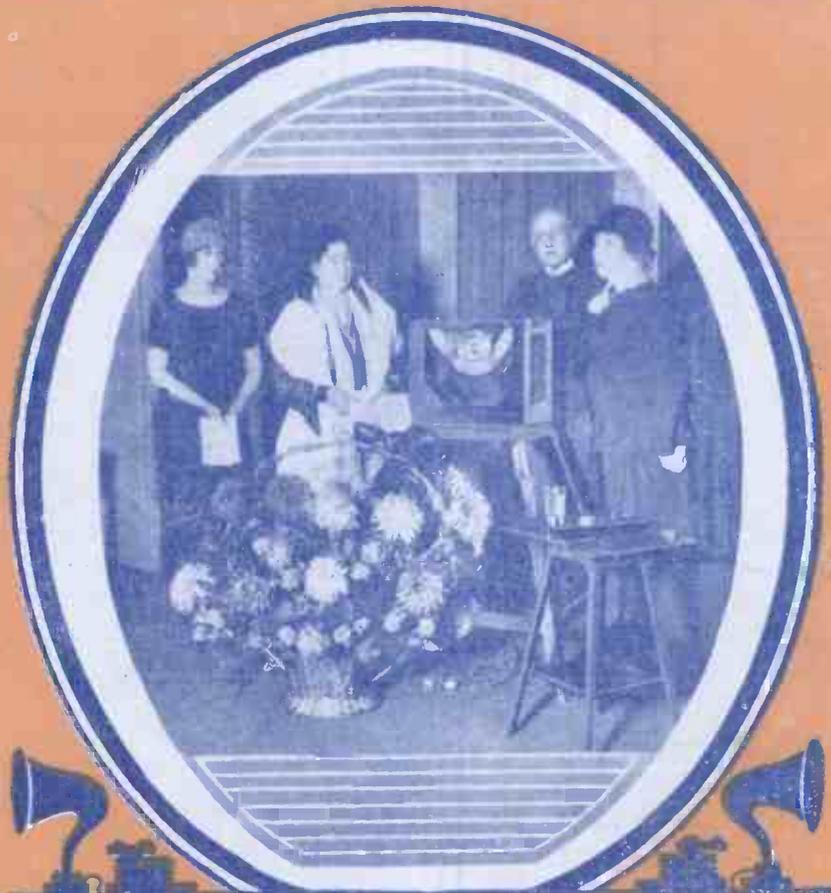
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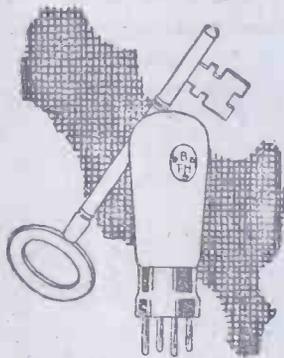
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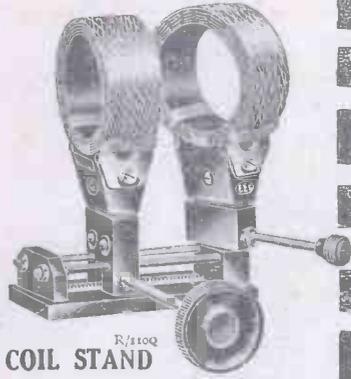
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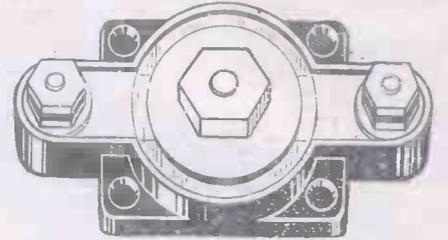
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*(Daily Express,  
Nov. 22nd, 1924)*

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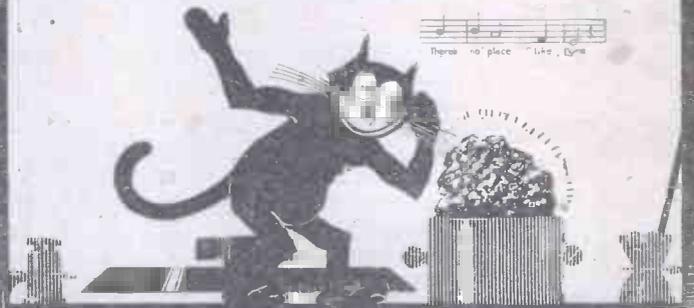
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*“The Finest Crystal in Existence!”*

# Amateur Wireless

## and Electrics

Vol. V. No. 133

December 20, 1924

## GETTING THE BEST FROM THE LOUD-SPEAKER

A LITTLE trouble in experimenting will often improve vastly the results obtained from a loud-speaker. Here are indicated the lines on which simple experiments can be carried out to determine the best means of using the loud-speaker.

### Too Much Power

One can at least be thankful that the loud-speaker demonstrations of the early days, when a hard and metallic sound roared forth as one passed the door of a wireless shop, have passed. They most probably frightened away more customers than they attracted. Generally they were examples of overstressing the loud-speaker diaphragm by providing too much power. Every loud-speaker is built for a purpose, and one cannot employ successfully a baby model to provide, for example, dance music on the lawn. That is the first point, choose your loud-speaker with some idea of where and for what purpose you are going to use it.

### Balancing the Defects

The use and design of loud-speakers are mainly a matter of compromise. Distortion can never be eliminated altogether, and in fact the human ear is quite used to a certain amount of distortion, but we require as far as possible to reduce distortion to the limit to which we are used. To do this entails a certain amount of personal experiment. Perhaps the high notes are over accentuated; this can be improved by shunting a fixed condenser across the secondary windings of the loud-speaker. The value of the condenser for best results will vary in every individual case.

### Controlling the Volume

Some, in fact many, loud-speakers have a mechanical means of adjusting the diaphragm and this should be adjusted first; but if there is still a tendency towards an effect of chatter and distortion, probably the signal strength is too strong for the type. The remedy is then to dim the filaments or reduce the high-tension voltage, or both, until pleasing results are obtained. Of course it may be possible to cut out one valve.

Tuning also provides a means of adjusting the volume. Slight detuning on a sensitive set will quickly make a difference to the volume obtained.

### The Position of the Loud-speaker

As Captain Eckersley has explained in his technical talks, a certain amount of echo effect is essential to successful transmission. Similarly an echo effect will often provide improved reception from a loud-speaker. The echo effect will vary with every room, and it is well worth trying the effect of placing the trumpet at varying distances from a wall and facing towards the wall, repeating the experiment with the trumpet facing a corner. The height of the loud-speaker from the



The Amplion "Dragonfly" Loud-speaker

floor also affects the results; and when trying out various positions remember that one is usually seated when listening, therefore be seated when testing, as a standing position may indicate slightly different results.

### Obtaining a Smooth Tone

Another method of providing against over-emphasis of high notes already referred to is to place a condenser, or condensers, across the terminals of the loud-speaker. The higher the value of the condenser the lower in tone the sounds that issue from the loud-speaker. The general practice of putting a fixed condenser across the phone terminals of the

set, of course, produces the same result, but too often the condenser used is on the small side. If one likes a low tone a condenser as large as .05 to .01 microfarad can be used with some types of loud-speaker. By arranging a switch-arm and studs in a similar manner to that employed on a tuning coil, but connecting condensers of various values to it in place of the coil, it can be arranged that a condenser of different value can be switched on at will. Thus the tone control can be varied in accordance with the class of music that is being transmitted.

An alternative method is to use a high fixed resistance in parallel with the loud-speaker terminals, one of the fixed value anode resistances being used for the purpose, but this usually has the effect of considerably reducing signal strength.

### The Effect of Long Leads

The methods of overcoming distortion which have been mentioned will all be affected if the loud-speaker is used in various rooms by means of leads run along the walls of the rooms and passages or under floors. It is therefore useful to have the control switch, mentioned previously, so that adjustments can be made by using different condensers, for it will be found that the effect of the long leads is to generally alter the value of condenser required to give the best results.

If the resistance method be employed, the difference will not be so noticeable, but the diminished signal strength will be accentuated due to the use of the long leads. One always tends to lose signal strength when long leads are brought into use. Many useful and interesting experiments can be made along the lines indicated, and it must always be borne in mind that individual tastes differ. Some like a high-toned instrument, others a low and mellow tone, and therefore the value of additional components to be used can only be determined for each individual case.

Volume is not everything. Most people would rather have pure sound and less volume. To hear a loud-speaker all over the house may indicate strong signals or a badly-built house, but it does not necessarily imply good tone. S. M. H.

WVJ regularly broadcasts play-by-play actions in baseball games at Detroit.

# CRYSTAL TALKS.—VII :: THE PROPER USE OF THE CONDENSER

In this article it is proposed to discuss the subject of fixed and variable condensers, their uses and construction. As

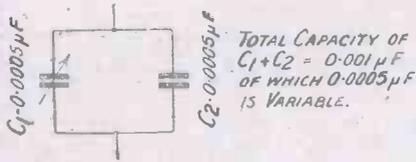


Fig. 1.—Condensers in Parallel.

suggested in a previous talk, condensers are best not embodied in the actual receiver from an experimental point of view. I will therefore describe an interesting method of employing these components.

It is not advisable to undertake the home construction of variable condensers for two reasons. The first reason is that it really takes an experienced assembler to put a variable condenser together properly and the second that it costs as much to buy the parts as it does to buy the condenser. In the case of fixed condensers, however, it may be profitable and more satisfactory to make them, as many of the cheap productions now on the market are very poorly put together and highly unsatisfactory in use. With one or two variable condensers and half a dozen fixed condensers practically any range of capacity may be obtained if they are used systematically.

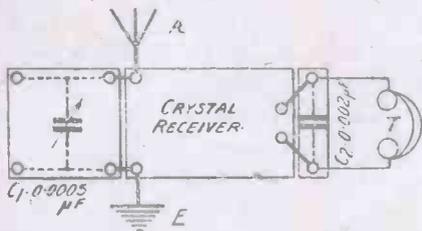


Fig. 4.—Method of Adding Condenser Unit.

In Fig. 1 two condensers are shown in parallel, one being variable and one fixed; both have a capacity of .0005 microfarad. This arrangement gives a total capacity of .001 microfarad, half of this capacity being variable. In placing the same two condensers in series the total capacity will be less than .0005 microfarad, or in all cases less than the condenser having the smaller capacity. We will base our method, therefore, on the parallel system, which will give us all the values we are likely to require.

### Condenser Panels

In Fig. 2 two fixed and one variable condenser panels are shown together with connections and dimensions. These may be made as required. They are intended to be added to an existing receiver. In

Fig. 3 the same three panels are represented theoretically, the condensers C1, C2 and C3 being shown linked up in parallel with each other, which gives us a total capacity of .0009 microfarad, of which .0005 microfarad is fixed. It will be seen at a glance that we can obtain many values in this manner. For instance, to obtain a total capacity of .0004 microfarad, we link up condensers C1 and C2 in parallel. To obtain a total of .0005 microfarad we link condensers C2 and C3, and to obtain a total of .0006 microfarad we link up condensers C1 and C3, this last instance giving us a total fixed capacity. Further values are obtained by using each condenser singly. The method of adding these units

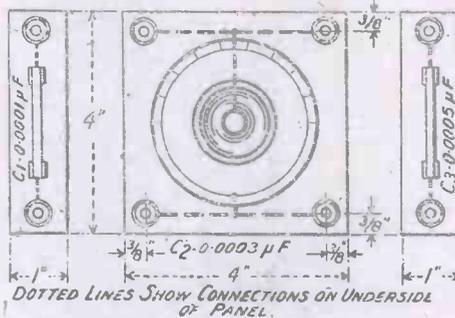


Fig. 2.—Connections of Two Fixed and One Variable Condensers.

to an existing receiver is shown in Figs. 4 and 5. Fig. 4 shows a condenser C1 connected in parallel with the aerial-tuning inductance and a fixed condenser C2 across the phones. The diagram Fig. 5 shows a condenser C1 in series with the aerial. This is achieved by simply turning the panel round, as indicated, which shows the object of the four terminals and two-way connections on this unit.

A circuit showing the arrangement of a series-parallel condenser is shown in Fig. 6. In this case one variable condenser is placed either in series with the

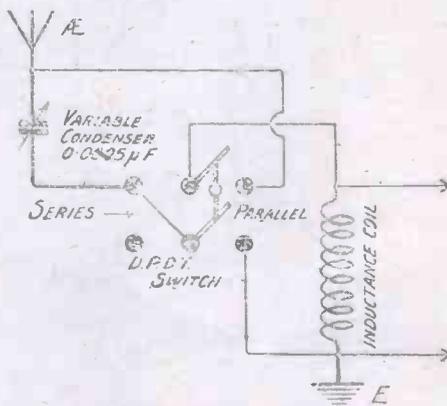


Fig. 6.—Circuit Including Series-parallel Condenser.

aerial or in parallel with the aerial tuning inductance by means of a double-pole double-throw switch. This arrangement,

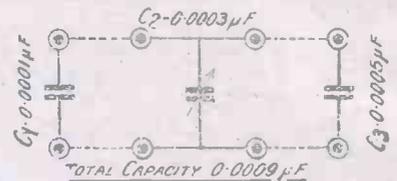


Fig. 3.—Theoretical Circuit of Fig. 2.

though quite satisfactory in operation, does not give a selection of values in each case.

### Condenser Points

- (1) By the use of a series condenser the capacity of the aerial is lessened, which permits of a larger tuning coil.
- (2) A series condenser should have a large maximum capacity, not less than .001 microfarad, and when in use this capacity should not be reduced below .0003 microfarad.
- (3) A condenser is necessary in the aerial circuit where the inductive tuning is not of a fine nature.
- (4) A series condenser is used to receive waves of a shorter length than the natural wavelength of the aerial.
- (5) Where fine tuning is obtainable from the aerial tuning inductance, variable condensers are best eliminated when used in

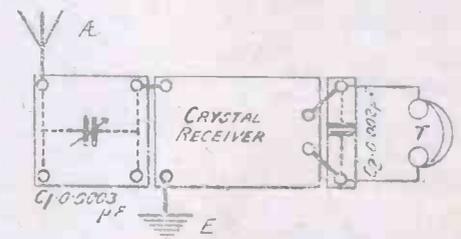
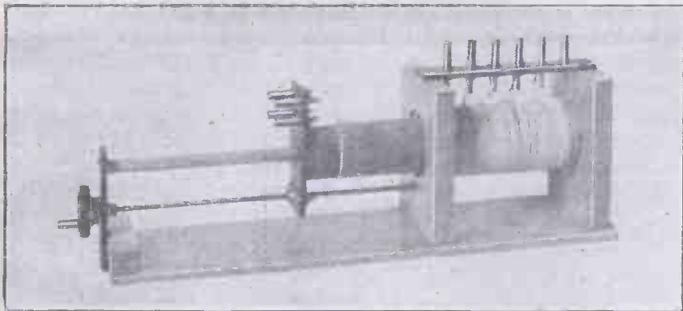


Fig. 5.—Another Method of Adding Condenser Unit.

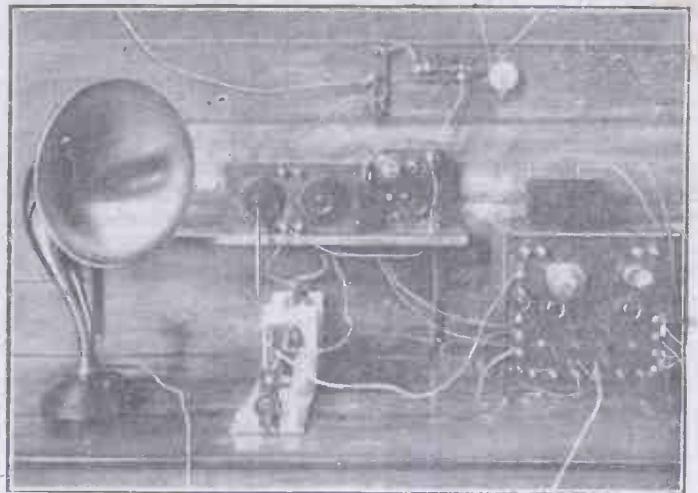
parallel with the aerial circuit; for long wavelengths, however, tuning over a considerable range may be obtained from the condenser.

- (6) The value of a variable condenser in parallel should be not greater than .0005 microfarad excepting for very long wavelengths.
- (7) A series condenser should be connected on the aerial and not on the earth side.
- (8) Capacity effects in condensers may be eliminated by employing insulated extension handles.
- (9) Various values of condensers are: Aerial tuning in series, .001 microfarad; aerial tuning in parallel, .0003 or .0005 microfarad; secondary tuning, ditto; telephone condenser, .002 microfarad.

# AN EXPERIMENTAL SHORT-WAVE SET



The Tuner Unit.



The Complete Receiver.

NOW that short wavelengths are used so much by amateur transmitters and broadcasting stations all over the world a brief account of an efficient and easily constructed experimental short-wave receiver will be of interest to those who wish to hear these stations with a one- or two-valve set.

First of all we have to decide whether we shall employ a high-frequency valve or not; H.F. amplification is, of course, very useful on the higher wavelengths, but lower down, and especially below about 200 metres, where the very high-frequency currents cross even the smallest capacities, the H.F. valve ceases to add range to the set. It still retains, however, the disadvantages of extra and very critical controls and of instability.

Experience has proved that a set with a detector valve and L.F. amplifier with carefully adjusted reaction can be made as sensitive as a set with a high-frequency valve, while it is much easier and quicker to tune—a very necessary state of affairs when one is trying to follow conversations between amateur transmitters. As the

### The Tuning Coil

The tuning coil is a very important item in a short-wave set and should be carefully made. Although the bare-wire air-spaced type of tuner is undoubtedly good, it presents a great deal of constructional difficulty to the average amateur when a reaction coil has to be coupled to it.

An efficient and easily-made tuner can be constructed as follows: The coil proper consists of 70 turns of No. 20 d.c.c. wire wound on a former 5 in. long and about 2 in. in diameter, tapped at the 10th, 20th, 35th, 50th and 70th turns, the tapplings being taken to valve legs mounted on a strip of ebonite (as at A in Fig. 1) screwed to the wooden ends of the coil. Adjustments are made to the number of turns in use by valve pins attached to flexible leads.

The reaction coil slides on a round wooden rod B, wood being used as brass is liable to damp the reaction effects when receiving on very short wavelengths. The coil is wound on a former 4½ in. long and of such a diameter that it will slide

means of a 2 B.A. nut at F, propels the reaction coil. This arrangement provides a very fine adjustment of the coupling, the advantage of which will be appreciated when receiving distant stations.

The nut is soldered to a piece of brass strip and screwed over the hole in the ebonite as in Fig. 2. The bearings G C can be made conveniently of two 2 B.A. condenser spacers, these being just the right size. The screwed rod is kept in position by the lock-nuts H. In practice the reaction need never be moved far, as the tapplings are employed for rough adjustment first. The overall length of the tuner is about 12 in., which allows the reaction coil to slide well clear of the A.T.I.

### Tuning Condensers

The coil is tuned by two variable condensers, one .0001 microfarad and the other .0002 microfarad. The .0001 condenser is used in series for wavelengths below 200 metres, while the two are used in parallel with each other and with the A.T.I. for wavelengths up to the higher

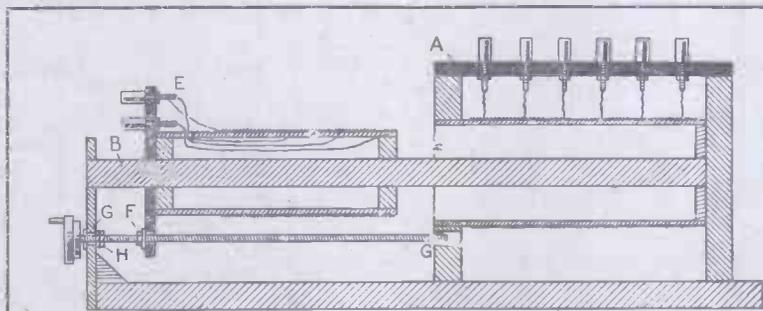


Fig. 1.—Section of Tuner.

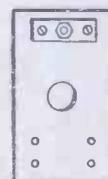


Fig. 2.—End-plate of Reaction Coil.

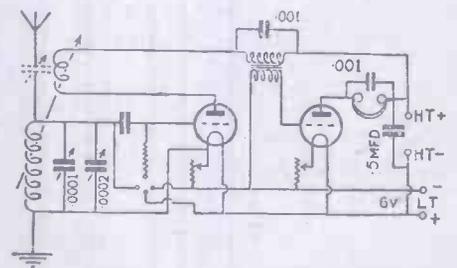


Fig. 3.—Circuit Diagram.

person who is interested in this class of reception is usually an experimenter, he will find it very useful to have a set built in units, the tuning coils, condensers and valve panels all being separate units, with terminals connected to all necessary points so that different circuits can be tried. We will therefore consider a set built on the lines indicated.

easily into the former used for the A.T.I. (1½ in.). It is wound with 90 turns of No. 26 d.c.c. wire, tapped at the 1st, 30th, 60th and 90th turns, the tapplings being brought through holes in the former to valve legs E. These latter are mounted on a piece of ebonite drilled to slide on the wooden rod, and lower down to clear a piece of 2 B.A. screwed rod, which, by

limit of the coil. The reason for this arrangement is that it is far easier to get near oscillation point on the very low wavelengths with a condenser not exceeding .0001 microfarad.

### Detector-valve Panel

The detector panel may be about 5 in. square. The valve should not be mounted

by means of an ebonite holder on account of stray capacities thus caused, but four valve legs mounted in the usual way should be used instead. A good filament resistance should be used, preferably of the 7-ohms type. The grid condenser should be of .0002 microfarad, as this value is better on short wavelengths than the usual .0003-microfarad condenser. A variable grid leak is also advisable, the filament end of which is connected by means of a wander plug (a valve pin will do very well) to any of three valve legs mounted on the panel and connected respectively to the + and - L.T. terminals, and to the filament side of the grid condenser. This provides a very useful means of varying the grid-leak connections.

It is also a good idea to have a terminal connected to the filament side of the rheostat, which must be in the negative lead. This is for the connection to the earth end of the A.T.I. The detector valve usually requires to be worked at about

zero volts grid potential, and, as it is assumed a 6-volt accumulator will be used, the usual connection to L.T. — makes the grid too negative for best results. This is a point which should, of course, be tried out in each individual case by taking the connection to various points on the filament circuit.

The wiring should be carried out with bare wire of about No. 18 gauge soldered to the terminals. The usual R valve will serve very well as a detector, although some prefer the soft low anode voltage type; it is difficult, however, to make this type oscillate on the shorter wavelengths, while adjustments of the filament and anode voltages are very critical.

#### The L.F. Amplifier

The L.F. panel can be made to the ideas of the constructor, as there are no special points to consider with regard to short-wave work. In fact if expense is a great consideration the amplifier can be dis-

pensed with altogether, although it will be found to aid very considerably the reception of the weaker signals.

