

WHAT TO SEE AT THE EXHIBITION

Amateur Wireless And Electrics

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VOTE (p. 256)

No. 13

SATURDAY, SEPTEMBER 2, 1922

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Amateur Wireless

and Electrics

No. 13

September 2, 1922

An Easily-made Pocket Receiver

Simple :: Effective :: Cheap

THE receiver about to be described has given excellent results, the following being a few of them. When erected five miles from Croydon air terminus, speech from the latter could be heard a foot from

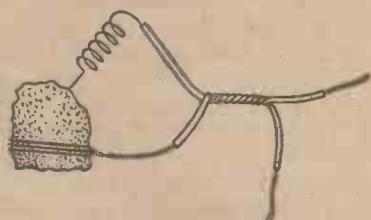


Fig. 1.—Method of Testing Crystals.

the 'phones, and the reply—from an aeroplane over Gravesend—could just be received. With a larger aerial the Marconi concerts from Chelmsford could be heard quite distinctly in Kent. Within twelve miles of a broadcasting station both music and speech could be heard extraordinarily loud, while from over forty miles they were heard very faintly. Ship calls came in very well, and when compared with a larger set, using a single layer inductance

earth was all right—two very essential features in a crystal set.

The set is the outcome of a great deal of experimenting, in the course of which sixteen different crystals were tried, the best results being obtained from galena, silicon, zincite-bornite combination and hertzite. Galena and silicon were about equal, the fault with them being that there were not enough sensitive parts, and should the detector receive a knock it took several minutes to readjust it. Zincite bornite required very little adjustment, and was the best detector until I obtained a piece of hertzite. This proved to be