The units must be arranged so that the operator can reach the condensers without having to stretch over any other part of the set, as capacity effects are always liable to be noticed in short-wave reception. The best way of making connections from one part of the set to another is by means of flexible rubber-covered wire with spade tags. Changes, such as changing the aerial condenser from series to parallel, can thus be carried out very easily and quickly. Switches should not be used for these purposes.

In conclusion it may be said that a carefully-made set on the lines described will be very sensitive and consistent in operation. With a good aerial and skilful handling it is not too much to expect it to receive the American short-wave stations when conditions are favourable. Fig. 3 shows the circuit diagram. R. R. W.

## A CHRISTMAS PRESENT FOR THE BOYS (!)

**R**UNNING short of a few gadgets, I popped into a shop about a week before Christmas for six of one and half a dozen of the other, and ran into Jameson. I noticed that the shopman was doing up a large parcel.

"How now, Jameson?" I said, smacking him heartily on the back. "Taking up wireless at last. Going to make up a seven-valve set, eh?"

#### Presents

Jameson smiled the slow cautious smile of a man not to be drawn. "Oh, no!" he replied, "I have just bought a few pack drills and an indian file or two for the boys—Christmas presents, you know. To be serious, Barker," he continued, "the constructional work involved in making a wireless receiver is a fine thing for the boys: makes them self-reliant; teaches them to use the auger and turnspit, the spokeshave and what not. You follow me? I have here the component parts of a three-valve receiver, the putting together of which will combine instruction with amusement. What better Christmas present for a couple of highly-intelligent boys—chips of the old block, if I may say so."

Watching the play of expression on Jameson's face, I mused as he talked. Many a time and oft had I encountered happy fathers leaving Hamages or Gamleys with a large angular parcel, a slight tear generally exposing a buffer or funnel. They were presents for the little ones at home, of course. True! But who played with them on Christmas Day? Could we but look into the hearts of these happy fathers with awkward-looking parcels, what dreadful secret would stand revealed?

"Why this sudden desire to trap the invisible waves, Jameson?" I inquired. "It was but a month ago that you uttered bitter words in reproof of those misguided folk who spend ten shillings per annum and three hours or so per night in listening to invisible speakers and musicians. You animadverted, if I remember rightly, upon men of affairs who wasted the precious hours of leisure in boring holes in vulcanised caoutchouc, and desecrated the beauty of suburban and rural districts by

erecting tall spars more or less perpendicular to the land. I admired the beauty of your diction, Jameson, and I have quoted your own words as far as possible, but the sentiments you expressed sound like rank heresy."

#### Truth Will Out

Jameson flushed slightly at my words, but nevertheless maintained a fairly stout front. "You misunderstand me, Barker," he said patiently, placing his hand affectionately on the parcel which the shopman had just finished tying up. "This parcel contains certain apparatus with which my boys will amuse themselves, as I hope, in making something which may enable them to receive, through the medium of the British Broadcasting Company, talks of an informative nature suited to their years. It may be necessary for me to give them slight assistance, but the sentiments I expressed on the occasion of our last meeting did not apply, I think, to the pastimes of youth?"

"The total amount is six pounds seventeen shillings and sixpence, sir," remarked the shopman, handing Jameson the bill.

"My wireless aunt, Jameson!" I cried, "your boys are lucky in having such an indulgent father. By the way, old man, what sort of circuit do you—er—the boys intend making up?"

Jameson hesitated a moment, and then drew a note-book and pencil from his pocket. With rapid strokes he drew the most complicated circuit I have ever seen.

I looked at Jameson steadily. "How old are the boys, old man?"

Jameson seized the parcel. "One's three and the other's five," he muttered, and disappeared. **ALFRED HEARD.**



"Felix Keeps on Tickling"—A Tungstalite advertisement at the recent exhibition.

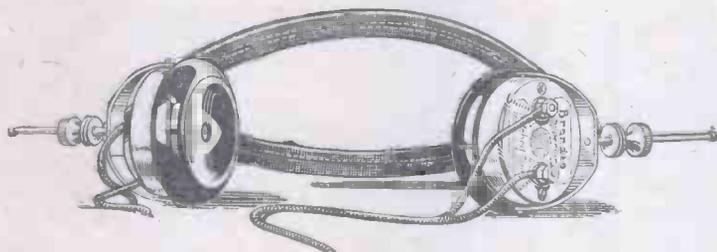
# Tune the Table-Talker with the "Matched Tone" Headphones



The Brandes Family Series

MARYLLIS holds the floor. "We're going to have a snappy time this Christmas with the 'Table-Talker,' and you, Bill," with imperious gesture, "will see to it. If you just dare to have the tummy out of the receiver for one of your con-founded experiments about that time"—she tailed off in vague threats of dire disaster for young Bill. "You, Father, need not blow through your fungus and look fierce 'cos the carpet's coming up, any way. And you've got to shell out for a new valve." Grandpa removed the "Matched Tone" 'phones from his ears as the strains of the Savoy band welled up in the "Table-Talker"—Amaryllis pirouetted, favoured him with a covert smile, and executed a successful retreat. Father snorted behind his paper, but he knows really that the "Table-Talker" makes for a jolly time.

Ask your Dealer for Brandes.  
British Manufacture (B.B.C. stamped).



Crown Farm House, Walton-on-Thames, Surrey. 19-11-24.

Dear Sirs,  
It may interest you to know that I received Australia on your 'phones. I consider that they are the most sensitive 'phones that I have used, and I am much pleased with their general performance.  
Yours faithfully,  
(Sgd.) F. Walker.



All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This practically constitutes a free trial.

The "Matched Tone" feature means that both your ears hear exactly the same sound at the same instant—and you learn a new beauty of tone. They are tested and re-tested for just this one vital point, and in addition their strength, long-wearing comfort, and reliable efficiency make them undoubtedly superior. **25/-**

The Table-Talker is a Brandes quality product at a moderate price. The non-resonant, specially constructed horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance and remarkable tone qualities. It is twenty-one inches high, and is finished a shade of neutral brown. **42/-**

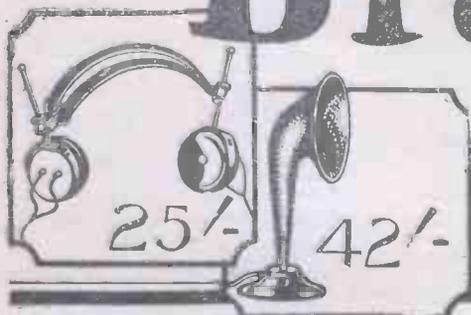
### For Christmas!

An excellent family gift to the family. Club together and get yourselves Brandes Products for the receiver. They provide good fun during Christmas festivities, and all the year round.

# Brandes

Result of  
16 Years  
Experience

The name  
to know in Radio



TO TRANSMITTERS  
TO EXPERIMENTERS  
TO CONSTRUCTORS

# Something new for Coils

500 Readers of "Amateur Wireless" may test the new "MARS" Coil Wire BEFORE it is PLACED ON THE MARKET

One of the largest makers of coils in the country have already proved that coils made from this wire give 20% greater efficiency than coils made from any wire previously tested.

Other expert opinions indicate that it is the best coil wire produced. But our heavy delivery commitments in connection with the "Mars" Aerial prohibit us from making the coil wire in commercial quantities at present.

We are continuing our tests and to meet our research requirements have spun 10 miles of coil wire.

We invite 500 readers of AMATEUR WIRELESS to cooperate with us in our experiments.

A special test offer. For the nominal charge of 1/- we will send to the first 500 readers who apply, one 72 ft. length of "Mars" wire, approx. 24 d.c.c., provided that applicants agree to furnish us with a short written report of their findings.

Please note:—

Only one length can be sent to each applicant. All requests must be accompanied by the coupon printed below. Send P.O. (not stamps). The wire cannot be obtained through dealers. Technical or commercial enquiries in connection with the wire cannot be dealt with until after the Christmas holidays.

TEST LENGTH of the New "MARS" COIL WIRE: 72 feet

1-

Sent on one simple condition.

## "Amateur Wireless" Coupon To E. & W. G. MAKINSON LTD.,

Coil Dept., Wellington Works, Wellfield Rd., Preston.

I enclose P.O. for 1/- (Note: Stamps not accepted). Please send me 72 ft. of "Mars" spirally wound wire, 24 d.c.c. I agree to furnish a short written report of my test results.

Please attach this coupon to a slip of paper, bearing your name and address, written clearly, and make out the P.O. to E. & W. G. Makinson, Ltd. The right is reserved to withdraw this offer without further announcement in which case all P.O.'s received will be returned. All requests will be dealt with in rotation.

**MULTICELL**  
A DEVICE FOR COUPLING POCKET LAMP BATTERIES AND FORMING A 66 VOLT UNIT FOR WIRELESS. IT'S CHEAP & A JOB IN ALL COUNTRIES.

Complete with Wander Plugs

SHORT TERMINALS  
**MULTICELL CONNECTOR**  
LONG TERMINALS

PATENT APPLIED FOR

Post **3/-** Free

"MULTICELL" 101, Bradford Road, Shipley, Yorks.

## THE BROWNE WIRELESS

— and the Crystal that made it famous!

For 7/6 you can buy this splendid Crystal Receiver and enjoy broadcasting at a distance of 25-30 miles from a broadcasting station or, with loading coil attached, up to 120 miles from Chelmsford. Complete with solid moulded Ebonite cap, high-grade Nickel fittings, glass protected Detector, D.L. 5 Crystal and "Palladium" Catwhisker. ... **7/6**



An Ideal Christmas Gift!

Two large pieces of crystal and the essential "Palladium" Catwhisker carefully packed in dust proof case ... **2/-**

From most dealers or direct.

Now for a word about the D.L. 5 Crystal—the excellent "Brownie" Rectifier. Possessing a rare sensitivity and stability, it is constantly creating reception records. Get some to-day and enjoy crystal reception at its best this Christmas.

**THE J. W. B. WIRELESS CO.**  
310a/312a, EUSTON ROAD, N.W.1  
(Facing Warren Street Tube Station.)

Telephone: Museum 3747

**D.L. 5. CRYSTAL**  
and  
**"Palladium" Catwhisker**

## IMPORTANT NOTICE!

Messrs The Fallon Condenser Co., Ltd., wish to notify all London and County Retailers that a considerable time-saving and economy can be effected by obtaining

**ALL FALLON SPECIALITIES**  
at their **NEW LONDON DEPOT,**  
143, FARRINGTON ROAD, E.C.,

where prompt attention and keenest wholesale prices are always yours to command.

Illustrated Catalogue free on Request

**FALLON CONDENSER CO., LTD.,**

Barclays 420

## THE GREATEST SENSATION AND SUCCESS OF THE SEASON

"Her Daddy's Voice"

The "World's Champion," the marvel "A.B." Headphone which has dealt the Knock Out Blow to all others and overshadowed them all.

**UNQUALIFIED GUARANTEE—IF UNSATISFACTORY MONEY RETURNED IN FULL.**

"A.B." adjustable 17/6

"A.B." non-adjustable 15/6

Ask your dealer, or send remittance to us for samples to cover postage as well.

**AMBATILO BROS., LTD.,** Even this child can recognise her celebrated daddy's voice from across the Atlantic with "A.B." Headphones.

Telephone, C'erkentwell 7450 & 7447.



# B.T.H. Headphones

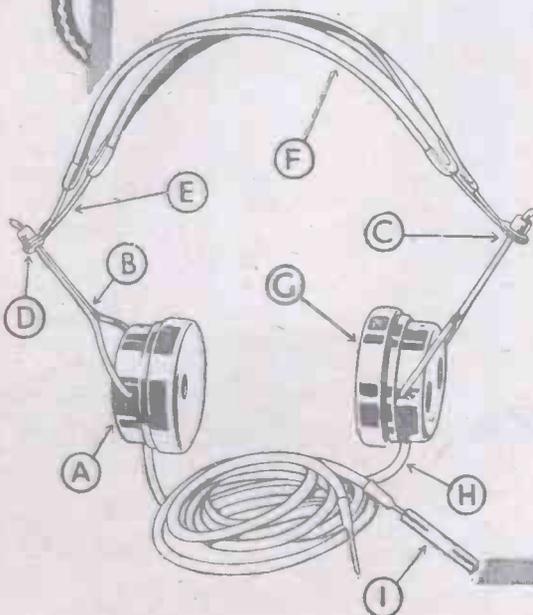
The original pattern B.T.H. Headphones achieved a remarkable reputation for sensitiveness and tonal quality. Many improvements have since been made, with the result that to-day B.T.H. Headphones are the most comfortable and convenient instruments of their kind. Some of the more important constructional features are given below:—

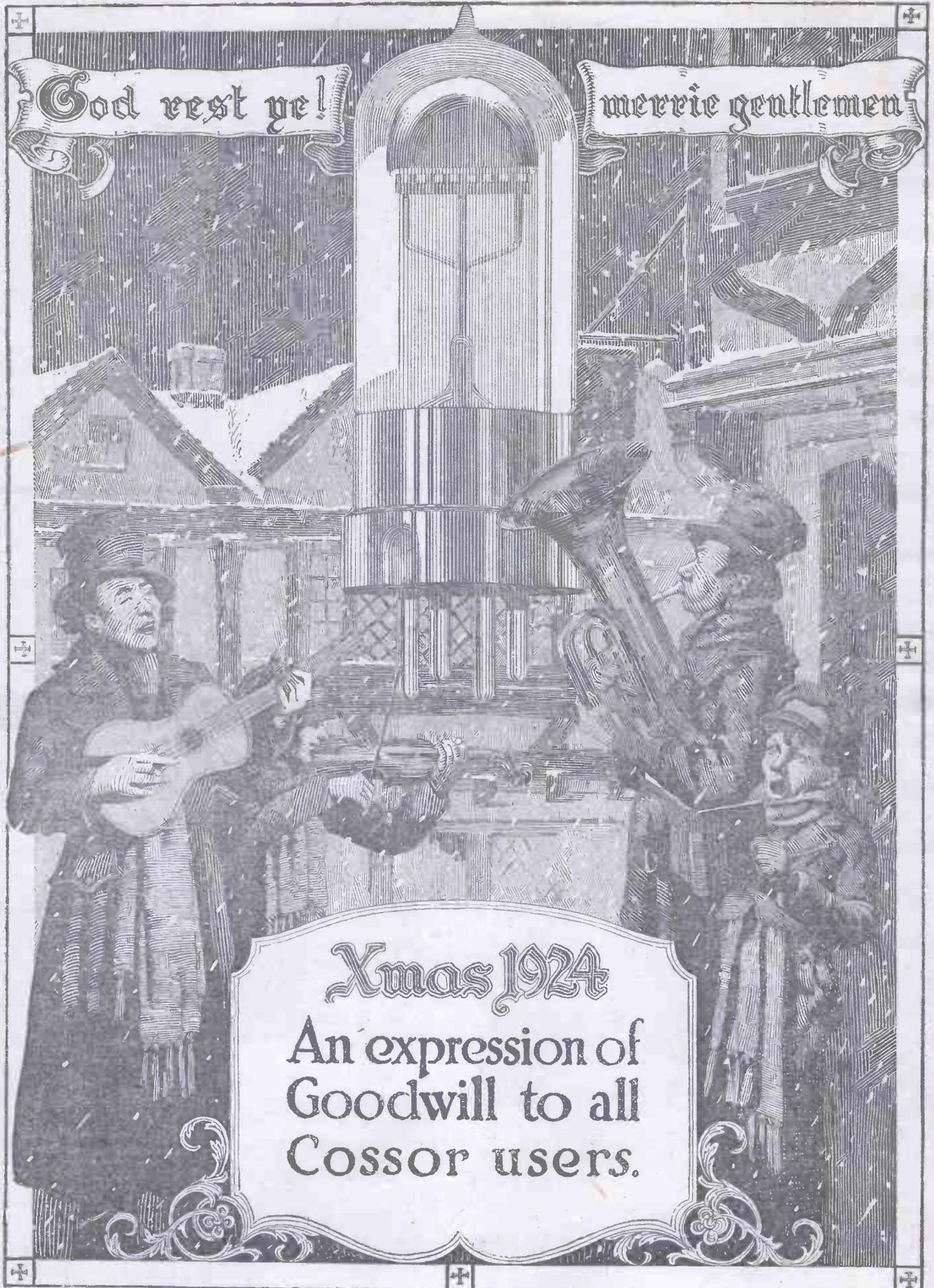
Price  
per pair **25/-**  
(4000 ohms)  
Weight with cord 9½ ozs

- A The body is of special non-resonating material.
- B The stirrup moves freely within the slider, and takes up and retains its position without any locking device.
- C The stirrup cannot be completely revolved in the slider. Kinking and twisting of the cord are thus avoided.
- D The special slider adjustment obviates the use of screws
- E Spring steel headbands give the exact pressure required for perfect hearing with ut discomfort. There is no "scissors" movement.
- F The leather covering gives perfect comfort.
- G The earpieces fit closely to the ears.
- H Best quality flexible cord.
- I Nickel plated series connector.

Obtainable from all Electricians and Radio Dealers.

Advert. of The British Thomson-Houston Co., Ltd.  
Crown House, Aldwych, London, W.C.2





Xmas 1924  
An expression of  
Goodwill to all  
Cossor users.

# On Your Wavelength!

## Bobbed Waves

AS the title of a recent article in "A.W." stated—"short-wave work is the thing." At present a vast amount of research work is being done, and much experimental broadcasting carried out, on the band of wavelengths below 100 metres; in fact, it seems that wireless has followed the prevailing fashion and bobbed it waves. Some strange things are apt to happen as a result of this short-wave work, too. If you happen to live near an amateur who is trying experimental transmission on such wavelengths, one of your electric lights may suddenly burst into illumination without being switched on, and then, if you should switch it on, burn out. Unless you are one of the enlightened, this will prove surprising to say the least of it, but otherwise you will realise that you have appropriated some energy rightly belonging to your neighbour. He has been adjusting his short-wave transmitter, and the natural tuning of your house wires has whisked away from him the energy which was destined for Australia or some other remote quarter of the globe.

## —And Their Tricks

These short waves give some interesting exhibitions of the transmission of power. Their behaviour at times borders on the eccentric; occasionally, instead of pursuing their intended path over a few hundred miles of land and sea, they perform gymnastics on a neighbour's bell-wires. Again, when they appear to be weak and feeble at the transmitter they may be striking with powerful impact at some distant point. The fact that they can travel over very long distances, however, excuses much of their temperamental behaviour—for temperamental they are.

## Trouble Hunting

Solenoid coils, though very useful in their way, are somewhat out of fashion nowadays. As they still have their adherents, however, the following tip may be of service: I was called in, a short time ago, to trace a deplorable weakness of signals in a friend's receiver, and finally discovered its origin in a short-circuit between two adjacent turns of wire on a tuning coil of this description. It is a mistake to use s.c.c. copper wire for winding such coils, because it is one of the easiest things in the world to damage the insulation. If two turns do touch in this manner, the radio-frequency currents induced in the coil will induce a heavy secondary current in the short-circuited portion, and bring about a voltage drop across the whole coil sufficient materially to lower the strength of the received signals. By using d.c.c.

wire, of course, the risk is minimised by the extra covering; but even with this medium reasonable care should be exercised in winding to see that the covering remains intact.

## That Drop of Oil!

Another trouble, which necessitated the disembowelling of the receiver before it could be traced, was due to—a drop of oil! The headphones rendered the signals with a background of positively maddening "frying" noises, which were the very deuce to locate. The H.T. battery naturally was the first to come under suspicion, but it passed every test with flying colours. Next I hunted for loose connections, but solder and fluxite had done their work manfully and well, and not a vacillating wire could be found. No "shorts" could be discovered, every component resembled Cæsar's wife, and I was puzzled beyond measure until I heard of the drop of oil. The amateur, it seemed, himself an engineer and familiar with the idea that every centre of friction should be suitably lubricated, had conceived the notion that the arm of his filament rheostat, at the point where it came into frictional contact with the coil of resistance wire, came under this heading, and would do better with a little lubrication. Consequently, when the resistance element became heated the oil also heated up, and carbonised in a thin film upon the wire, causing a varying resistance junction with direful effects.

## Pictures by Wireless

The recent transmission of pictures from London to New York by means of wireless was really an amazing success. The process now used differs a good deal from others that have been tried at various times in the past. Most of them, I believe, tried to obtain reproduction of photographs by the dot method, which is used in printing half-tone blocks. If you examine any reproduction of a photograph in a magazine through a magnifying-glass you will see that it consists of a mass of dots, whose sizes vary according to the quality of the paper. The same effect can be obtained by means of straight lines, but in the method now used for transmitting photographs by wireless, reproduction is done by means of very finely-spaced curved lines.

The effect is most pleasing, for it gives one the idea of a beautifully-executed drawing, though not a single detail of importance in the original photograph is missed. The time taken to transmit a half-plate picture is about twenty minutes. This means, of course, that only single photographs can be sent, and that tele-

vision, which would involve a rate of sending thousands of times more rapid, is still a long way off. However, it is bound to come within the next few years, at any rate, and I am certain that in the drawing-room of the near future a small white screen will stand beside the loud-speaker. On to it will be thrown pictures of events, such as the Boat Race, the Derby or a great boxing match whilst they are actually in progress. If relaying is as successful with television as it is with wireless telephony, then the receiving set will be a magic carpet indeed, enabling its owner to voyage over half the world, seeing the sights and hearing the sounds of foreign countries whilst sitting in his arm-chair before the fire at home.

## More About H.T. Batteries

There is still no sign forthcoming that dry battery manufacturers are going to do anything with regard to the present unsatisfactory system whereby we purchase a dry battery with a knowledge of the voltage and no knowledge of its capacity or life. When I say that this is unsatisfactory, it is only putting the position mildly. It is true that at least one firm dates its batteries in code.

A vast new industry of dry battery manufacture has been called into being by a permanent and steady demand for a large quantity of H.T. batteries, and we have to rely upon quick sales as an insurance against the dealers having stale stocks on their hands.

This may work quite well when the dealer has a large connection and is able to turn over his stock at a fairly rapid rate, but there are many instances where dealers in country and outlying town districts will have H.T. batteries on their hands for a year or perhaps more, and so far as can be seen there is no indication whereby the date of the manufacture of the battery can be known to the customers.

It has long been the custom of some flashlamp battery manufacturers to stamp the date of manufacture on the battery so that the stock may be checked and those refills suffering from senile decay withheld from the customers. There seems to be no such arrangement with H.T. batteries, and when the man in the street pays half a guinea or more for a 60-volt unit he naturally wishes to feel that he is getting his money's worth.

## Crude Tests

I have seen H.T. batteries being tested by a salesman with a flashlamp bulb socket by socket, the lamp glowing beautifully for a period of about fifteen seconds each time. It is sad to think of the con-

## On Your Wavelength! (continued)

tented customer walking away without the twelve hours (or more) life of his battery which had been sucked away by that bulb test.

Some batteries are sealed so that no such assaults may be made upon them, but it seems that the manufacturers do not supervise the final test properly, for I have had two 60-volt units from reputable firms which were so sealed but were nevertheless duds.

On another occasion I saw a cheap moving-iron pocket voltmeter being used to test an H.T. battery. The resistance of these voltmeters is generally so low that on a 60-volt unit the current flowing through the instrument would be something in the neighbourhood of  $\frac{1}{4}$  ampere—an extremely disastrous thing for the battery. What one would like to see would be H.T. batteries plainly labelled with the date of production, voltage and capacity, or a statement as to its expectation of life and the number of valves it is intended to feed. This should be backed by a definite guarantee.

### Radium and Radio

Of late I have come across so many references to radium filaments and radio-active valves, that I have been almost induced to believe that the really "cold" valve—whose ultimate appearance I have previously predicted in these columns—was about to make its advent. Already we have on the market a well-known dull-emitter that works almost cold—at three-quarters of a volt to be precise—which is well on the way to the development when the potential we now apply to the filament will no longer be necessary. The necessary function of the valve filament is, of course, to provide the stream of negative electrons. The chief peculiarity of radium and radio-active substances lies in its constant electronic emission, so constant, indeed, that a radium filament in a valve would produce electrons continuously, whether it were hot or cold, for thousands of years. Consequently, could our twelve-and-sixpenny "toobs" be so employed, we should be spared the low-tension accumulator and all its accompanying trials and tribulations.

### No Radium Valves Yet!—

Alas! however, for the pleasant hopes and dreams which such a contemplation engenders, we should all need to be multi-millionaires to afford such components; a filament of metallic radium would cost something like £100,000, which at once places it in the realms of impossibility. What is actually proposed, and has been many times attempted, is to construct a valve in which the hot filament as a source of electrons is replaced by a preparation containing only a trace of the precious metal, but still capable of continual emis-

sion. The preparation would doubtless be something like the luminous paint used for certain watch dials, only that instead of the trace of radium being used to produce light from the other constituents, its activities would be directed towards the production of electrons. The radium valve is, therefore, theoretically possible.

varying circumstances of volume required, circuit used, battery capacity and so forth, it is possible to vary the number of electrons passing from the filament to the plate during a given period. With a radio-active filament this would be impossible. The rate of emission would be nearly constant, and almost exactly the same number of electrons would pass, second by second, for hundreds of years. Possibly some means might be discovered of controlling this stream more or less when the valve actually came into use; but until such means of control were devised it would seem that the advantages which the radium valve offers over the present-day type would be largely offset by the uncontrollability of its most desirable feature.

### Anti-capacity Switches

If you think of fitting switches to a new set under construction be rather careful in your choice of them or you may find that you are simply asking for trouble. The average switch of the D.P.T.O. type, which consists of two parallel arms fitting into clips, is apt to be rather a trap for the unwary if fitted on the high-frequency side of the set, since it may introduce a comparatively large amount of unwanted capacity. Small switches look neat, but give me the larger and clumsier ones every time from the point of view of efficiency. It is far better to use switches specially designed to have the smallest possible capacity. There are a good many of these on the market and they are worthy of the amateur constructor's attention.

One of the most satisfactory types is what is known as the barrel switch. Here the fixed contact points are so placed that their edges and not their flat sides are opposite to one another, which, of course, makes for a considerable reduction in capacity. Then, again, the moving contacts are not flat arms with their broad surfaces opposite one another, as is the case in the usual type of D.P.T.O. switch. They are usually pieces of thin stiff wire so well spaced that the capacity between them is negligible. I have known several cases in which sets fitted with D.P.T.O. switches of the arm-and-clip type have been most difficult to handle owing to the presence of stray capacities. In every case the trouble has been remedied by substituting anti-capacity switches and attending to the wiring.

Should you find your set liable to howl when fine tuning is in progress, the switches, if such things are fitted, are most likely to blame. Try the effect of removing them altogether temporarily. If this makes an improvement, as it most probably will, anti-capacity switches may be substituted without fear of a recurrence of the old trouble. THERMION.

## CHRISTMAS WEEK BROADCAST

### SUNDAY, December 21

London	3.0	Music of <i>Peter Pan</i> (S.B. to Newcastle).
Birmingham	3.0	Carols by the Children's Choir of Sir Josiah Mason's Orphanage.
Bournemouth	3.0	Vocal and Instrumental Concert.
Manchester	3.0	<i>The Christmas Oratorio</i> (Bach).
Aberdeen	9.0	<i>Jubilee Cantata</i> (Weber).
Glasgow	9.5	Carols and Christmas Music.

### MONDAY

ALL STATIONS	7.30	Fairy Opera, <i>Hansel and Gretel</i> (Humperdinck).
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### TUESDAY

London	7.30	"Dips in a Christmas Bran Tub."
Birmingham	7.55	<i>A Christmas Carol</i> (Dickens) (S.B. to London).
Bournemouth	7.30	Chinese Night.
Cardiff	7.30	Vocal and Instrumental Evening.
Manchester	7.30	Symphony Concert.
Newcastle	3.45-7.30	5 N O Birthday Programme.
Glasgow	7.30	Choral and Orchestral Evening.
Aberdeen	7.30	Pantomime, <i>Humpty Dumpty</i> .

### WEDNESDAY

London	7.30	"Christmas Eve" (S.B. to other stations).
Bournemouth	3.0	Bournemouth Symphony Orchestra.
Newcastle	7.30	French Opereetta.
Belfast	7.30	Oratorio, <i>The Messiah</i> (Handel).

### THURSDAY (Christmas Day)

London	7.30	Sir Hall Caine reading <i>A Dream of Christmas Day</i> . (S.B. to all stations).
London	7.30	Light Orchestral Programme of Christmas Fare. (S.B. to all stations except Aberdeen).
Aberdeen	7.30	Oratorio, <i>The Messiah</i> (Handel).

### FRIDAY

London	7.30	Special Boxing Night Programme Band of H.M. Grenadier Guards. (S.B. to Bournemouth).
Birmingham	7.30	Wireless Pantomime.
Bournemouth	3.0	Musical Orchestra.
Cardiff	7.30	"Christmas with the Immortals."
Manchester	7.30	"Darkies Lead a Happy Life."
Newcastle	7.30	Excerpts from <i>Revue, Past and Present</i> .
Aberdeen	7.30	Part Songs and Madrigals.

### SATURDAY

London	7.30	<i>Old Mother Two Shoes, or Dick Riding Hood and His Goose.</i> A Pantomime by The Roosters Concert Party. (S.B. to other stations).
Birmingham	7.30	Oratorio, <i>The Messiah</i> (Handel)
Belfast	7.30	Band of 1st Batt. Seaforth Highlanders.

Whether it would really prove more useful than the hot-filament type is another question.

### —and Why

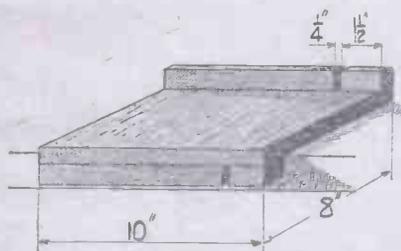
One of the chief advantages of the heated filament as a source of electrons lies in the fact that it is controllable. In

# PRACTICAL ODDS AND ENDS



## Cutting Ebonite

BY means of the slot in the back ledge of the board shown here ebonite can be cut very accurately. The ledges also steady the panels while being drilled.



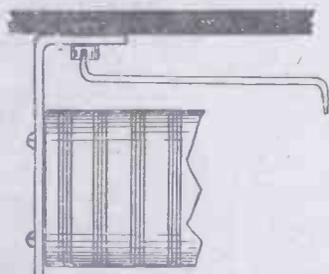
Board for Cutting Ebonite.

Above all, such a board protects the tables belonging to those home constructors who cannot boast a workshop. H. W.

## "Spanner-screwdrivers"

WHEN fitting certain components to the under side of a panel it is often quite impossible to use the ordinary screwdriver, as is shown in an example given in the accompanying sketch. The usual way out of the difficulty is to use a bolt instead of the screw, but if it is desired to keep the face of the panel free from bolt heads, the screw may easily be fitted by means of the special tool shown.

This consists simply of a strip of 1/8-in. sheet steel about 3/4 in. wide and 3 in. long, the ends of which are filed off to a chisel



"Spanner-screwdriver" in Use.

point and bent over at right angles. A number of these "spanner-screwdrivers" should be made up in various sizes, and for very awkward jobs it is advisable to arrange the bends as shown in the lower diagram. O. J. R.

## Mercury Crystal Contact

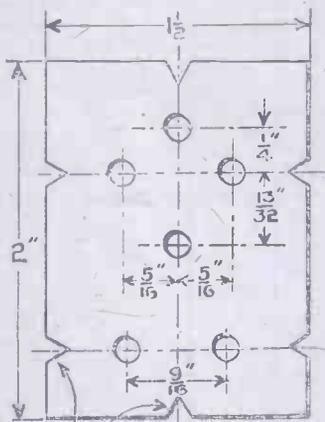
THOSE amateurs who are keen crystal enthusiasts may have tried at various times to find some contact other than the conventional catwhisker, probably not with much success.

A contact that might be tried experimentally is mercury. This can be placed in a crystal cup and the crystal itself mounted on an adjustable arm above the mercury.

Used in conjunction with a synthetic crystal, mercury has been found to form a stable detector. D.

## Panel-marking Template

WHEN constructing multi-valve sets, marking out of holes for each individual leg of the valve and coil holders becomes a tedious operation; by using a template similar to that shown below much tiresome work can be eliminated.



Template for Valve and Coil Sockets.

The plate can be made from any scrap sheet-metal which happens to be at hand, but nothing thinner than about 3/32 in. should be used or there will be a difficulty in drilling the holes accurately. R. N. W.

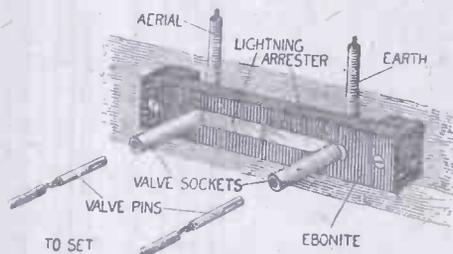
## Reed-phon Tip

A MATEURS interested in the pleated-paper type of loud-speaker may have experienced difficulty in obtaining sufficient B.A. threaded rod to couple the centre of the paper diaphragm to the phone reed.

A suitable extension can be made by soldering a short brass pin to the head of the screw that originally clamped the conical diaphragm to the reed. S.

## Aerial-earth Plug

A N aerial and earth plug that will permit of quick connection to the set, and of a discharge to earth should the aerial be charged during a thunder storm, can be easily and cheaply made from



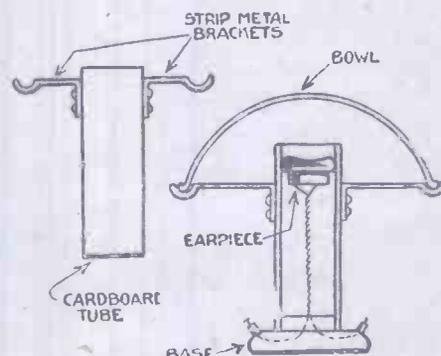
Aerial-earth Plug.

valve sockets and valve pins are shown. The strip comprising the lightning arrester should be thin, about No. 30 gauge, to avoid capacity effects, as it is necessary that the opposing surfaces when serrated should be not more than 1/8 in. apart.

It is a good plan to enamel the aerial socket some conspicuous colour so that it may be quickly identified. Care must be taken that the enamel is not allowed to run into the socket, thus causing bad contact. E. A. D.

## Easily-made Loud-speaker

THERE is nothing difficult about the construction of the loud-speaker shown by the diagram. Two strip-metal brackets are bent and fastened to a cardboard tube about 1 ft. in length and of a diameter



Assembly of Loud-speaker.

that will just accommodate the earpiece to be used.

A wooden base with two terminals is now fitted to the tube. The loud-speaker is completed by placing a shallow bowl or basin on the brackets. N. M.

# WIRELESS HUMOUR

"DOES your wife like wireless?"  
 "Not a bit. She can't talk over it."

*Father:* "Stop rattling that money-box, Georgie, Aberdeen's calling."

The best H.T.-less set—a crystal receiver.

Listening-in is no new pastime. It has been practised for years past by people who dwell on the edge of golf links.

A teacher says that wireless can be very useful in teaching history. At the present time it is busily engaged in making it.

*Positive:* "Great success, my new valve set, old man! Got America last night without any trouble!"

*Negative:* "Using dry cells, of course?"

*First Lady:* "Does your new maid care for listening-in?"

*Second ditto:* "Oh, yes! Unfortunately, though, she mistakes everything she hears for bed-time stories."

For want of some solder the contact was bad;

For want of a contact no circuit was had;

For want of the circuit no current flowed;

For want of the current no filament glowed;

For want of the glow not an electron stirred;

For want of electrons not a thing was heard.

One receiving set that does not receive everything broadcast is an ash-tray.

"What do they mean by the word 'broadcasting'?"

"Telling a secret to a woman."

*The Enthusiast:* "When I got up this morning I found all the valves damp. What do you think caused that?"

*The Expert:* "Probably the grid leaks."

The ex-Kaiser's latest pastime is listening-in. It is a pity he cannot listen to what some people would like to say to him.

With all its drawbacks the loud-speaker has its compensations. It will enable company sergeant-majors to be dispensed with when the next war comes.

Traders in wireless find that the hobby has created a big demand on the part of amateurs for tools. Judging from some sets we have heard, an appropriate tool to take in dealing with them, would be a hatchet.

"The Blue Danube Waltz' doesn't come in very well to-night."

"No; we're using a two-step amplifier."

It is estimated that 5,000 new words have come into being as a result of the development of wireless, not including, of course, those used in describing the oscillation fiends in the next street.

*Mr. A.:* "I reproached my son for not knowing the difference between the Iliad and Odyssey."

*Mr. B.:* "Was he apologetic?"

*Mr. A.:* "Not at all! He merely asked me if I knew the difference between crystal reception and a neutrödyne."

Domestic servants are said to be very fond of listening-in—outside the drawing-room door!

There is no truth in the rumour that the call sign IOU has been allocated to Moscow.

It is suggested that if the police are provided with wireless transmitters there will be a great demand for receiving sets amongst suburban cooks.

Extract from the Eiffel Tower programme: "Weather forecast (excluding Sunday)." Sounds like the sort of weather we get over here.

It is indeed a cynic who refers to wireless as *wireless* after winding coils, connecting parts and putting up the aerial.

The Rakovsky March was broadcast from Cardiff. Sounds like a "Red Letter" Day in the history of the station.

*Aerial:* "It must take a lot of money to follow the wireless craze. I hear you have a new outfit. What kind of receivers are you going to have?"

*Earth:* "I don't know. The court hasn't appointed them yet."



"JOHN HENRY" AND THE "EXPERT."



# STERLING *for Xmas* LIGHTWEIGHT Headphones

What a wonderful present! Something that will give almost endless enjoyment, not just for Xmas time, not just to one person, but for years, to all members of a family. Certainly Sterling Headphones make the ideal gift.

You know why Sterling Headphones are best? Simply because any test will show the highest efficiency yet known in reception, the highest degree of precision workmanship, absolute comfort and lightness and perfect finish. The Sterling Company were pioneers in telephone manufacture.

Sterling Headphones are boxed attractively and conveniently for postage.



STERLING TELEPHONE AND ELECTRIC COMPANY, LIMITED  
210-212, TOTTENHAM COURT ROAD, LONDON, W.1

Signals unheard  
with TEN other  
headphones—  
perfectly audible  
with this super  
head-set



# Bechsteina

*"Headphones that Amplify"*

This is a notable result of tests carried out on a one-valve reaction set with no amplification.

American Stations WGY and KDKA, also Canadian amateurs and most European Stations, have been consistently received with a singular absence of distortion.

Bechsteins are almost the equivalent of a valve amplifier when used in conjunction with a crystal set, making audible signals at present unheard.

With a one-valve set, employing no amplification, the range covers

a vastly increased radius over which formerly no signals have been logged.

Get what you are missing—and improve what you are getting in wireless, by insisting on the "Headphones that Amplify."

Bechsteins are the last word in comfort, and every pair is guaranteed.

Further particulars are given in an illustrated folder on request.

If your local dealer does not stock Bechsteins, write direct giving his name and address to:—



FOLDER ON  
REQUEST

25/-

# Bechsteina

**RADIO COMPANY**  
4, CANAL ROAD, BRADFORD, YORKS.

WHOLESALE DISTRIBUTORS:—Liverpool: H. Kniveton, Norman Road, Runcorn, Chesh.; London: Penton Engineering Co., 15, Cromer Street, King's Cross, W.C.1. Manchester: Accelero Co., 7, Liverpool Road; Leeds: Radio Productions, Ltd., 107, Portland Crescent; Sheffield: Sheffield Wholesale Motor Supplies, 43, Carver Street; Glasgow: London Radio Stores, 11, Bath Street; Nottingham: Super Radio Co., 32, Parliament Street.

# A DE LUXE THOUSAND-CIRCUIT RECEIVER.—II

IN the case of variable condensers, these patterns are as shown in Fig. 5; they represent the condenser at its minimum capacity when the moving plates are not at all in mesh with the fixed. Using patterns of this kind and "tiddleywink" counters to represent terminals one's task is very much simplified if any alterations have to be made in original design.

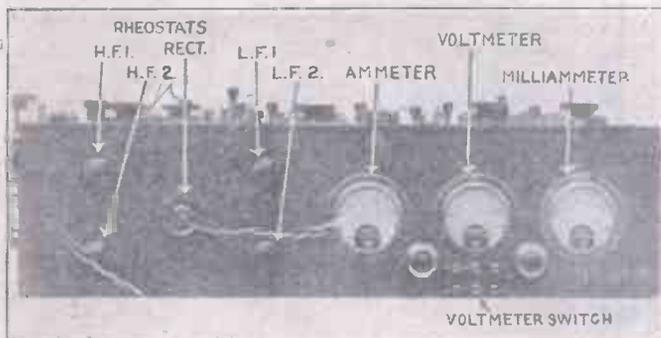
The actual drilling will depend a little upon the components used. Personally I much prefer to use tapped instead of clearance holes for both terminals and valve legs. If terminals are screwed in and locked with a nut below the panel there is no fear at all of their working loose provided that these nuts are given

formidable one, and it would certainly take some time if it were done in the usual way with the tap fixed in a hand wrench. It is, as a matter of fact, quite unnecessary to use a tap wrench for screwing the ebonite provided one is careful. Having made all the necessary holes of one size, fix the tap into the chuck of your breast-

as quickly as if it were a drill.

The mounting of variable condensers is very much simplified if those with one-hole fixing are used. All that one has to do in this case is to drill a single  $\frac{3}{8}$ -in. hole for it. Unfortunately some components with one-hole fixing are designed to be mounted on  $\frac{1}{4}$ -in. panels. The screwed bush is therefore rather too short when  $\frac{1}{2}$ -in. ebonite is used. This difficulty can be overcome by counter-sinking the upper end of the hole so that the fixing nut is able to get a grip.

Where condensers intended to be fixed by two or three screws are used a paper template should always be used for laying out the necessary holes. Many makers



Front View of Thousand-circuit Receiver.

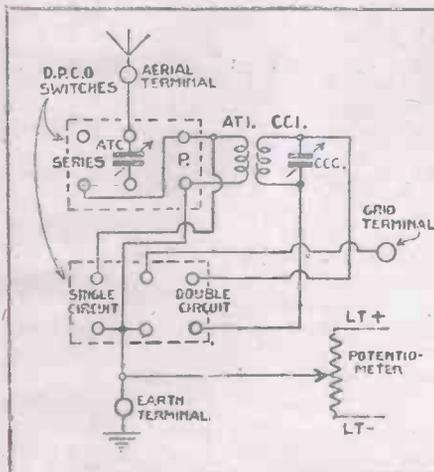
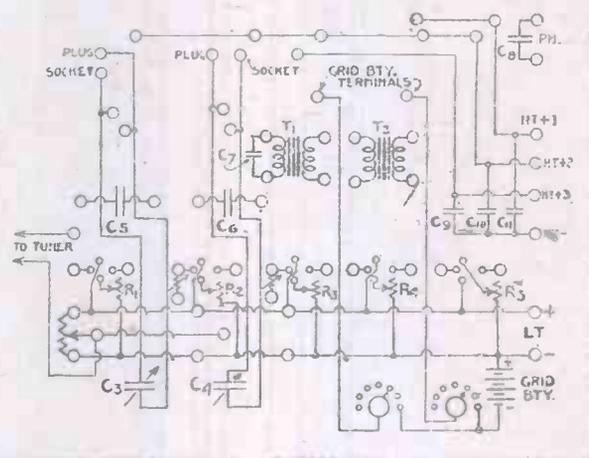
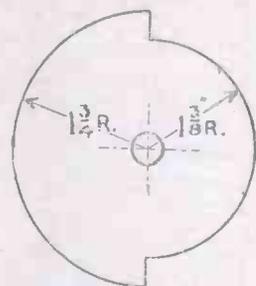


Fig. 5 (below).—Diagram showing Space Occupied by Condenser.

Fig. 6 (left).—Circuit Diagram of Tuner.

Fig. 7 (right).—Diagram of H.F. and L.F. Circuits.



a turn down after soldered connections have been made. When valve legs are screwed in one can dispense altogether with nuts beneath the panel to secure them, which is a very great advantage since it reduces the capacity in the valve holder, a very important point, especially on the high-frequency side of the set and in the rectifier.

It is a good tip, too, to cut the socket portion of each valve leg to about one-half its original length. This gives plenty of grip and it helps to reduce capacity. The plate leg can with advantage be made about  $\frac{1}{8}$  in. shorter than the others, which makes it practically impossible to burn out the filament by attempting to insert a valve wrongly into its holder.

The task of screwing holes for three and a half dozen terminals and twenty valve legs might at first sight seem a

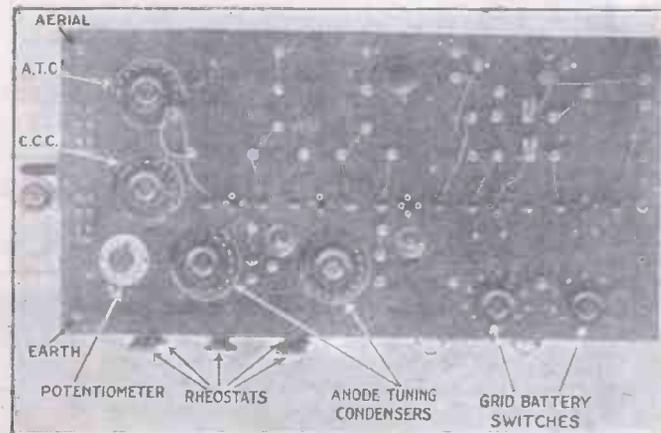
drill and go straight ahead. Turn the crank slowly, without exercising too much pressure until the tap has "bitten," then give it half a turn backwards to allow it to clear itself. You can now run the tap straight through almost

supply these with their condensers, but should you have no templates you can make them quite easily.

The two selector switches used for adjusting the grid potentials of the note-magnifying valves may be of standard pattern. It is, however, important that they should be provided with screwed bushes, which can be firmly fixed to the panel by means of a nut on the under side. Some switches have plain bushes, and these are never satisfactory, since there is always a certain amount of wobble in the spindle. It is essential that the contact points should be so spaced that the switch arm cannot rest upon two of them at once, for if it were to do so it would short-circuit one of the cells of the grid battery.

### Wiring

The wiring of the set was



Plan View of Panel.

done throughout with the usual square tinned-copper rod. This material was chosen because some of the leads have to be rather long and it is much stiffer than any kind of wire. I find it most satisfactory to use and, as the photograph of the under side of the set shows, a neat job results. The square rod is easier to straighten than wire, and there is no difficulty at all about bending it at right angles with a pair of flat-nosed pliers. It is best always to tin the end of the rod before making a joint. As it is thicker than wire a good blob of solder is required on the shank of each terminal to fix it properly. The best method is to insert all your terminals and valve legs in the set and then to lay a sheet of drawing-paper over the panel, pressing it down so that the ends of the shanks are pushed through it. Leave it in place until all soldering has been done and then tear it away carefully. It will catch all the splutterings and keep your panel perfectly clean.

It will be noticed that three high-tension plus terminals are provided on the panel. The reason for this is that for rectification quite a low plate potential is generally required, whilst a higher one should be used for good results in high-frequency amplification and a very big voltage indeed for perfect low-frequency reproduction. If you have a common bus-bar for the plates of all valves the voltage upon all is the same, and you do not get the best results.

The presence of the extra terminals adds very little complication to the set and it makes a great deal of difference to its working. The only point to be noticed is that it is necessary to have a condenser from each bus-bar to H.T. — I was lucky enough to have a condenser, picked up shortly after the war at a surplus sale, which contains three separate units, each with a capacity of 1 microfarad. These, I believe, are still obtainable from certain dealers, but if you cannot get one three condensers of 1 microfarad each should be used.

#### Separate Circuits

To make matters easy for those who intend to make up the set I have given the wiring not only as one complete diagram, but in several portions. Fig. 6 shows the way in which the tuner is wired with its two switches. These latter are of the double-pole change-over pattern and they should not be too small in size, otherwise they will introduce a certain amount of unwanted capacity. The upper switch allows the aerial tuning condenser to be placed in series or in parallel as desired. The lower permits either a single circuit or a loose-coupled tuner to be employed. In the original set there were no switches, terminals having been used instead. It was, however, found much more convenient to introduce the two switches shown and to make a permanent connection from the second switch to a terminal

on the panel which I have called the grid terminal. A flexible lead is attached to this on the upper side of the panel, and one can thus bring into action either high-frequency valve by attaching this lead to its grid. If the diagram in Fig. 6 is followed carefully it will not be found that the wiring of the tuner portion presents any great difficulty. The leads running to A.T.I. and C.C.I. are taken through holes bored in the frame to the coil stand. They should be insulated with systoflex where they pass through the wood. Stiff rod may be used for those running to the fixed coil, whilst those connected to the moving coil should be of good flexible wire.

Fig. 7 shows the general wiring of the high- and low-frequency circuits. R1, R2, R3, R4 and R5 are the rheostats, which in this set were of the Burndept dual type. Another dual rheostat, with a fine-wired element of 25 ohms and coarse-wired

element of 5 ohms, is now made by the Metropolitan-Vickers Co. The resistance R6 and R7 are grid leaks, preferably variable. T1 and T2 are the two low-frequency transformers. Any good make of transformer will do, though I think it is advisable to use a shrouded pattern in order to avoid any possibility of interaction.

C3 and C4 are the variable condensers for tuning the anodes of the high-frequency valves. This should have a maximum capacity of .00025 or .0003 microfarad. C5 and C6 are grid condensers, whose value should be .0003 microfarad. C7 is a condenser in shunt with the primary of the first low-frequency transformer; its capacity, like that of C8 placed across the telephone terminals, should be .001 or .002 microfarad. C9, C10 and C11 are the high-tension battery condensers, whose value should not be less than 1 microfarad apiece.

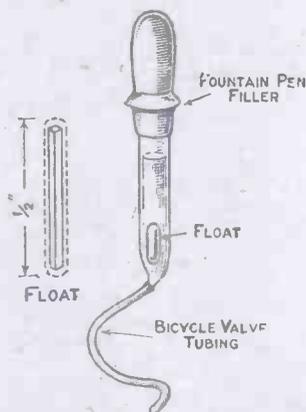
J. H. R.

(To be continued)

## AN EASILY-MADE HYDROMETER

ALL users of accumulators require a reliable method of ascertaining when their cells are run down and also when they are fully charged. The specific gravity test of the acid is a necessity.

The parts required for the home-made hydrometer shown by the sketch are easily



An Easily-made Hydrometer.

obtained. The writer simply took a stout filler stopper out of a fountain-pen ink bottle and cleaned it. These pen fillers are stronger than the kind sold in the pen boxes. A piece of valve tubing (bicycle) about 2 in. long was then attached.

The float presented the only serious difficulty. Experiments were conducted with pieces of celluloid, glass tubing and sealing-wax. If all experimenters were equipped with a bunsen burner and the fittings of a laboratory the matter would be easy. However, the solution was easier than was expected. A piece of match-stick, about 1/2 in. long, was taken and

completely coated with sealing-wax. A freshly-charged cell was tested and the float was adjusted until it rose to the top of the acid. A partly-used cell caused the float to rise half-way, and a third cell, which was known to be nearly run down, would not cause the float to rise at all. A further test was made with a mixture known to be of specific gravity 1.200. The float rose to the top. This home-made hydrometer was further tested with an expensive accumulator which contained floats of different colours in the cells. A little patience only is necessary to determine the exact amount of sealing-wax to be melted on the wood, but great care must be taken to ensure that all the wood is covered or it will absorb some of the liquid and this will affect its weight. If desired, marks can be made on the glass filler so that readings may be more accurate.

To operate the instrument it is only necessary to remove the accumulator vent plug, insert the tubing so that it goes beneath the surface of the acid, press the rubber bulb, and take the reading of the height of the float in the glass tube of the filler.

H. S. W.

### CHRISTMAS HOLIDAYS

The issue of AMATEUR WIRELESS dated Saturday, December 27 will, owing to the Christmas Holidays, be ON SALE on Tuesday, December 23

# PROGRESS AND INVENTION

## Double-coil Frame-aerial

A NEW type of frame aerial is described in Patent No. 224,056/23 (H. W. Cole, of Victoria Street, London). It will be



Two-coil Frame Aerial (224,056/23),

seen in the diagram that the frame consists essentially of two windings, one the usual outer winding suited more or less to the required wavelength, and also an inner winding which may be connected in series or parallel with the main winding.

It is claimed that the coupling of this inner coil boosts up the received energy and the signals are increased in volume. The frame, however, is not directional, since it acts on an entirely different principle to the ordinary loop, and it is essential that the receiving set should be earthed.

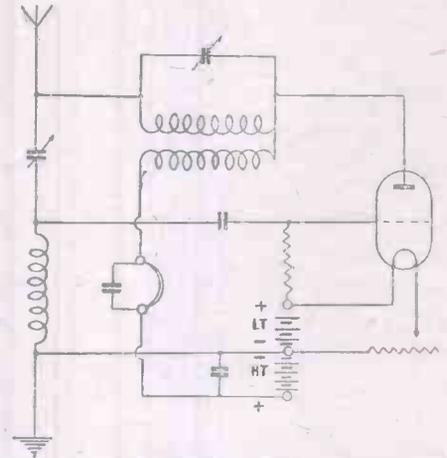
## Interesting Single-valve Circuit

A DESCRIPTION of an interesting single-valve circuit is given in Patent No. 223,061/23 (H. R. Taunton, of Norwich), of which the theoretical arrangement is shown in the diagram.

It will be seen that the secondary winding of an air-core high-frequency transformer is included in the phone-plate circuit of the valve, while the primary of the same transformer is connected between the plate and aerial, acting as a tuned choke.

It is claimed that with this circuit stability of oscillation control is obtained, and greater amplification is possible. A step-up ratio of 1 to 4 may be employed for the H.F. transformer, thus increasing amplification.

The transformer may be of the solenoid type, having two concentric coils, and 14 and 56 turns may be used for the primary and secondary windings respectively, for



Novel Circuit (223,061/23).

the British broadcasting band of wavelengths.

The condenser tuning the primary coil should be of about .0003 microfarad, while other components should have the value usual in a one-valve set.

# AROUND THE SHOWROOMS

## Marconiphone VI Set

MANY people are in need of a really good one-valve set, especially those who are satisfied with headphone reception and do not want to operate a loud-speaker. With a good aerial and a little patience astonishing results can be obtained with one valve.

A particularly neat single-valve set has, I notice, recently been put on the market by the Marconiphone Company. Simplicity in both design and operation (the latter is a point often overlooked) are two noteworthy features.

For receiving on different wavelength ranges it is necessary only to change one small coil block.

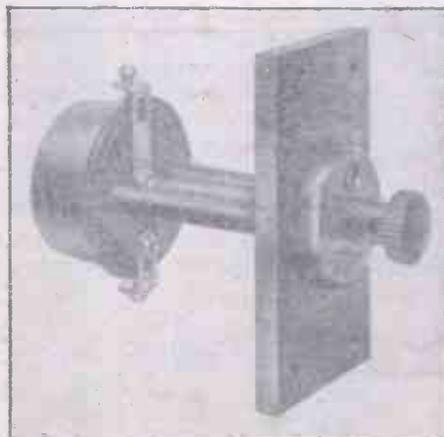
## Variable Grid Leak

NOWADAYS it is the fashion to use variable grid leaks wherever possible—a practice that is not without its advantages. Very often these devices are used to obtain critical adjustments, and it seems to be a good point that they should be fitted with anti-capacity controls.

An Igranic grid leak so constructed is shown by the photograph. The variable leak is kept some distance away from the

control knob and panel, hand-capacity effects thus being eliminated. I have found one of these leaks to be quite silent.

The variable resistance itself is made of a small block of graphite making contact



Igranic Grid Leak.

with an ebonite ring that is impregnated with more graphite by a special process.

The address of the Igranic Electric Co., Ltd., is 149, Queen Victoria Street, E.C.

## New Terminal

EVEN if the perfect terminal has not yet been invented, something very near it has been placed on the market. This is the Mousley terminal, for which Mr. N. K. Mousley, of 22, Queen's Road, Erdington, Birmingham, is sole concessionaire.

At the end of each connecting lead is fixed a small brass ferrule, which, when in use, is held tightly in the slotted head of the terminal.

The result is an excellent connection that can be made with one hand only. This means that many otherwise awkward connections become easily accessible.

VANGUARD.

We are informed by A. T. Stevens & Co. (1914), Ltd., Wolverhampton, that the recent builders' strike retarded the completion of the extensions to their new wireless factory.

A novel window display card for loud-speakers has been sent us by Brandes, Ltd., 206, Regent Street, W.1.

From Morch Bros., 35, Tresham Avenue, E.9, we have received an illustrated catalogue of Rex wireless products.

**Valve Holders**

WHEN a valve holder is required the range of patterns one is offered by the local dealer is extremely limited; as a matter of fact, the so-called range con-

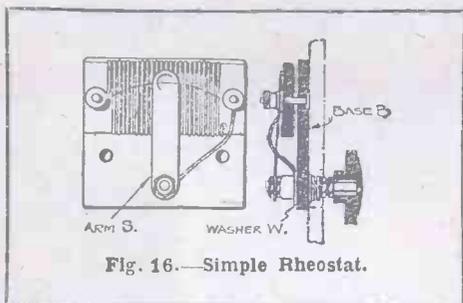


Fig. 16.—Simple Rheostat.

sists of two kinds only—the circular ebonite block into which is fitted four sockets, and the same sockets sold as separate components. These are all very well so long as one follows the stereotyped

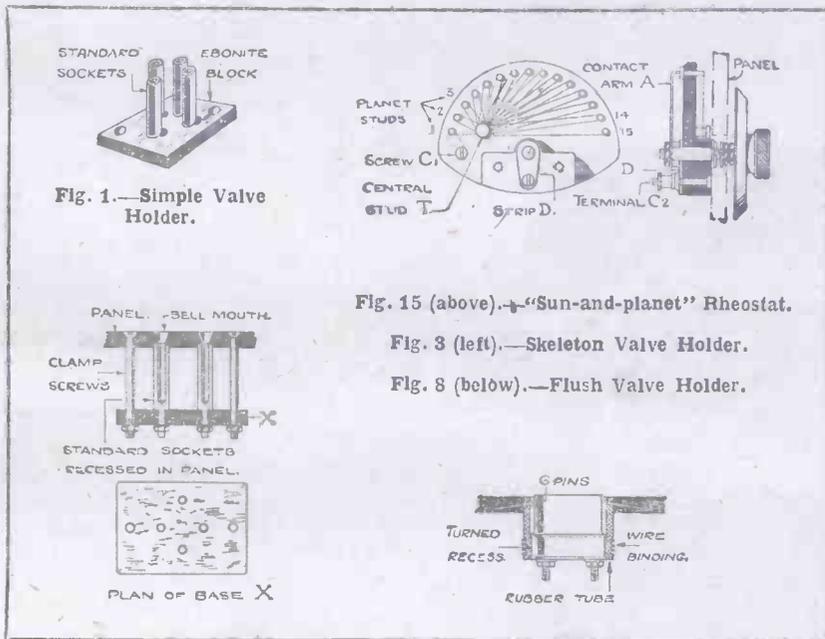


Fig. 1.—Simple Valve Holder.

Fig. 15 (above).—“Sun-and-planet” Rheostat.

Fig. 3 (left).—Skeleton Valve Holder.

Fig. 8 (below).—Flush Valve Holder.

forms of receiver construction, but there are times when other types would be most acceptable.

One objection to the ordinary valve holder is that it necessitates an overall

The use of standard sockets is the feature of Fig. 3. It will be seen that the legs are screwed to a base X of ebonite in the manner shown in Fig. 1. Holes to the valve leg centres are then

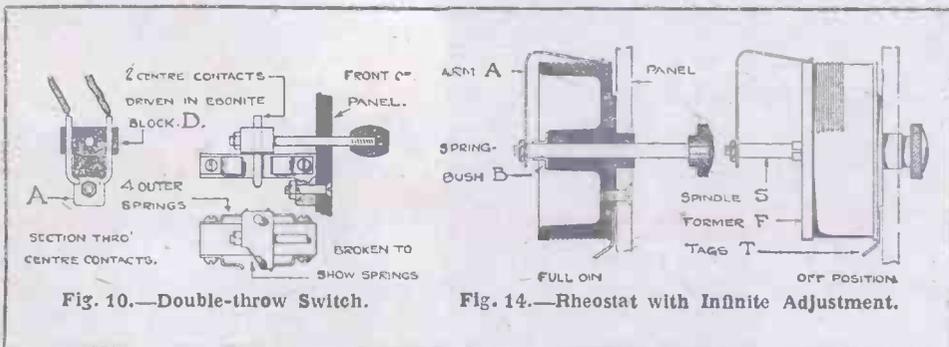


Fig. 10.—Double-throw Switch.

Fig. 14.—Rheostat with Infinite Adjustment.

# NEW ID COMPO

*Some Suggestions for*

drilled in the required positions on the panel and made slightly bell-mouthed on the outside. Each hole in the under side of the panel is then counterbored to the same depth to receive the tops of the valve sockets. The holder is then held up to the panel by two long 4 B.A. screws.

This form of holder presents a neat appearance from the outside, as the metal sockets are invisible, and, incidentally, it is a safety holder because the legs of the filament cannot be placed accidentally in the H.T. circuit. One objection that may be put forward against this holder is the fact that the heads of the clamping screws are exposed to view on the outside of the panel.

Those readers who wish to possess an extremely neat valve holder and who have the facilities for screwing a standard socket cannot do better than adopt the suggestion shown in Fig. 4. This new type of socket can either be made right out or converted from the trade pattern by cutting off the 4 B.A. shank and screwing the top portion to a length equal to the thickness of the panel after leaving a piece about 1/8 in. long. A driver slot will be required to screw the socket home. The four rounded socket heads projecting slightly present quite a neat appearance.

A simple manner in which an ordinary holder can be converted into a safe one is shown by Fig. 5. All that is necessary to do is to cut away each side about 1/8 in. deep, as shown in the sketch. In this manner the filament legs cannot come into contact with the plate socket.

**Non-microphonic Holders**

For portable and other sets subject to shock and vibration the ordinary holder is really too rigid. The writer has yet to come across a simple form which can be bought cheaply from the trade. Again, some valves are extremely microphonic, which state of affairs is more increased than reduced with the rigid type of

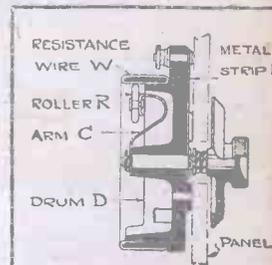


Fig. 13.—Roller.

# IDEAS IN COMPONENTS

the Home Constructor

holder, yet the remedy is so simple. Fig. 6 shows a very convenient form in which the legs of a standard holder are passed through a disc of rubber about 2½ in. in diameter, which is held to the panel by a turned ebonite ring.

Of the same type, yet a little simpler for the amateur to construct, is the one shown in Fig. 7. This consists of a similar rubber disc and holder, only this time screwed to the under side of the panel by six screws and washers. This construction also allows the holder to be sunk slightly in the panel. A very good material for this work is crepe rubber about ⅛ in. in thickness.

If it is desired that the top of the holder be flush with the face of the panel, then that shown by Fig. 8 will serve. This consists of a piece of rubber tubing squeezed into a hole in the panel and held by six brads, the holes for which can first be drilled with a hand brace. A groove is then turned round the large diameter of the holder and the latter pushed into the tube and then bound with wire. This design allows sufficient movement at the top to counteract severe vibration.

### Switches

Switches, although they cannot be classed as essential components in a circuit, are, generally speaking, an expensive item. The patterns which are sold by the trade are usually well made and efficient, but they include the manufacture of special parts, such as turned spindles and specially machined ebonite formers. It is the purpose of these notes to present to readers various designs which can easily be made from ordinary materials with the aid of no more elaborate tools than a hacksaw, drill and one or two files.

### Three-way Drum Switch

Fig. 9 shows a drum switch which is useful for panel mounting and which occupies very little panel space. The main por-

tion consists of a disc of ebonite 1½ in. in diameter by ¼ in. thick with a central hole to receive a ⅜-in. or ⅝-in. ebonite axis pin, which can be either a plain screw with lock-nuts or, better still, a plain piece of rod fitted with a small split pin at each end. Reverting to the disc, this is so supported by the brass brackets B that a portion of the disc protrudes on the outside of the panel, and has a stop pin passing through it which acts as an indicator for the switch positions and prevents the disc from completely rotating. Three screws (one is shown in section) are screwed into the edge of the disc and sunk so that the heads are flush with the periphery; a hollow is filed right across the head of the screw and parallel with the axis of the disc to form a definite seating for the contact spring C, which is screwed to the panel. One lead is sweated to this contact spring and the others are sweated to the sides of each screw, and then pass through three holes X drilled

shown to indicate the positions, this switch can be made to appear extremely neat.

### Double Throw-over Switch

An interesting amateur's switch, func-

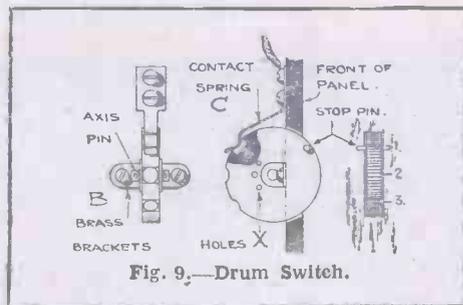


Fig. 9.—Drum Switch.

tioning as a double throw-over switch and operated by a push-pull method, is shown in Fig. 10. An L-shaped ebonite bracket A is sawn out to the shape shown; it carries on the sides of the horizontal limb

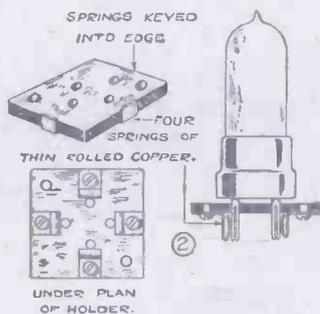


Fig. 2.—Valve Holder for Use in Limited Space.

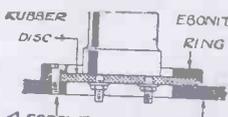


Fig. 6.—Non-microphonic Valve Holder.

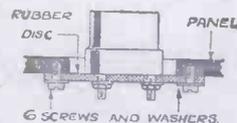


Fig. 7.—Another Non-microphonic Valve Holder.

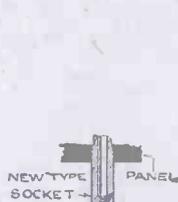


Fig. 4.—New Type of Valve Socket.

FILAMENT H.T. SOCKETS. SOCKET



Fig. 5.—Safety Holder.

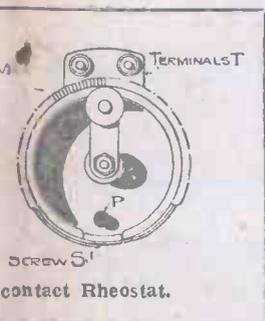
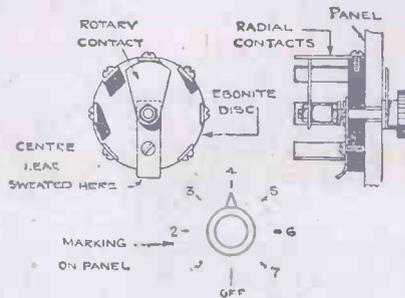
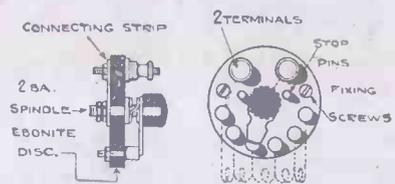
right through the disc in order to lock them.

The portion projecting through the panel is preferably milled like the edge of a florin, and if the panel is marked as

four springs, one pair at each end. These springs are screwed on and the respective leads sweated to the heads of the screws. The moving portion consists of an ebonite block, through which are driven two pieces

Fig. 11 (below).—Simple Radial Switch.

Fig. 12 (right).—Simple Multiple Switch.



of  $\frac{1}{8}$ -in. diameter brass wire, the bottom ends of which pass down the sides of and are bent under block A as shown so as to keep D down in its place. The upper ends of the wire are used to attach the respective leads. A  $\frac{1}{8}$ -in. diameter brass rod is screwed into the upper block and passes through the panel and terminates in a small ebonite knob. It will be seen that when the knob is pulled outwards the centre contacts are engaged in the rear pair of springs, and when pushed inwards are engaged in the front pair.

This switch can be used for series-parallel switching or cutting in or out different valves in a circuit.

#### Simple Radial Switch

A switch, made from standard parts, that can be made up very quickly is shown in Fig. 11. The diameter of the disc will depend on the number of contacts required; the one shown has five (plus one for "off" position) and is  $1\frac{3}{4}$  in. in diameter.

It is advisable, in the case of this pattern, to lay out the centres for drilling on paper so as to ensure a symmetrical appearance and to mark off the various holes.

Standard contact studs are used, and it will be noticed that the switch arm is quite short, the pressure upon the studs being obtained by the spring washer and lock-nuts. There is really no need to use the trade-pattern laminated arm as it is too long and cumbersome for this type of switch. Two terminals are fitted, one being connected to the arm and the other to the first stud; the remainder of the studs have connected to them their respective tappings. This is a very useful switch for fixing to the ends of cylindrical coils or the "all-range" type of coil built up of a number of separate basket coils which are switched in consecutively as the occasion demands.

#### Unobtrusive Multiple Switch

A rather unusual pattern of switch that can be made quite easily to cater for (say) sixteen tappings without being at all cumbersome is shown by Fig. 12.

The figure shows a design for seven tappings and is first made by cutting an ebonite disc about  $1\frac{3}{4}$  in. in diameter and securing around the circumference the required number of contacts. These contacts are plain strips of brass,  $\frac{1}{4}$  in. wide by  $\frac{1}{16}$  in. thick; they are screwed into position and are prevented from rotating by being sunk into the edge of the disc. The rotary contact is a specially-shaped piece of brass secured to the end of a 2 B.A. spindle, which is fitted with the usual nuts and spring washer, the lead to this contact being sweated to a brass connecting strip held under the spring washer and screwed to the ebonite disc.

A small pointer is fitted under the knob and the marking on the panel is as shown in the figure.

#### Filament Rheostats

Owing to the fact that the flow of cur-

rent through the filament of a valve is of necessity a variable quantity, the resistance controlling this current has become a permanent and essential component on all valve receiving sets. Apart from the comparatively modern pattern functioning by the compression of carbon pellets, resistances are nearly all of the type comprising a coil of wire and a radial contact arm. Both types have their advantages and disadvantages.

#### Roller-contact Rheostat

A defect often found in rheostats is the jumpy action of the arm when passing from one turn on to another.

Fig. 13 shows a type in which the defect is not present. The resistance wire W is wound on a strip of insulating material and formed round the outside of an ebonite drum D, being fixed at the bottom by a screw S. The contact arm C is of hard-rolled brass and carries a roller R, which presses against the inner diameter of the resistance wire and can move over almost a complete circle—that is, to the left and to the right until the spring arm comes into contact with the stop pin P. Two terminals T are provided, one end of the wire being taken to one terminal; a metal strip M, the inner end of which is under the spring washer on the spindle, is connected to the other.

This pattern makes for easy operation, and the design is such that the spring arm and roller are shielded by the coil of resistance wire and its former.

#### A Simple Infinite Adjustment Resistance

A type of resistance that is extremely simple and gives infinite adjustment is shown in Fig. 14. It consists of a cylindrical former F of insulating material on which is helically wound the resistance wire, preferably in a semicircular groove so as to hold the wire firmly in position.

Contact is made by the arm A fixed to the end of a spindle S; the arm is allowed free movement both in axial and circular directions, there being provided a long plain bearing to carry the spindle. A spring bush B makes contact with the spindle and arm, and a wire connection is made from that to one of the two tags T, the other tag having soldered to it one end of the resistance wire. Circuit connections are soldered to the projecting ends of these two tags.

From Fig. 14 it will be seen that when the knob is right in against the panel, electrical connection is broken by the arm being lifted up on to the rim of the former. When the maximum amount of current is allowed to pass the knob is pulled right out as shown in the left-hand view and is resting on the last turn of wire.

One great advantage of this pattern is that coarse adjustment is obtained by the aerial movement and fine adjustment by the circular motion.

#### "A Sun-and-planet" Rheostat

An interesting though somewhat unorthodox pattern of rheostat is illustrated

by Fig. 15. In this a long length of fine resistance wire can be used, which makes it eminently suitable for dull-emitter valves. A series of small studs is arranged radially from the control spindle and project about  $\frac{1}{8}$  in. A central stud T is screwed to the body portion, thus forming a sun-and-planet arrangement. The wire is put on as follows: First solder one end of the wire to the terminal screw C and wind it round the neck of stud No. 1, then round the central stud, and then on to stud No. 2, around the central stud again, and then on to stud No. 3, and so on up to stud No. 15. It is necessary to use a covered wire because if it were bare it would, of course, "short" when passing round the central stud. The covering is just scraped away where the wire passes over the planet studs, to which it is then spot soldered. Contact is made by an arm A fixed to a 2 B.A. spindle. The electrical connection is made by a metal strip D, which is clamped under the second terminal C2.

It might be supposed that the step from stud to stud does not allow of sufficiently fine adjustment. It must be noted here that the stud T is purposely put out of centre so as to make the lengths of wire from it to the first five (say) studs very short in comparison with the rest, because tuning adjustment takes place on those studs, the rest (say from about 6 to 15) merely acting as a safety resistance for the filament.

#### A Simple Rheostat

An extremely simple and effective type of resistance is shown in Fig. 16; it can be made up very cheaply from odd pieces of ebonite, etc. The resistance wire is wound round a strip of ebonite about  $1\frac{1}{4}$  in. by  $\frac{1}{8}$  in. by about  $2\frac{1}{2}$  in. long, carrying a terminal at each end, to one of which is connected one end of the wire. A spring arm S makes contact over the wire and rotates on a 2 B.A. spindle provided with the usual washer, nuts and knob, the electrical connection being made by a wire soldered to washer W and to the other terminal. The resistance is clamped on an ebonite base B by the terminal screws with intervening spacer washers as shown.

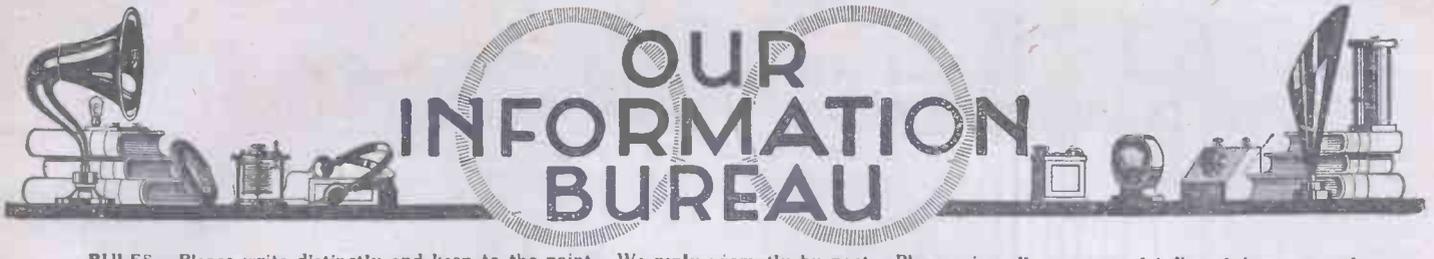
H. J. T.

## RADIO SOCIETY OF GREAT BRITAIN

THE possibilities of wireless recording formed the subject of a talk by Mr. Maurice Child before the Transmitters and Relay Section of the Radio Society of Great Britain on Tuesday, December 2.

Mr. Child dealt with two practicable methods of recording—the phonograph cylinder and the tape printer. An interesting theoretical design was also described in which use was made of a Turner relay in conjunction with three electrode valves.

A recorder used in conjunction with a Lodge-Muirhead detector twenty-four years ago was exhibited under actual working conditions.

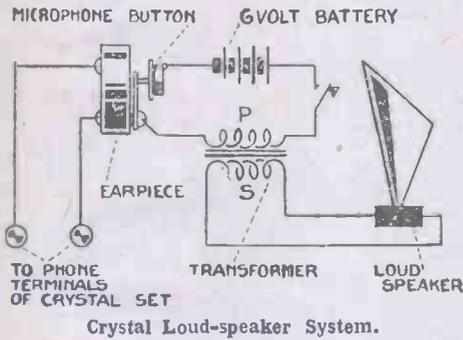


**RULES.**—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 1016).

**Crystal Loud-speaker System**

**Q.**—I have been unable to obtain the back numbers of "A.W." dealing with the "A.W." Crystal Loud-speaker system. Would you please give me a circuit diagram of the arrangement?—A. K. (Newcastle-on-Tyne).

**A.**—The circuit diagram is reproduced here.



You should use an earpiece of the reed type, as this gives far superior results to those obtained by using a flat diaphragm earpiece.—D. R.

**Lamps for Charging Board**

**Q.**—Is there any relationship existing between the candle-power of a lamp and the amount of current it consumes?—L. D. (Bristol).

**A.**—A carbon-filament lamp consumes approximately 4 watts per candle-power. Thus a 16 c.p. carbon-filament lamp would use 64 watts. If the lamp is made for a 110-volt supply the current it will take is approximately .58 ampere. An ordinary metal-filament lamp consumes about 1.2 watts per candle-power, while the 1/2-watt type, as its name implies, uses rather more than 1/2 watt per candle-power.—D. C. R.

**The Vibrating Reed Rectifier**

**Q.**—I have experienced difficulty in making the reed of the "A.W." rectifier vibrate properly when using only a 60-watt lamp in series. The reed, however, vibrates satisfactorily when a small 750-watt heater is put in series with the primary, but it will not work slowly enough to give a steady flow of current. A. C. (Greenock, N.B.)

**A.**—Should the reed not vibrate properly with careful adjustment of the variable resistance, reed weight, and adjusting screw, the experiment may be tried of placing a small permanent magnet above the reed, or backing the reed away from the transformer core and placing a small magnet in series with the primary above the reed. Generally these are not necessary. An effective method of clamping the reed is to wedge a small piece of soft rubber between the contact spring and the reed. In reply to other queries concerning this rectifier it should be noted that it is only suitable for the voltage and periodicity mentioned in the original article, and different design is necessary for other voltages and periodicities.—J. S. R.

**Rectifying A.C. for Charging**

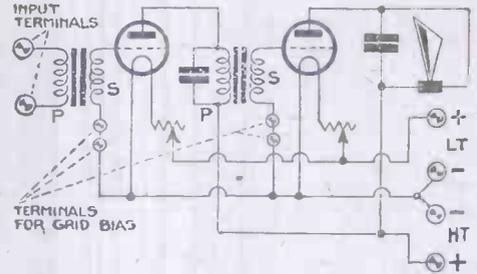
**Q.**—Please give constructional details of a Nodon valve suitable for rectifying 220-volt A.C. I wish to charge a 6-volt accumulator.—F. N. (Liverpool.)

**A.**—We would point out that, before rectification, your A.C. supply should be transformed down to about 25 volts by means of a static transformer. Then rectify with four Nodon cells in order that full-wave rectification may be obtained. The Nodon valve depends for its action on the peculiar property possessed by certain salts which allow current to pass only one way. Four-quart size cells made of brown acid-proof earthenware, completely lined with pure lead sheet, 1/8 in. thick, having central electrodes of 1/4 in. round aluminium rods, will rectify 4 to 5 amperes without overheating; but directly the solution reaches about 120° F. the rectifying function ceases and the valve passes both halves of the alternating waves. Even at 70° F. the efficiency falls off rapidly; hence it is necessary to keep the valves cool. Many different salts may be used for the electrolyte. Neutral ammonium phosphate in saturated solution gives good results. The solution becomes acid in working and should be neutralised from time to time by the addition of a weak solution of ammonia. Ammonium carbonate may also be used, also magnesium in a solution of ammonium fluoride. Lead, carbon, or steel electrodes may be used with aluminium, and the latter must not present too large a surface to the electrolyte, or the insulating film de-

posited on it will not be able to resist the passage of current, and the rectifying effect will consequently diminish.—D. C. R.

**Adding L.F. Amplifiers with Grid Bias**

**Q.**—Will you please give me a circuit diagram of a two-valve low-frequency amplifier



L.F. Amplifier Circuit.

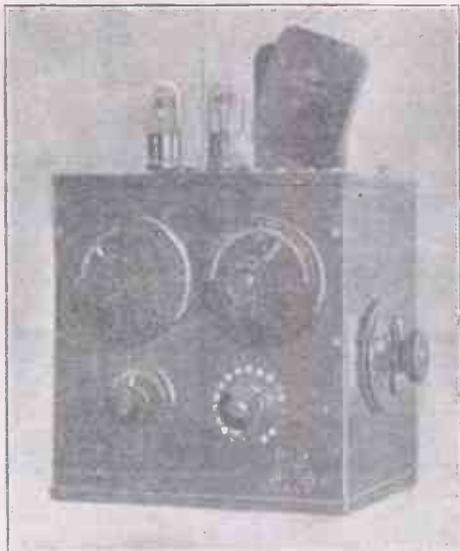
incorporating grid bias. I should like to be able to add this amplifier to a crystal or a valve set.—IGNORAMUS (Dover).

**A.**—In the accompanying circuit diagram of a two-valve note magnifier, terminals are shown in the secondary circuits of the intervalve transformers for the insertion of grid bias. The two fixed condensers shown should have a capacity of .002 microfarad each for the best results.—D. C. R.

**WIRELESS TERMS TRAVESTIED**



MUTUAL INDUCTANCE



The Tone-tune Receiver of Prof. R. V. Lvovitch.

IN the year 1908, at the laboratory of Wireless Telegraphy and Telephony at Petrograd, the writer began experimenting on the tuning of the low-frequency circuit to the number of discharges per second of transmitting stations.

The system experimented with consisted of a low-frequency amplifier coupled by means of a transformer to the detector circuit of an ordinary receiver. The low-

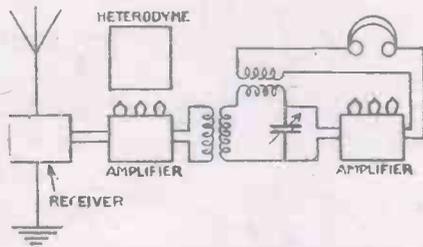


Fig. 1.—The Original Experimental Circuit.

frequency circuit was tuned by a variable condenser and the phones were coupled to a tone-selector circuit. By this system it was quite possible to receive separately the signals of two stations working on the same wavelength but having different tones.

The use of this system permitted the reception of signals from Eiffel Tower station at one of the big Russian stations, which formerly was quite impossible owing to the Nauen station working on exactly the same wavelength.

The loss of energy, however, in the low-frequency circuit was found to be a great disadvantage.

Later, the advent of the valve and the application of reaction coupling opened up a possibility of developing the principle.

The tests of the circuit (Fig. 1) were made at Odessa in 1922. The signals received in an ordinary receiver with three-step amplification were applied to a low-frequency circuit, and were again amplified by means of reaction coupling. This circuit gave very strong signals and sharp

# A TONE-TUNED RECEIVER

*Details of a New System of Spark and C.W. Reception*

tuning, and it was found that the "spacing" of arc stations was eliminated and even the husky tone of spark stations became clarified and musical. In order to receive continuous waves a separate heterodyne was used.

These results and the need for simplicity led to the circuit shown by Fig. 2 being developed. Only two valves are used in this receiver, one for combined rectification and regenerative amplification and the other for low-frequency amplification. Both detector and L.F. circuits employ reactor coupling, the first being tuned to the wavelength and the second to the tone.

The inductance value of the reaction coupling in the low-frequency circuit is regulated by moving a copper plate fitted between the coupling coil and the iron core of the low-frequency transformer. In order to receive telephony, the secondary tuning condenser  $C_2$  is switched out. Ultimate tests of this set at the Board of Posts and Telegraphy proved that the reception of long, as well as short, waves was very good. The wavelength range of the set is 500 to 30,000 metres.

It is very easy to change the pitch of the tone when receiving continuous waves, and it is possible to lower the tone to such an extent as to make it resonant with the diaphragms of the phones, thus increasing the strength of signals to a greater degree. The writer is indebted to Mr. A. V. Bek for the building of the set, Mr. I. S. Shoolman for his aid in the tests, and also to Mr. Serapin.

### Details of Components

The tuning coils A and B (see Fig. 3) are of the plug-in type and should be suitable for the reception of the desired wavelength. The transformer coupling between the detector and "tone-selector"

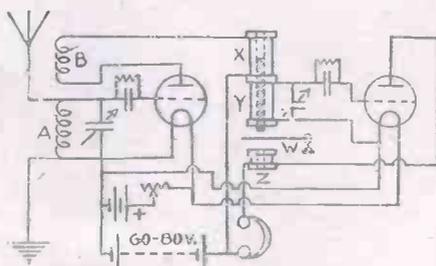


Fig. 3.—Circuit showing Arrangement of L.F. Transformer Reaction.

amplifier consists of two coils of 16,000 turns, each having a resistance of approximately 1,250 ohms. The length of each coil is 80 mm., diameter of core bobbin 20 mm., and the external diameter of each

coil 40 mm. Each coil has an approximate inductance of 6 henries (without iron core). The iron core protrudes only half-way through coil X but completely through Y. The regenerative coil Z is coupled to the end of coil Y and consists of a flat cylindrical coil of a length of 25 mm., external diameter 40 mm., internal diameter 25 mm. The total inductance of this coil is about 1 henry. The copper plate between the transformer and coil Z is shown at W (Fig. 3); this should be a little larger in diameter than coil Z.

PROF. R. V. LVOVITCH.

### LONG RANGES ON SHORT WAVELENGTHS

THE extraordinary penetrative power of wavelengths of 100 metres and under, as compared with ordinary long-wave high-power commercial transmission is illustrated by the recent two-way working

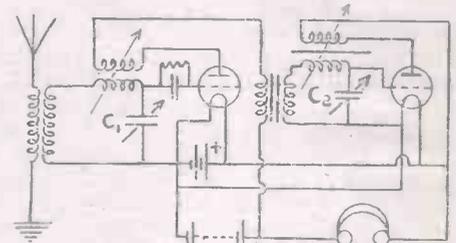


Fig. 2.—Modified Circuit.

between the amateurs of this country and New Zealand and Australia. The ease with which the 100-metre broadcast transmission from the Pittsburg station KDKA can be heard on this side of the "Herring Pond" is another case in point. Professor Howe has recently advanced an interesting theory suggesting that the antipodes are more favourably situated than other intermediate localities as regards reception from this country.

Owing to the presence of the Heaviside layer, all radiated ether waves are confined within a horizontal shell, the depth of which is measured by the distance between the Heaviside layer and the earth's surface. As the waves travel southwards they expand laterally over the spherical surface of the earth, until at the equator they have acquired a maximum spread and consequently a minimum amplitude. After passing the equator they naturally contract, following the curvature of the earth, until at the antipodes they are again concentrated. The signal intensity in this way reaches a second maximum at a point on the earth's surface diametrically opposite the transmitting station. M. A. L.

# RADIOGRAMS

It is proposed to transmit messages to pilots of vessels on the Clyde from the Gourock pilot station.

Experiments have been made with receiving apparatus in a South African gold mine at a depth of 7,000 ft. under ground.

The nursing staff of the London Homœopathic Hospital has been presented with a receiving set with loud-speaker by Mr. Geoffrey Duvcen.

A seasonable programme at 7.30 p.m. on December 24 will include a recital of Christmas songs by John Coates, the eminent English tenor.

It is proposed to erect a wireless beam station in India.

A new wireless broadcasting station has been opened in Dubendorf, near Zurich, Switzerland. This station, H B K, operates on a wavelength of 1,980 metres.

Listening-in as a cure for nerve cases and insomnia is being recognised by hospital authorities.

Educational talks are being broadcast once a week from the Nottingham station 5 N G, and it is expected that at least 5,000 children will be able to follow the remarks of the speaker.

It is reported that an amateur of Regina, Saskatchewan, in the Canadian North West, has heard a concert given in Turin, Italy, on a four-valve set.

No transmission will be given before 7 p.m. on Christmas Day, when Sir Hall Caine will give a talk on "A Dream of Christmas Day."

The Moscow broadcasting station on the last day of every month devotes a special programme to Esperanto. These transmissions take place on a wavelength of 3,200 metres.

The programme for Saturday, December 20, will include cheery selections by the London Orchestra. The Savoy bands will be broadcast from 10 p.m. till 11 p.m.

M. Deloy, of 8 A B, Nice, has sent messages to America on a wavelength of 40 metres. He received an immediate reply from Hartford, Conn., stating that signals were coming in at great strength on that wavelength.

A message sent from a recent wireless exhibition at Berlin to Honolulu (9,000 miles away) received an acknowledgment within six seconds.

A Transatlantic wireless station has been erected at Grimeto, in Sweden; it began operations successfully on December 1.

Even stockbrokers are averse to the suggestion that the B.B.C. should broadcast stock exchange prices.

The Admiralty station at Berwick is to be replaced by the Post Office station at Cullercoats.

The Horsforth Urban Council has formed a sub-committee with the object of preparing by-laws to regulate and control the erection of acrias over public streets.

"Some day we shall see as we speak," ran the first message by direct wireless from Poldhu to Milnerton, South Africa.

The two beam stations to be used in Australia for communication with Canada and England will be capable of dealing with 86,400 words daily.

A jolly wireless pantomime by the "Rooster's" concert party will be broadcast on Christmas night.

German Government experts in Altenburg (Saxony) have recently conducted wireless experiments over common lighting wires, and have succeeded in receiving messages without acrias or any earth contact. All that is necessary for broadcasting messages by this new system is a special sending apparatus. The messages can be received anywhere within a certain radius by connecting the receiving set by a simple electric contact with the lighting mains in a house. It is believed that this system will make broadcasting accessible to the remotest districts with a cost far below that of present arrangements.

(Continued on page 1002)



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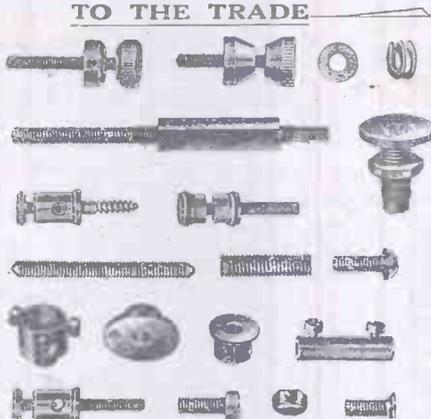
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RADIOGRAMS (continued from page 1001)

Many trappers and Red Indians in the Lake Louis district made their first acquaintance with wireless when the Goldwyn Film troupe took a set to provide recreation during the time between "shooting" scenes.

Poldhu has been received in Cape Town on a wavelength of 92 metres by means of the new Marconi beam system.

The Radio-Sociedade broadcasting station is now transmitting in Rio de Janeiro, Brazil. There is no call sign allotted, and all expenses are shared by a group of amateurs.

The B.B.C. have had over a thousand letters with regard to the broadcast of the second act of *Patricia*.

A call broadcast from Manchester asking for a volunteer to give a pint of blood to save the life of a patient resulted in forty people presenting themselves the following day.

Radio-Wien (Vienna) starts its evening transmissions by means of a tuning signal

followed by two or three V's (in morse). The call is now: "Allo, Allo, Hier Radio-Wien auf Welle fünf hundert und dreissig meter."

A site has been chosen for an important Marconi station near Dorchester, the county town of Dorset. One of the masts to be erected will be 300 ft. high.

An association of Hungarian wireless amateurs has been recently organised in that country.

The Sunday concert which Königswusterhausen (L.P.) usually transmits on 2,800 metres is now being given on 2,450 metres.

A high-power broadcasting station is now in operation at Rakovitz, Yugoslavia, on a wavelength of 1,650 metres.

In three months 36,500 licences have been taken out in the Leeds-Bradford area.

A direction-finding station has been opened at Niton, in the Isle of Wight.

The number of wireless licences taken out in Sheffield is 12,000.

A wireless club has been started in Rangoon, and the members are building a transmitting station at their own expense.

Complaints have been received of oscillation and interference in the Salisbury district.

With the opening of the Swansea station, 5 SX, on Friday, December 12, the B.B.C. completes its programme of extensions for this year. The power of this new station will be 200 watts, and it is expected that this will be quite suitable for the range it is desired to cover.

The French military station at Tunis (North Africa), OOTU, which for some time has been broadcasting a concert every Monday, Wednesday and Thursday at 17.00 G.M.T. on 1,100 metres, is now undertaking a series of tests on 92 metres.

Wireless announcements to the housewife have promoted the sale of red herrings in Hamburg. For our own part we had enough of these during the election.

## BEGINNER'S GUIDE TO WIRELESS

If you wish to make Wireless Sets which are **UNBEATABLE in PRICE, QUALITY, or EFFICIENCY**, this is the book you must have. Everything is so clearly explained that any beginner, without previous experience, can make the most efficient receiving sets obtainable. Full instructions are given for making complete Crystal Sets, 1 and 2 valve Amplifiers, Dual Amplification Sets; also the very latest 2, 3 and 4-valve Tuned Anode Receivers. 160 pages. (28 DIAGRAMS) **1/3 POST SATISFACT'ON GUARANTEED** or money returned. **1/3 FREE** SAXON RADIO CO. (DEPT. 12), SOUTH SHORE, BLACKPOOL

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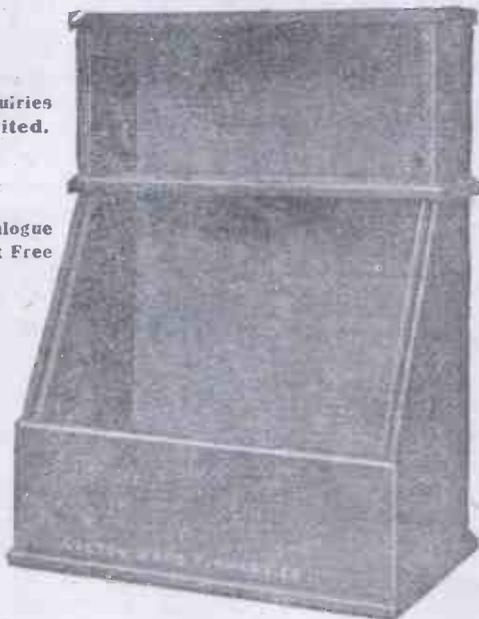
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**SMITH & ELLIS, Ltd.** (Dept. 66), 11, Little Britain, E.C.1. Tel. City 8994.

**A type for every Valve**



**219-229 SHAFTESBURY AVENUE, W.C.2**

**Athol** = PORCELAIN =  
**REVERSIBLE VALVE HOLDER**  
 One-hole fixing, above or below panel. 1/3 each.  
**COIL MOUNT.** With the Perfect Plug. 1/- each.  
**ATHOL ENG. CO.,** Cornet St., H.K. Broughton, MANCHESTER.

**AT LAST—GOOD 3d.**  
 Music for 3d.

Get a Silver Star Concert-de-Luxe Catwhisker for your Crystal Set. Scientifically made from Super Sensitive Alloy—in fact it brings the broadcasting Station to miles nearer. Paris signals received regularly by users. Sold only in sealed packets 3d. each from most reliable dealers. If unable to obtain locally send your dealer's name and address, together with P.O. value 6d. Two Pkts. will be mailed free. Sole concessionaires for British Isles.  
**Radio Warehouse, Fountain St., Fenton, Staffs.**

Please mention "A.W." when you write to Advertisers.

**ACCUMULATORS**  
 C.A.V. Fullers, etc. Guaranteed brand new and perfect but slightly soiled. We refund cash with carriage both ways if returned within 7 days.

2V-40a	8/6	2V-60a	11/6
1V-40a	17/-	6V-40a	25/-
4V-60a	21/9	6V-60a	32/6
4V-80a	27/8	6V-80a	40/-
4V-100a	32/8	6V-100a	47/6

Special Price. C.A.V., 2V-100a (actual) 27/6.  
**MADE RUBBER CO., 58, Praed St., W.2.**

**CABINETS for Wireless CONSTRUCTORS**



**PICKETT'S HIGHLY PRICED CABINETS**  
 from 1/6 each  
 They're good Value

Send for constructors list free—  
**PICKETT'S CABINET WORKS, BEXLEY HEATH, S.E.**

Send for Constructor's List (A.M.) FREE

**CATALOGUES**

**A** CATALOGUE of Efescaphone wireless receiving sets and Efesca wireless components has been received from Falk, Stadelmann and Co., Ltd., 89, Farringdon Road, E.C.1.

Literature describing B.T.H. headphones has been sent us by The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

From Henry Joseph & Co., Ltd., 96, Victoria Street, S.W.1, we have received an illustrated price list of wireless cabinets, boxes, and accumulator crates.

Literature on Sparta headphones and the Sparta one-valve amplifier have been sent us by Fullers United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex.

From A. H. Hunt, Ltd., Tunstall Road, Croydon, we have received leaflets dealing with H.A.H. grid leaks, crystal detectors and safety wander plugs.

A price list of wireless components has been sent us by the Brighton Radio and Electrical Stores, Western Road, Brighton.

We have received from M. Verstraeten, Melville Chambers, 50A, Lord Street, Liverpool, an illustrated price list of cabinets and complete cabinet wireless sets.

From Fuller's United Electric Works, Ltd., Chadwell Heath, Essex, we have received literature dealing with the Little Sparta loud-speaker.

**YOUR LOUD SPEAKER MUST be fitted with the WAVEOLA (PAT.) HORN**



It is to produce perfect results. It is sound-expanding and tone-purifying. Scientifically constructed. Two sizes, 15" and 30" each.  
**LOUD SPEAKER Complete £3 15/-**  
 Head Dept., 142, GRAY'S INN RD., W.C.1  
 Telephone: Museum 7597. Agents W. used 1781/7/10

**50% GREATER RANGE**

Write now for Brochure telling you how you can make your set selective and increase its range 50% by fitting Bowyer-Lowe Square Law Condensers which have a capacity ratio of 150 to 1 and evenly distributed wavelength scale. Send a postcard at once.

**TESTED SQUARE LAW CONDENSERS**  
**BOWYER-LOWE CO. LTD. LETCHWORTH**

**XMAS PARTY FOR THE BLIND**

**A** MONSTER party for the blind will be given in the Central Hall, Westminster at four o'clock on Saturday, December 20.

The well-known Roosters' Concert Party will provide the programme, and a tea will be given to all blind folk prior to the concert.

Application for tickets (1s. and 2s. 6d. each) should be made to the Braille and "Servers of the Blind" League at 3, Upper Woburn Place, W.C.1.

The current issue of "The Amateur Mechanic" contains two seasonable articles: "Novelty Calendars for 1925"; and "Photographic Christmas Cards." Other articles appearing in this number are: "Cycling Chat: Winter Riding"; "A Home-made Thread-pitch Gauge"; "Bossing Sheet-lead"; "Motor Cycle Practicalities"; "Making a Loose-coupler Tuner"; "A Bookshelf Overmantel"; "Fake Juggling and How to Make the Apparatus"; "Amateur Theatrical Properties"; "Hints for the Motor-car Owner"; "Wallboard: Some Interesting Notes on a Useful Modern Material"; "New Magic for Amateur Conjurers."

"Wire for Inductances."—In No. 131 on page 890, in the article with the above title, the third line above the table should read "130 microhenries, 800,000 cycles per second," not "130 microhenries, 80,000 cycles per second," as printed.

**RADIO IGRANIC DEVICES**



**EBONITE**  
 Sheet, Rod and Tubing in all sizes kept in stock and cut to any required size while you wait or sent by post on receipt of cash.  
**WE CAN TURN ANYTHING IN EBONITE**  
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**An Ideal Christmas Present**

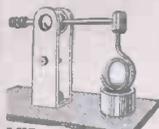
**SKINDERVIKEN CRYSTAL LOUD SPEAKER SYSTEM**

Complete Set, including Loud Speaker and Horn £4 18s. 6d.  
 Complete Amplifier, without Loud Speaker and Horn (for use with 120-ohm Loud Speaker) £2 5s.  
 " " " (for use with 2,000-ohm Loud Speaker) £2 10s.

Separate parts can be supplied to those making their own sets. This system works perfectly, but it is essential, however, if you want good results, that you should be able to hear the crystal reception when holding your 'phones 10" away from the ear. If the crystal set gives such results, can you think of any present which would be appreciated more? This amplifier can be used with equal efficiency with valve sets.

**SEND YOUR ORDER TO-DAY to ensure delivery before Christmas.**  
 Your usual dealer can supply. If not, write direct to:

**MIKRO, Ltd., 32a Craven Street, Charing Cross, LONDON, W.C.2**



**PERFECT RECEPTION**  
without any  
**CRYSTAL OR VALVE!!**  
THE  
*Wonderwire*  
CATWHISKER  
detects and rectifies without the aid  
of crystal or valve—the most marvellous  
advance as yet in broadcast reception  
Send for a Specimen To-day.  
Trade terms on application to Sole  
Dist. Importers: W. W. SLOTT & Co. Ltd.  
180, SAUCHEHALL ST., GLASGOW

THE  
"WONDERWIRE"  
simply touches an  
empty crystal cup  
**PER PIECE**  
**1/7**  
**POST FREE.**

**WIRELESS CABINETS**

SOLID OAK. ALL WELL-MADE, AND HAND-POLISHED.  
FLAT. SLOPING. FLAT. SLOPING.  
Inside measurements. Panel. Price Inside measurements. Panel. Price  
7' x 5' x 5, 3/9 .. 8' x 9, 0/9 .. 10' x 8' x 5, 6/6 .. 10' x 12, 13/3  
8' x 7' x 5, 4/9 .. 8' x 12, 11/6 .. 12' x 10' x 5, 7/6 .. 10' x 15, 15/6  
POST FREE. Solid Mahogany 20% extra. Fitted with best quality  
1" Matt. Ebonite price 1/6d. per square inch.

**J. W. WALKER**  
9, MANOR PARK PARADE (Opposite "ROSE OF LEBE"),  
HIGH ROAD, LEE, S.E. 13

**RADIO "CROXSONIA" PANELS**

Black matt finish, insulation perfect, rigid without being  
brittle, drills, cuts and taps perfect:—7" x 5", 1/2"; 6" x 6",  
1/2"; 8" x 5", 1/2"; 7" x 6", 1/3"; 8" x 6", 1/5"; 9" x 5",  
1/5"; 9" x 6", 1/7"; 10" x 8", 2/1"; 11" x 8", 2/3"; 10",  
x 9", 2/4"; 12" x 8", 2/6"; 11" x 9", 2/7"; 12" x 9", 2/10";  
12" x 10", 3/5"; 14" x 10", 3/5"; 14" x 12", 4/1";  
thick. Post free. Callers, cut any size, and quote by  
Post. Exceptional Terms to the Trade. Write for sample  
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**CROXSONIA COMPANY, 10 South St., MOORGATE, E.C.2**

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**IN AUDIO TRANSFORMER DESIGN**

The L.C.G. TRANSFORMER gives full volume and  
no distortion. Each one thoroughly tested and  
**ABSOLUTELY GUARANTEED.**

First class workmanship and finish. Ratio of windings 4:1  
INSULATION TESTS: windings to frame, 10  
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**SUPERIOR RESULTS AT LESS COST**

TRADE ENQUIRIES SOLICITED  
**15/6 L. CHARLES GARDINER 15/6**  
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The MASTER Crystal

**"Jewel-Listron"**

MAKES A CRYSTAL  
SET EQUAL TO  
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*The Wireless Wonder!*  
Guaranteed  
efficient. Com-  
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Catswhisker and full  
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CLEARLY HEARD within 9 miles of **BOURNE-**  
MOUTH STATION on the

**ONE VALVE**  
**"MIRACLE" MASTER SET**  
**THE WORLD'S BEST**

Letters of appreciation pouring in from all parts  
of the country.

1 Valve 43/- } including Coils  
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Plus Royalty.

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**TELEPHONES RE-WOUND**

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Brown "A" 6/- and Sullivan. Wax filled, 10/- per  
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carriage. Re magnetising 9d. per earpiece.

Postage extra 6d. per pair.  
**JOHN W. MILLER, 68 Farringdon ST., E.C.4**  
(2nd and 3rd Floors). Phone: CENTRAL 1930

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—AT BARGAIN PRICES



**ONE VALVE SET, Type**  
**N. Mk. 1\***

**TUNING.** The tuning arrangements,  
a vari-coupler with variable Reaction,  
are simple and extraordinarily good,  
giving long range, high selectivity, and  
eliminating to a great extent local in-  
terference.

**RANGE.** The Wavelength Range  
of this Instrument is 300 to 1800 Metres, and  
it is capable of receiving, in addition to ALL  
British Broadcasting Stations (including new  
Chelmsford Station), PARIS Telephony Broad-  
casting, without any additions in the shape of  
Loading Coils or Amplifiers. We have recently  
received Testimonials from satisfied users, to  
the effect that they have also received direct  
transmissions from AMERICA.

**FINISH.** The Panel consists of best quality,  
hand polished, 1/2 in. Ebonite and all fittings are  
heavily Nickelled. The Cabinet is of Oak or Ma-  
hogany, size 10 x 8 ins. with 2 in. Lid.  
Price of Instrument only, excluding Valve and  
Accessories, but including Marconi Royalty £5 5 0  
Price of Complete Set, including All Accessories £8 15 0  
N.B.—We can supply in place a Dull Emitter Valve  
and Dry Battery for working same, at no extra charge.  
This eliminates the trouble of  
having accumulator recharged  
and the results obtained on  
Set are just as good.

**Choose your Xmas Gifts**  
**from these Super Sets!**

**The N. Mk. C.L. Special High-Low**  
**Wavelength SUPER CRYSTAL SET**

Specially designed for receiving Chelmsford in addition to usual  
Broadcast.

The N. Mk. C.L. Super Crystal Set illustrated above has been  
specially designed by us for the reception of the new Chelmsford  
B.B.C. Station and also for Paris Telephony, in addition to the  
usual Broadcasting on lower wavelengths. The addition of Loading  
Coils to short wave Sets is unsatisfactory, especially if the latter  
are Variometer tuned.

On this Set, when listening in to Broadcast on the 300 to 500  
Metre wavelength, the extra winding used for 1600 metre wave-  
length is automatically shorted, thus obviating "dead end"  
losses.

As regards range (distance from Broadcast Stations) this Set  
will do all that the famous little "Gnat" does, and in addition  
it will, on a good Aerial, receive Chelmsford Broadcast up to a  
distance of over 200 miles.

The finish is unequalled in quality, all brass parts being Nickelled  
and the Ebonite Panel highly hand polished. At the same time  
the price is ridiculously low. Several pairs of phones may be  
used if desired.

Price of Instrument  
only ..... 32/6  
Price complete with 1  
pair Brown's "P"  
Type Headphones  
(4000 ohms) (25/-),  
100 ft. Aerial Wire,  
4 Insulators, Lead  
In Tube and Earth  
Wire, £3 0 0. Restr-  
icted Post, 2/-.  
**WRITE FOR**  
**CATALOGUE,**  
post free 3d.



**TWO VALVE SET, Type**  
**N. Mk. 2\***

The N. Mk. 2\*, which is illustrated  
here is practically identical to our N.  
Mk. 1\* (see above) except that it  
has one stage of L.F. Amplification  
added. The Tuning arrangements are  
precisely the same and the wavelength  
is 300 to 1800 Metres, covering all  
British and most Continental Broadcast.

This instrument is capable of  
working a Loud Speaker up to a  
distance of 50 miles for usual  
British Broadcasting and up to  
a distance of over 200 miles for  
Chelmsford and Paris Stations.  
In addition to the above it will  
of course receive on Headphones  
all British Stations, Paris and  
America. In fact there is prac-  
tically nothing it will not receive.

Price of Instrument only,  
excluding Valves and  
Accessories, but includ-  
ing Marconi Royalty £8 10 0  
Price of Complete Set in-  
cluding Accessories £18 19 0

Dull Emitter Valves, which only require dry battery, can be sup-  
plied in lieu of ordinary type quoted above and a dry battery  
in place of Accumulator. Total extra charge, 12/6.

**NATIONAL WIRELESS & ELECTRIC COMPANY**  
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Telephone: **HOLBORN 4756**



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

**GREAT BRITAIN**

The times given are according to Greenwich Mean Time.

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

**Aberdeen** (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5VA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

**Bradford** (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX).

**CONTINENT**

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

**AUSTRIA.**

**Vienna** (Ravag), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 12.00, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Tues.); 17.15, lec. (Mon., Thurs., Fri.); 18.30, news, weather; 19.00, time sig., con., news; 20.30, dance.

**BELGIUM.**

**Brussels** (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

**Haeren** (BAV), 1700 m. 13.00, 14.00, 16.50, 18.50, weather.

**CZECHO-SLOVAKIA.**

**Kbely** (OKP), 680 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, Stock Ex.; 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

**Komarov** (OKB), 1,800 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 09.00, con. (Sun.).

**DENMARK.**

**Copenhagen** (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750 m. other days.

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

**Ryvang**, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

**FRANCE.**

**Eiffel Tower**, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,\* Stock Ex. (exc. Sun and Mon.); 18.00, con.; 19.00, weather; 22.10, weather (exc. Sun.).

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

**Radio-Paris** (SFR), 1,780 m. (10 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, con.; 22.00, dance. 12.30, news, Stock Ex., orch.; 16.30, markets, Stock Ex.,

con.; 17.45, Stock Ex., news, women's hour; 20.30, lec., news, con.; 22.00, dance (not daily). Special con. by *Le Matin*, Paris, every 2nd and 4th Sat. in month at 22.00.

**L'École Sup. des Postes et Télégraphes** (PTT), 450-458 m. (500 w.). 16.00, lec. (Tues. and Thurs.); 20.30, Eng. conv. and con. (Tues.); 20.30, lec. or con. On 3rd Sun. of each month, organ recital, 20.45.

**"Le Petit Parisien,"** 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.).

**Lyons-la-Doua**, 550 m. 10.30, news and con.; 11.30-11.45-12.15, 16.15, Stock Ex.; 20.00, news and con.

**Toulouse Aerodrome** (MRD), 1,525 m. 09.42, 19.42, weather.

**Pic-du-Midi**, 350 m. (300 w.). Testing.

**GERMANY.**

**Berlin** (2), 505 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, con. on 430 and 505 m.; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig.; 12.30, lec. (Sun.); 13.15, Stock Ex.; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch.; 17.05, lec., women; 19.00, French (Mon., on Tues. 17.40); 19.30, lec.; 20.30,\* con., weather, news, time sig.; 21.30, chess (Mon.), dance (Thurs., Sat.). \* If opera relayed, at 18.30.

**Berlin** (Telefunken Co.), 750 m. (1 kw.). 10.30, 19.00, con., tests (irr.). 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

**Eberswalde**, 280 m. 22.15, con. (Mon.). **Königswusterhausen** (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00, 2,800 m. (5 kw.): 10.30, con. (Sun.). 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

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

**Breslau**, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, gramophone con., time sig., (Concluded on page 1008)



You can share this lucky fellow's enthusiasm when you have tried a "Uralium" Crystal on your set. "Uralium" is a natural product and the finest thing in the way of wireless crystals that has ever been discovered. You naturally want the best reception your set is capable of. Well, there is one way to get it. USE—

**Uralium**  
NATURE'S WONDER CRYSTAL

"Uralium" is put up in neat little boxes with a silver case. The Price is 1/6. OF ALL DEALERS OR DIRECT FROM—  
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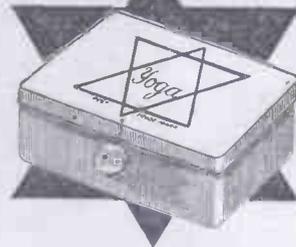
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HENRY HOLLINGDRAKE & SON, LTD.,  
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**The IDEAL CRYSTAL**

for  
**DISTANCE, VOLUME**  
or REFLEX **CIRCUITS**

A Super  
Crystal  
Triple  
Tested.



Loud—  
Clear  
Ever-  
lasting.

**E**ACH Crystal is fully tested and guaranteed. A Spiral contact of a special alloy is included, and we recommend its use, although this crystal will function with any wire contact or with zincite as a perikon detector.

Obtainable from all Wireless Stores, or post free from any of our addresses below.

Sealed Boxes 2/6 each.

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Electrical Co., Ltd.

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Manchester: 25-27, Miller Street.  
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AS SHOWN, WITH DIAL, KNOB AND BUSH.

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 •0005 - - 5/11  
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POST 6d. SET.  
 UNSURPASSED FOR FINE TUNING.

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Equal Parts of—  
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Knob & Dial Aluminium Ends Free. Ebonite Ends

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POST DEPT. will be closed Dec. 20 to Jan. 1

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 •002, •003, •004..... 1/-  
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 D.C.C. Wire. per 1/2 lb.—  
 13 g. ... 9d. 20 g. ... 9d.  
 22 g. ... 10d. 24 g. ... 1/-  
 26 g. ... 1/1 23 g. ... 1/3  
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ACCUMULATORS	NEUTRON CRYSTAL	H.T. BATTERIES
NO POST ORDER at present	Neutron Crystal ..... 1/6 Uralium ..... 1/- Midite ..... 6d. Enclosed Detectors... 9d. Large, Brass, on base 1/3 Ditto, Nickel, on base 1/6 MicMet Type..... 2/8 Variometers (special) 1/6 Ditto, with clips. etc. 2/3 Ebonite, D.C.C. and Dial ..... 3/9 Also at 3/11, 4/3, 4/6, up.	Wonderful Value 60 v..... 7/6 30 v..... 4/6 60 B.B.C..... 9/6 36 B.B.C..... 5/6 9 v. B.B.C..... 2/6 15 D.E..... 1/9 Ditto..... 2/- to 3/-

BOXES	PHILLIPS' '04 TYPE VALVE	MANSBRIDGE FIXED CONDENSERS
7 x 5 10 x 8 12 x 12 8 x 6 10 x 9 14 x 10 9 x 6 12 x 9 Any Size to Order.	15/11 BUS-BAR 1/16 sq. .... 12 ft. 6d. 18 g sq. .... 15 feet 5d.	1 mfd ..... 3/6 2 mfd ..... 3/11

LEGLESS VALVE HOLDER	PHILLIPS' '06 VALVES	FIBRE STRIP (for Coils)
Legless Valve Holder 1/- Solid Rod Ditto ..... 1/- Under Panel Ditto ..... 1/6 Valve Templates 2d., 4d. Electron Aerial..... 1/3d Adhesive Tape Roll... 2 1/2d. Copper Foil per foot ..... 2 1/2d. 1 in. Fibre Strip 3 ft. 2d. Insulated Hooks 4 for 3d. Ditto Staples..... 5 a 1d.	Microstat ..... 2/6 Switch Arms 8d. to 1/- Flex (Red and Black) 12 yds..... 2/- Shellac..... 5d. Loading Coil and Plug 8d. Contact Studs 4 for 1 1/2d. Nickel ditto 2 for 1 1/2d. Nickel Switch arm 1/- Sorbo ear caps pair... 1/4 Tumbler Switches ... 1/4	3 ft. long, 1 in. wide, 2d.

"ORMOND" L.F. 13/11	PHILLIPS' 12/6	"METAL" (FRENCH)
A Wonderful Transformer	4 ELECTRODE VALVE FOR "UNIDYNE"	'06 VALVES, 15/11
DUTCH '16 VALVES 12/0	16g D.C.C. USUALLY IN STOCK	'06 VALVES, 15/11

TWIN FLEX	"PHONE CORDS"	DE LUXE CRYSTAL SET
Twin Flex, 4 yards. 6d. Twin Silk Small 6 yds. 6d. D.C.C. Bell Wire 10 yds..... 5d. Knobs, 2 B.A. 2d., 3d., 4d. Small Knobs 6 B.A. 3d. Small Knobs 4 B.A. 3d. Wander Plugs pair 3d. Egg Insulators each 1d. Tape Aerial 100 ft. 2/- Valve Windows 4d. to 8d. Mica ..... 2d.	'Phone Cords 6 ft. 1/- & 2/3 Nugraving ..... 6 1/2d. Empire Tape, 2 yds. 1d. Allen Var. Grid Leak 1/3 Best Sleeving 3 yds. 10d. Rubber Lead-in 10 yds. 1/- Thick ditto, 1d., 2d., & 3d. Aerial, 7/22 100 ft. ... 1/10 1/4 Ditto, Extra Heavy 100 ft. .... 2/3 Anto Cap. Handles... 8d. Tumbler Switches ... 1/-	De Luxe Crystal Set 7/11 4 Whiskers, 1 Gold ... 2d. Coil Plugs (ebonite) 4 1/2d. Ditto ..... 6d. 8d. Shaped ..... 8d., 1/- 5 ohm Rheostat ..... 1/3 Variable 1/3, 1/6, 1/9, 1/11 With Dial ..... 1/11 Ormond ..... 1/9 'Phone Connector ... 1d. Nuts 2, 4, 6, B.A. doz. 2d. Washers ..... 12 a 1d.

NOTE! OUR WONDERFUL MICRO-METER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE? 1/9

RAYMOND CRYSTAL SETS	WAXLESS COILS	EBONITE STOCK SIZES
4 B.A. rod, per ft. ... 2 1/2d. 4 B.A. Rod, per ft. 2d. Basket Holders..... 8 1/2d. Also at 10d., 1/-, 1/3, 1/6 2-Way Coil Stands ... 1/11 3-way ditto..... 4/3 2-way with ex handles 2/11 3-way ditto..... 4/9 45 Batteries 4 1/2d., 5d. Brass Coil Former ... 2/11	5 Waxless Coils 200/2000 ..... 1/5 5 equal 25 to 100..... 1/11 5 ditto, Extra Air Space ..... 2/8 6 waxed 200/3600 ..... 1/8 7 waxed 150/3600 ..... 1/11 Chelmsford D.C.C. 1/-, 1/3 2/6 With adapter 9d. extra. Switch Arm, 12 Studs, 12 Nuts, 12 Washers, Lot 10 1/2d.	6 x 6 ... 1/4 7 x 5 ... 1/10 9 x 6 ... 2/- 10 x 8 ... 3/- 12 x 6 ... 3/- 12 x 9 ... 4/3 12 x 12 ... 5/6 3/16 in. 14 x 10 ... 5/6

LISSEN

Variable Grid Leak 2/6  
Anode Resistance ... 2/6  
Lissen Minor..... 3/6  
Lissenstat ..... 7/6  
Do. Universal ..... 10/6  
2-way Switch ..... 2/9  
Series Parallel..... 3/9  
T1 Transformers..... 30/-  
T2, 26/-; T3, 16/6; Coils:  
25, 4/10; 30, 35, 40, 4/10,  
50, 5/-; 60, 5/4; 75, 5/4;  
100, 6/9.  
5 point switch ..... 4/-  
Lissen choke ..... 10/-  
Aux. Res. .... 1/3

POLAR VARIABLE CONDENSERS

•001, •0005, •0003 each 10/6  
2-way CV (Junior) stand 6/-  
2-way Universal..... 11/-  
Others not Obtainable.

GOSWELL ENGINEERING (QUALITY)

2-way Cam Vernier ... 9/-  
3-way " " ..... 12/6  
3-way Ordinary..... 7/6  
2-way Panel..... 3/-  
3-way Panel..... 5/-  
Post 3d. each.

HEADPHONES 4000 ohms

Sterling ..... 25/-  
B.T.H. .... 25/-  
Brandes Matched..... 25/-  
Brown's Featherweight 25/-  
G.R.C. .... 20/-  
Etc. Etc.

VALVES BRIGHT EMITTER 12/6

B.T.H., Ediswan, Marconi, Mullard, Cosson, Myers, Green and Red Ring, etc.

BRETWOOD

Var. Grid Leak to 10..... Meg. 3/-  
Anode Resistance ... 3/-  
Anti-capacity Valve Holder ..... 1/9

\*06, DER, ARDE, etc. Myers, Cosson, Mullard, Ediswan, Marconi, etc. Valves sent by post (purchasers' Risk)

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TELEFUNKEN HEADPHONES 4000 ohms ..... 17/11 4000 Patterns ..... 12/5

DR. NESPER (See Trad-Mark) Genuine 4000 ohms ..... 13/3 Post 6d. pair.

LOUD SPEAKERS Sterling Dinkie..... 30/- Dragon Fly ..... 25/- Junior Amplion ..... 27/6 "De-Luxe" Raymond 22/6 Various others stocked.

THORPE K4 FOR UNIDYNE 17/6 (5 Pin valve holder 1/6)

PHILLIPS 4 ELECTRODE FOR UNIDYNE 12/6 (4 pin valve holder 1/3)

FILAMENT RHEOSTATS Shipton 30 or 60 ohms 3/6 Shipton 600 ohm Potentiometer ..... 4/6 T.C.B. 6, 13, 30 ohms 4/- Potentiometer 300 ohms 5/-

STERLING VARIABLE CONDENSERS Square Law with Vernier •0025, •0005 in stock

DUBILIER

•001, •002, •003, •004, •005, •006. Fixed ... 3/-  
•0001, •0002, •0003, •0004, •0005 ..... 2/6  
Type 577, '01 ..... 7/6  
Grid Leaks, each ... 2/6  
Anode Resistance 50 000, 70 000, 80 000, 100 000, on stand complete ..... 5/6

IGRANIC

Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6  
Fil. Rheostat ..... 4/6  
Potentiometer ..... 7/-  
30-ohm Rheostat ... 7/-

EDISON BELL

•001 to •0005 Fixed ... 1/3  
•002 to •006 ..... 2/-  
•001 ..... 1/3  
•003 with Grid Leak 2/6  
Variometer ..... 10/6  
Twin Detector ..... 5/6

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"BROADCAST TELEPHONY" (cont. from page 1006)  
 weather (Sun.), lec. (other days); 12.30, time sig., weather, Stock Ex.; 14.00, Stock Ex., news; 15.00, children (Sun.); 16.00, lec. (Sun.), orch. (other days); 16.30, children (Sat.); 17.00, orch. (Sun.); 18.30, Esperanto (Mon.), English (Thurs.), lec. (other days); 19.30, con., weather, time sig.; 20.30, dance (Tues.).

**Frankfort-on-Main**, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, con. (Sun.), Stock Ex. (weekdays); 15.30, con., women (Fri.); 16.00, children (Sun., Wed. 17.00); 17.30, lec., opera (irr.); 18.00, lec. (daily), shorthand (Thurs.); 18.30, Esperanto (Fri.); 19.00, lec. (Sun.), English (Mon.); 19.30, con. (daily); 20.30, time sig., weather, news; 21.00, late con. (Mon., Wed., Thurs., Sat.), dance (Fri.).

**Hamburg**, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.15, sacred con.; 11.15, chess; 12.15, con.; 15.00, children; 16.00, con.; 17.45, English conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 11.15, markets; 12.10, Spanish lesson; 13.45, markets; 14.15, news, markets, women; 16.05, lec.; 17.00, con., Esperanto (Thurs.); 18.00, lec., English conv. (Wed.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

**Norddeich (KAV)**, 1,800 m. 10.25 and 21.45, weather.

**Königsberg**, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15, markets; 15.00, orch. (Sun.), markets (weekdays); 15.30, orch., children (Wed.); 18.30, lec.; 19.00, con. or opera; 20.15, orch. or lec.

**Leipzig**, 454 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.55, markets, orch., time sig.; 15.00, markets; 15.30, orch.; 17.00, markets, lec.; 18.00, Esperanto (Mon.), chess (Tues.), lec.; 18.30, con. (Sun.); 19.00, English humour

(Tues.); 19.30, con., weather, news; 21.00, con. (not daily).

**Münich**, 485 m. (1½ kw.). 09.30, lec. (Sun.); 10.00, con. (Sun.); 13.00, news, weather, time sig.; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.); 17.00, agric. talk (Mon.); 17.30, con. (daily); 18.30, English (Mon.), Russian (Sat.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.).

**Nuremberg**, 340 m. Relay from Munich.  
**Munster**, 410 m. (1½ kw.). 06.55, time sig., news; 08.00, sacred con. (Sun.); 11.30, Stock Ex.; 11.55, time sig.; 14.30, markets; 15.00, children (Wed.); 16.00, con.; 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English (Mon., Wed., Fri.), Spanish (Tues., Thurs., Sat.).

**Stuttgart**, 443 m. (1½ kw.). 10.30, con. (Sun.); 15.00, time sig., orch. (Sun.); 16.30, markets, time sig., weather, orch., children (Wed., Sat.); 18.00, news; 18.30, lec., English humour (Fri.); 19.00, con. or opera, time sig.; 20.15, late con.; 21.15, news, &c.

**HOLLAND.**  
**Amsterdam (PCFF)**, 2,125 m. Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10 (PX9), 1,070 m.: con., 20.40 (Mon.). (PA5), 1,050 m.: 19.40, con. (Wed.).

**Hilversum (NSF)**, 1,060 m. 17.40, children (Mon.); 20.40, lec. (Fri.); 19.40, con. (Sun.).

**Ymuiden (PCMM)**, 1,050 m. 19.40, con. (Sat.).

**Vossegat (Bé)**, 1,050 m. 12.30 and 19.40, weather.

**Soesterberg**, 1,050 m. 19.26, weather.

**HUNGARY.**  
**Buda-Pesth (MT1)**, 950 m. Half-hourly from 06.45, news, Stock Ex.; 10.00, con.; 11.30 news (daily).

**ITALY.**  
**Rome (IRO)**, 425 m. (1½ kw.). 19.40 to 21.40, con.

**Centocelle (ICD)**, 1,800 m. (6 kw.). 15.00 and 19.30, news.

**JUGO-SLAVIA.**  
**Belgrade**, 1,650 m. (2 k.w.). 17.45, con. (Tues., Thurs., Sat.).

**PORTUGAL.**  
**Lisbon (Aero-Lisboa)**, 375-410 m. 20.30, tests, music, speech (irr.).

**Montesanto (CTV)**, 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

**RUSSIA.**  
**Moscow**, 3,200 m. 13.30, speech or lec. (Esperanto) on last day of each month.

**SPAIN.**  
**Madrid (EAJ2)**, Radio-España, 335 m. 18.00, con.

**Madrid (Radio-Iberica)**, 392 m. 21.00, weather, Stock Ex., time sig., con., news.

**Barcelona (EAJ1)**, 325 m. 17.00 and 21.00, con.

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

**SWEDEN.**  
**Stockholm (TV)**, 440 m. 10.00, service, relayed (Sun.); 11.45, weather, time sig.; 18.10, con., news (exc. Mon.).

**Gothenburg**, 460 m. 18.10, con. (Tues., Fri. and Sat.). 680 m.: 18.10 (Mon., Wed. and Thurs.).

**Boden**, 2,500 m. 17.40, con. (Tues. and Fri.); 16.40, con., news (Sun.).

**SWITZERLAND.**  
**Geneva (HB1)**, 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

**Lausanne (HB2)**, 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

**Zurich (Höngg)**, 515 m. (500 w.). 08.00, con., news; 12.00, weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., news, weather, dance (Sat.). Sundays: 15.00 and 19.15, con., news, weather.

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**I.M.I. ALL BRITISH**  
**POPULAR ACCUMULATORS**



**DO NOT LET THE PRICE DETER YOU, AS EFFICIENCY IS GUARANTEED.**

20A	40A	60A	80A	100A	IGNITION CAPACITY
7/6	9/10	12/3	15/6	17/6	2 Volts
14/2	18/8	23/6	29/6	33/-	4 Volts
20/6	27/-	35/3	41/9	46/9	6 Volts

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# An unusual Set - at an ordinary price

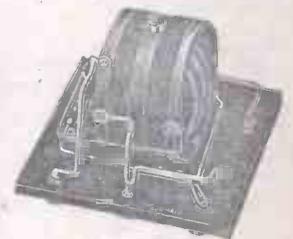


The Woodhall Crystal Set, incorporating the special No. 3 Variometer, covers the entire B.B.C. wave lengths—300 to 500 metres—without the use of a condenser. This means that capacity is at a minimum, and efficiency accordingly high.

**Loading-Coil Socket—Plated Fittings—Bus-Bar Wiring**

Provision is made for a loading Coil (Chelmsford). All fittings are nickel-plated, and best quality matt ebonite is used. The detector has screw pattern cup and opal-backed dust cover to reduce eye-strain.

Particular attention is paid to the internal wiring, which is of square-section wire (all joints being soldered) in accordance with the best modern practice.



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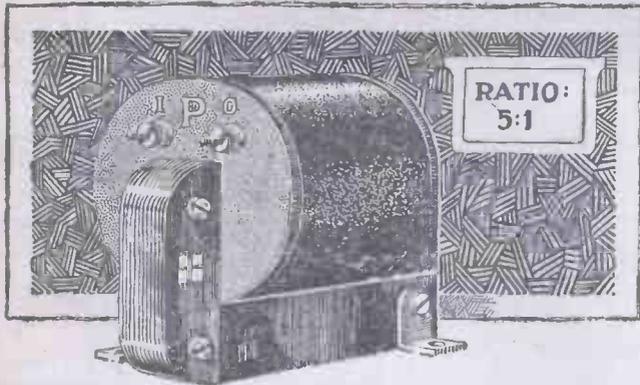
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**Supra**  
*Low-Frequency Transformer*

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The unique arrangement of the windings of the SUPRA Low-Frequency Transformer is responsible for the distortionless and effective results obtained from those sets in which it is installed. Each layer has six sections made up of highly insulated wire, whilst the core is composed of 38 laminations made of fine soft iron. The SUPRA, although giving maximum amplification, reproduces music with clarity and richness of tone, whilst speech comes through it with that crisp resonance that makes "listening in" a pleasure. It is a high-grade article at a popular price.

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**Supratone**  
*Headphones*

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**£1**

You may tune an instrument to perfection, but real results cannot be obtained without good receivers. Each component part of the SUPRATONE Headphones is constructed with the utmost care, assembled and tested for perfection of tone, strength and all that has gone to make the SUPRATONE a popular piece. Too often an instrument is blamed for indifferent results, but if you listen through a SUPRATONE you will hear all that your set can impart. The dual adjustment of the ear-pieces ensures perfect comfort for any length of time.

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**HIGH GRADE HEADPHONES**  
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PRICES :

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**WOOLWICH, LONDON, S.E.18.**

## INTERNATIONAL WIRELESS COMBINE

THE four principal companies which control the world's wireless traffic are Marconi's Wireless Co., Ltd., London, the Telefunken Gesellschaft, of Berlin, the Radio Corporation of America, New York, and the Compagnie Générale de Télégraphie sans fil, Paris. These important concerns, with a view to putting an end to the competitive war which of late had assumed acute proportions, have agreed to a combined working arrangement with a mutual interchange of patents.

The Telefunken Gesellschaft is an off-spring of the famous Siemens and Halske and General Electric firms of Berlin, and

has erected the Nauen, Goltow, Eilvese, Westernland and Sylt stations, all controlled from Germany's capital. Hamburg, another large station, is worked by an affiliated concern, the Trans-Radio Co.

The Radio Corporation of America monopolises all wireless traffic with Europe from the other side of the Herring Pond. The Marconi Co. is connected with the United States through its high-power station at Carnarvon. Owing to delay in the development of the Imperial Wireless chain the Colonies are making direct contracts with the Marconi Co. for the establishment of their own high-power stations.

Several important French groups are interested in the Cie Générale de Télégraphie sans fil. Since the war considerable pro-

gress has been made by France in the development of direct communication with her distant colonies, as well as with the North and South American Continents. Sainte Assise, near Melun, is the centre of the French wireless nervous system.

It has been commonly agreed that the four companies mentioned shall in future jointly erect all new stations. Monte Grande, near Buenos Aires, one of the latest and most modern of all, after having been undertaken by the Telefunken Co., was actually completed by the combine. The Trans-Radio Argentina Co. was founded for this purpose, and in this concern the "big four" were jointly interested. J. G. A.

# GIL-RAY

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Yours truly,  
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| <p><b>AERIAL WIRE.</b>—7/22 Stranded Copper, 100 ft., 1/11; 7/22 Stranded Copper, per 50 ft., 1/-; "Electron" Aerial Wire, per 100 ft., 1/8.</p> <p><b>ACCUMULATORS.</b>—Fuller's 2 volt 40 amp. in Ebonite, 9/6; 2 volt 60, 11/9; 4 volt 40, 18/6; 4 volt 60, 22/6; 6 volt 20, 27/6; 6 volt 60, 33/9</p> <p><b>BRASS RODS.</b>—Screwed 2 B.A., 12 in. lengths, 2/6; Screwed 4 B.A., 12 in. lengths, 2/6.</p> <p><b>BRASS ROD, SQUARE.</b>—Cut any length, per 12 in., 3d.</p> <p><b>BASE BOARDS.</b>—6 in. by 6 in., 9d.; 9 in. by 6 in., 1/-.</p> <p><b>BUZZERS</b> for testing, 2/-.</p> <p><b>BUSHES</b> for Condensers and Variometers.—Condenser top bush, 4/6; Condenser bottom bush, 1/6; Variometer screwed bush, 2/6.</p> <p><b>BELL WIRE.</b>—Single, 2 yds., 1/6; double, 1 yd., 1/6.</p> <p><b>BOXES.</b>—All sizes stocked or made to order</p> <p><b>CATWHISKERS.</b>—Silver, 1d.; Gold, 2d.; Spear-point (Silver) 2d.; Gold Whiskers in tubes, 5d.; Experimenter's Envelopes, of 4 &amp; 5 Whiskers, 3d.</p> <p><b>CONNECTORS</b> (Brass), useful for many jobs, 1/6.</p> <p><b>COIL HOLDERS.</b>—Single, 9d. to 2/6; 2-way, 3/-; 3/6, 3/8, 4/-, 4/6, 5/6; 3-way, 4/-, 4/6, 5/-, 5/6. Cam Vernier 2 Coil Holders, 3/6; Poar Cain Vernier, 6/-; Coil Plugs for attaching Basket Coil to Plug into ordinary 2 or 3 Coil Holder, 7d., 1/-, 1/3; Coil Plugs for making own Coils, Plain Flat Type, 7d.; Wedge Type, 9d., 10d., and 1/-; Fitted with Ebonite Wings, 1/3.</p> <p><b>COILS.</b>—Duplex Waxless Coils, per set of 5, 2/6; Duplex Coil, wound to 1,000 metres for Chelmsford, 2/-; Tapped Coils, d.c.c., 20 Tappings, 1/11;</p> | <p>Enamel Wound Coils, 6 by 2 1/4, 1/4; O'Keefe, Burn-dept and Igranic Coils always in stock.</p> <p><b>DIAPHRAGMS</b>, 2d. and 3d.</p> <p><b>DIALS AND KNOBS</b>, 1/3. <b>DIALS</b>, 1/-.</p> <p><b>EAR CAPS</b> for all makes of Phones, 6d. to 1/6.</p> <p><b>EMPIRE TAPE</b>, per yd., 1d.</p> <p><b>EARTH CLIPS</b>, 4/6 to 6d.</p> <p><b>EBONITE.</b>—Cut to any size, 1/2 to 1 in., per lb. 3/6.</p> <p><b>EBONITE TUBE.</b>—All sizes stocked.</p> <p><b>FILAMENT RHEOSTATS.</b>—Velvet Perfecta, 1/6; Microstat, 2/9; Igranic (with Vernier), 7/8; Igranic (Plain), 4/6; Lissenstat Minor, 3/6; Lissenstat Major, 7/6; 30 ohm Special for '06 Valves, 2/6.</p> <p><b>FORMERS.</b>—Cardboard, very stout, from 2 in. to 4 in. diameter, 1d. to 4d.</p> <p><b>FORMERS, VARIOMETERS</b>, in Black Composition, per pair, 3d.</p> <p><b>FLEX.</b>—For Phone Cords H.T. Leads to many other jobs, per yd., 2d.; Red and Black Twisted, per yd., 2d.; Silk Covered, per yd., 1 1/2d.</p> <p><b>GRID LEAKS.</b>—"Dubilier" 2 meg., 2/6; "Lissen" Variable, 2/6; "Watmel," 2/6; "Bretwood," 3/-.</p> <p><b>HYDROMETERS (ACID TESTERS)</b>, 5/6.</p> <p><b>HEADPHONE CORDS</b>, 1/6 and 2/3.</p> <p><b>HIGH TENSION BATTERIES.</b>—"Phoenix," M.A.L., S.D.H., 15 volts, 2/9; 30 volts, 5/6; 36 volts, 6/6; 60 volts, 10/6; 90 volts, 16/6.</p> <p><b>HIGH FREQUENCY PLUG-IN TRANSFORMERS.</b>—All Wavelengths from 150 to 8,000</p> | <p>metres, prices from 3/9 to 5/6; Leslie McMichael H.F. Transformers, 300 to 600 metres, 10/-; 1,000 to 3,000 metres, 10/-.</p> <p><b>INSULATORS.</b>—Large Reel, 1d.; Small Reel, 1d.; Egg type, 1d.; Shell Type, 1d.; Hook (for indoor use), 1d.</p> <p><b>CONDENSERS.</b>—Fixed, All Capacities '001 to '003 and '001 to '005, 8d.; "Edison Bell" Fixed Condensers, All Capacities, '002 to '006, 2/-; All Capacities, '001 to '005, 1/3; "Dubilier" Fixed Condensers, '001 to '006, 3/-; '001 to '005, 2/6; "Mansbridge" Condensers, '006, 2/6; '25, 2/9; '5, 3/3; 1 mf., 3/6; 2 mf., 4/-.</p> <p><b>CONDENSERS (Variable).</b>—"Ormond," '001, 8/-; '00075, 7/-; '0005, 6/-; '0003, 5/6; '0002, 5/-; '0001, 4/-; "Vernier," 4/-; Condensers with "Vernier," '001 9/6; '0005, 7/6; '0003, 7/-; Also all square law stocked.</p> <p><b>CONTACT STUDS.</b>—5d. per doz., complete with nuts and washers; Nickel, per doz., 1/3.</p> <p><b>CONTACT STOPS.</b>—Two for 1 1/2d., complete with nut and washer.</p> <p><b>CRYSTALS.</b>—Small Box Hertzite, 8d.; Large Box Hertzite, 1/-; Midite, 1/-; Tungstalite (Blue Label), 1/6; Gecosite, 1/3; Carborundum, 4d.; Bornite, 6d.; Zincite, 9d.; Crystal Cups, patent screw tops, 2/6; 3 screw tops, 1/6d.</p> <p><b>CRYSTAL SETS.</b>—Excellent results are being obtained on these Sets, which are all guaranteed. Slope Panel, 12/6; "Hawker's" Mark III Set, Maker's Price, 21/-; Our Price, 17/6; "Service Set," splendid value, 30/-; with Variometer Tuning plug, 1,600 Metre Station.</p> |
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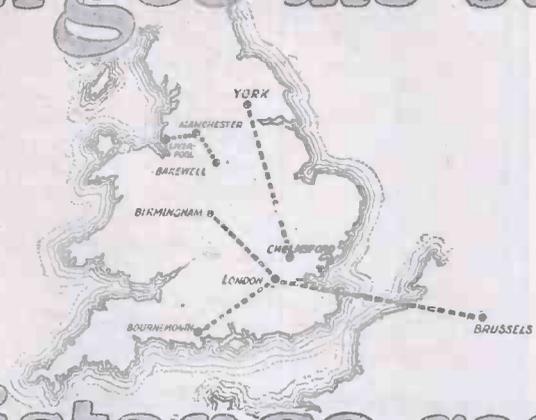
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# You can get the same

Mr. L. V. Clark, of Experimental Station 5BT Chiswick, reports receiving Brussels (200 miles) and Birmingham (125 miles) on a Neutron, without the aid of amplifiers.

Mr. C. S. Miller, Bellingham, S.E., receives Birmingham (125 miles) and Bournemouth (90 miles) on a Neutron without amplifiers.



"A. E." Bakewell, receives Manchester (38 miles) on a Neutron plain crystal circuit.

"E. C. D." York, receives Chelmsford (160 miles) on a single slider crystal set with a Neutron.

"T. C." Radcliffe, receives Liverpool (40 miles) on a cigar-box crystal set, with a Neutron.

# long-distance results

If you follow these simple hints you can reach the same standard of efficiency, and either bring in the distant stations, or (if a town-dweller) double the strength of reception from your near-by station.

**The Aerial.** Have a single-wire aerial for choice; stranded and enamelled wire, with leading-in wire of the same material is the best. Look to the insulation, and avoid running the leading-in wire too close to the wall. See that wet weather does not cause leakage from aerial to earth.

**The Earth.** Run a stout copper wire to a plate, buried in the earth, for preference. If connected to a water-pipe, run the wire downstairs and connect there if possible. Avoid gas-pipes, which have faulty connections. If you use a water-pipe use one that goes to earth, not to a cistern. Use an earth-clip.

**The Coil.** Use 16-gauge wire, cotton-covered, straight-wound (on cardboard, not ebonite) or spider-wound. Use no shellac or wax. Variometers are often inefficient through damping when the coils are in opposition, and through capacity between

the coils. Use a coil of nearly exact size, rather than a long-wave coil tapped. If you want long-wave stations, bring them in with a removable loading coil.

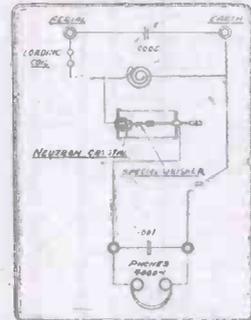
**Variable Condensers.** Avoid cheap composition end-plates. Ebonite for preference; or if metal-ended, see that the washers are ebonite and large in diameter. Use as small a condenser as possible, having the coil large enough to require only a small amount of condenser for tuning. Connect moving plates to earth end of coil.

**The Detector.** Enclosed type for preference. One that is not easily vibrated out of adjustment. Micrometer type, if possible. Neutron requires very light pressure. Ensure good contact between crystal and crystal-cup. Set in Woods' metal, or pack tight with tin-foil—not lead-foil.

**The Phones.** High-resistance (4,000 ohms). Be sure to obtain good leads.

Poor reception is often due to faulty phone-leads. Don't remove ear-caps; they are often adjusted for maximum sensitiveness by the makers.

**The Circuit.** The circuit given here is not a freak circuit, but just a good standard circuit, exactly as used by Mr. L. V. Clark (see report above). Amateurs are advised to use the best material throughout—the difference in price is only small compared with the freedom from trouble, and the greater satisfaction which good components yield.



## and the Crystal: it must be —



Concert Tested and Guaranteed.

A good aerial, heavy-gauge, efficiently-wound coils, minimum self-capacity — all these count; but most important of all is your Crystal. There are many efficient Crystals, but you may try twenty before you find a good one—unless you ask for NEUTRON, in the black-yellow tin. If you take this precaution you will undoubtedly secure a crystal that will give you full efficiency first time, requiring no "searching" for sensitive spots, and giving you continued joy in listening.

Stocked by the Best Radio Dealers. Packed in tin, with silver cats-whisker. Insist on Neutron, in the Black and Yellow Tin. If unable to obtain, send 1/6 with dealer's name, and this wonderful crystal will be mailed by return. **1/6**

Sole Distributors:—**V. Zeitlin & Sons,**  
144, Theobalds Rd., London, W.C.1. Phones: Museum 3795 & 6841. Produced by:—Neutron Ltd., Sicilian House, Southampton Row, London, W.C.1. Phone: Museum 2677.





5 XX and Radio-Paris

SIR,—Having noticed frequent complaints regarding the separation of 5 XX and Radio-Paris, I should like to give you my experience.

My set is a four-valve straight circuit, with single aerial tuning, H.F., detector, two L.F. I have never had any difficulty in separating the two stations either on one, two three or four valves.

The following are the coils I use for both stations, with .001 microfarad condensers in aerial and tuned-anode circuits: Aerial, 150; anode, 200; reaction, 100-150. With .0005-microfarad condenser in aerial circuit and .0003 anode condenser circuit. For Chelmsford: aerial, 150; anode, 200; reaction, 100. For Radio-Paris: aerial, 150; anode, 250; reaction, 150. For Eiffel Tower: aerial, 250; anode, 300; reaction, 200.—P. T. T. (Cardiff).

Broadcast Plays

SIR,—The B.B.C. seem wedded to the idea that plays, and generally those with a large number of characters, are suitable for broadcasting. I feel sure, however, that other people's opinions must be the same as mine, namely, that they are

wholly unsuitable and a sheer waste of time.

I have written on more than one occasion to the B.B.C. pointing out why long plays, and particularly those which are S.B., are unsuitable.

The B.B.C. seems to expect that one is going to sit for two hours, and sometimes longer than that, listening to one continuous play, which starts just at the same time that most people are sitting down to dinner. Also they do not appear to have listened to these plays "from outside," particularly if they are S.B. If so, they would soon realise the almost impossibility of sorting out the number of characters. Even where the number of characters is small one constantly misses words or phrases, due presumably to the action on the stage, and the sense is lost.

I have talked a good deal about this subject to other listeners and have not found anybody yet who was not of the same opinion. It seems to me that the airing of this subject in your paper might have some influence on the B.B.C.—E. W. (Stoneleigh).

Other Correspondence Summarised

J. C. and H. M. (Ormskirk) take exception to the statement in the article on "Colloid Rectifiers," in No. 129, that "Colloids are jelly-like substances of large molecular mass," and states that colloids are not all essentially jelly-like in nature.

H. J. C. (Co. Kerry) received telephony

from the ss. *Leviathan* on an unaided crystal receiver.

W. F. F. (Huntingdon) received telephony from the ss. *Leviathan* on a loud-speaker.

R. W. (Sheffield) and W. F. H. (Birmingham), referring to a letter of S. P. (Redcar) in No. 126, write us that the station he heard was W G Y, of Schenectady, New York, transmitting on a wavelength of 380 metres.

T. M. (Co Kerry, Ireland) has received K D K A, W B Z, Radio-Paris, Madrid and eleven B.B.C. stations.

T. R. W. G. (Tooting) finds that, owing to capacity effects, he obtains stronger signals when his H.F. valve is not employed.

J. A. (Taunton) has received C K C A, W G Y, K D K A and W B Z on his home-made valve-crystal set.

J. G. (Lancashire) received telephony from the ss. *Leviathan* at loud-speaker strength on his four-valve set.

"My Ideal Wireless Christmas."—We regret that owing to the great demands upon our space we have been obliged to hold over, until our next issue, the remaining letters in our Christmas competition "My Ideal Wireless Christmas." It has also been necessary to hold over the instalments of "Experimental Transmission" and "A Double-dual or Duplex Reflex Set."

**Give a Loud Speaker for Christmas**

Your wireless friend will appreciate the compliment if it is a C.A.V., for no other is capable of rendering the broadcasted programmes with greater Clarity And Volume.

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<p>Junior, 2,000 ohms, 55/- Tom Tit, 2,000 ohms, 30/-</p>	<p>120 ohms, £4 15 2,000 ,, £5 4,000 ,, £5 10</p>
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## It seemed a very serious matter

Just a week to go and a whole crowd of people coming along for Christmas. How on earth were they going to entertain them? Then HE came along—the man who settled their problem. Showed them an “EZI-WIRING” book. Said: “Take advantage of the delightful programmes the B.B.C. are providing. These 4-colour wiring diagrams and detailed instructions make building a receiver the easiest thing in the world—sure of giving splendid results too.” And so—thanks to the “EZI-WIRING” Series—wireless settled another entertainment problem.

### A 2-Valve and Crystal Reflex Receiver (EZI-WIRING SERIES No. 3. By W. JAMES).

Reflex Receivers are capable of giving a very high degree of amplification per valve. This 2-valve and crystal receiver, unlike many reflex receivers, will be found perfectly stable in operation, and will be capable of giving loud-speaker strength with a radius of thirty miles of a main B.B.C. Station.

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- No. 1. 3-Valve Portable Receiver, by Hugh S. Pocock.
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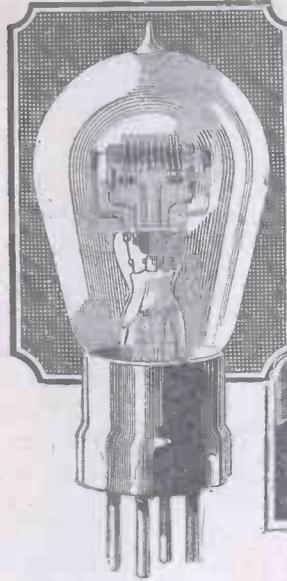
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Complete with 4-colour wiring diagrams, detailed measurements and explanations as to components, progressive diagrams and plates, showing the set in various positions, with disposition of components and full instructions on operation. No loose sheets.

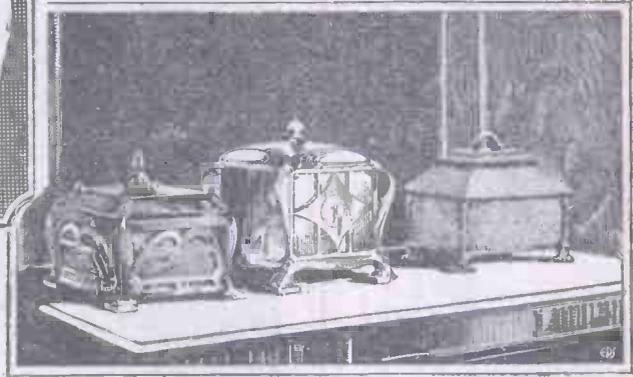
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The three caskets

10/-

IT was not the Golden Casket that contained Portia's portrait, but the lead; and so it often happens that the most expensive article is not necessarily the one most to be desired. There are many valves more expensive than the Loudens; yet there is not one of them that combines all its many advantages.

It uses considerably less current from the accumulators than is usual amongst valves of the bright filament type—a point which needs no labouring to those anxious to keep down costs.

It gives a reproduction full in volume and silver clear in quality, and it has a stout filament which is not readily broken. Further, it only costs 10/-.

Four months ago people had not heard of Loudens Valves; to-day they are demanding them at the rate of many thousands per week—which is, perhaps, the most striking testimony of all. See that your next valve is a Louden.

Louden VALVES



The plain Louden for detecting and Low Frequency Amplifying.  
The Blue Louden for H.P. Amplification.  
Filament Volts... 4.5-5  
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Manufactured throughout in Great Britain. All Loudens are Silver Clear and free from "mush." The current consumption is very low and the life long.

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**Croydon Wireless and Physical Society**

Hon. Sec.—MR. H. T. P. GEE, 51, Chancery Lane, W.C.2.

THE last meeting of the society was in lighter vein than usual when Major John Manley spoke on "The Humbug Voice: Its Uses and Abuses."

**Bethnal Green Radio Society**

Hon. Sec.—MR. C. J. HILTON, 142, Mansford Street, Bethnal Green, E.2.

A LANTERN lecture was given on December 2 by Mr. W. Davis, of the G.E.C., on "The Manufacture of Wireless Valves."

**Englefield Green and District Radio Society**

Hon. Sec.—MR. A. ROBBINS, Thirlmere, Egham. THE usual meeting took place on December 3,

when Mr. Holford gave a lecture on how to obtain pure reception by means of a broadcast receiver.

**South Birmingham Wireless Club**

Hon. Sec.—MR. W. E. PRITCHARD, "Windermere," Wake Green Road, Moseley.

THE above club has been formed for the purpose of encouraging wireless in this locality and installing sets at a later date and giving lectures on them.

**City of Belfast Y.M.C.A. Radio Club**

Hon. Sec.—MR. J. C. COWLEY, 4, St. Paul's Street, Belfast.

ON December 2 Mr. J. Wylie, B.A., gave a talk and demonstration on "The Principles Governing the Action of Crystal Receivers."

**ANNOUNCEMENTS**

"Amateur Wireless and Electric." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

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

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

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

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

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Outdoor type as illustrated, complete with 50 ft. down lead, four insulated arms, central hub bracket, ready for mounting on mast. **£3 - 15 - 0**  
*Special Wind Brackets and Masts supplied.*

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This is the most efficient aerial wire on the market—the same as used on the patent "VERTEX" Aerial. 100 ft. coil, 10/6  
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IT'S THE LEAK THAT DOES IT

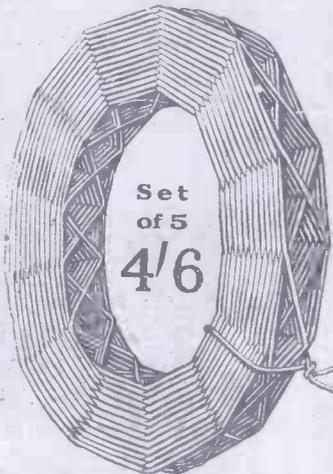
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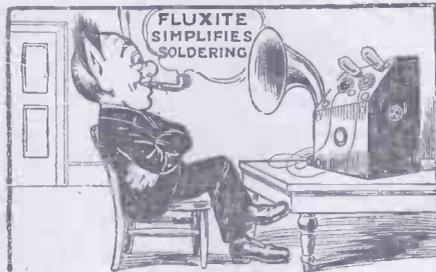
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If you appreciate purity of tone and selectivity of reception, solder every join in your circuit and you will be handsomely rewarded for your pains. FLUXITE makes soldering really simple and you will be delighted at how light it makes this one-time tedious job.

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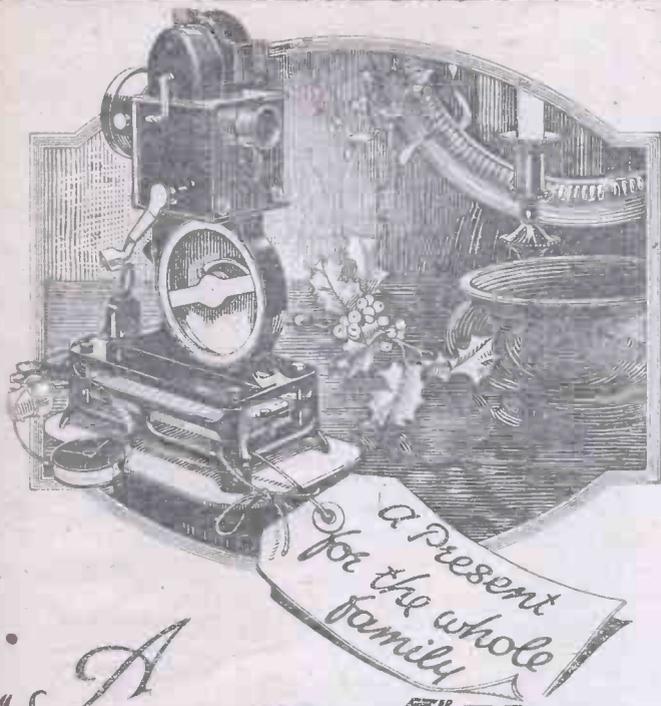
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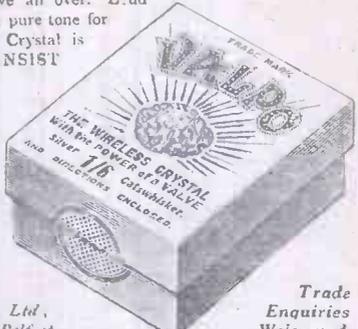
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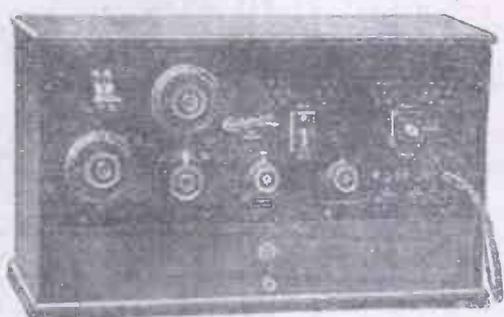
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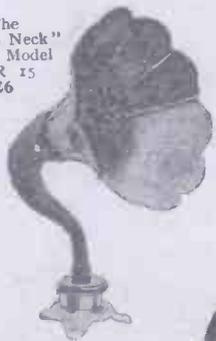
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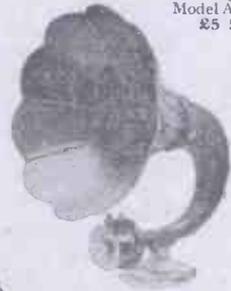
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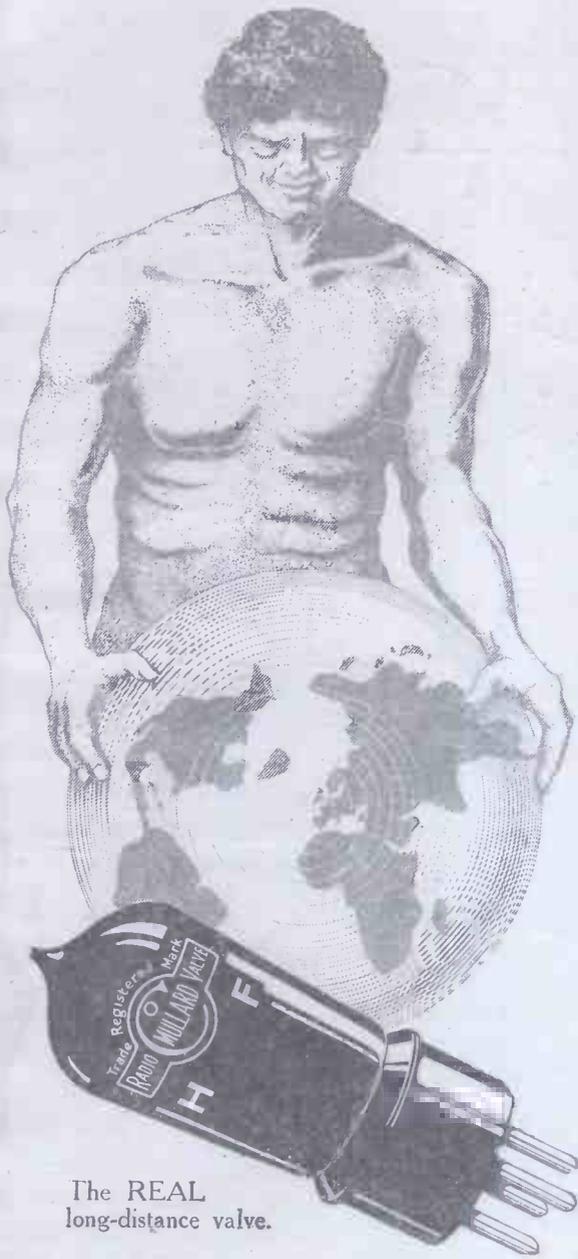
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## MULLARD H.F. MASTER VALVES

Single Red Ring bright filament valves	12/6 each.
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LISSEN  
2-WAY  
SWITCH  
2/9



### WHAT THE LISSEN 5-POINT SWITCH DOES

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LISSEN  
SERIES-  
PARALLEL  
SWITCH  
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### LISSEN REVERSING SWITCH

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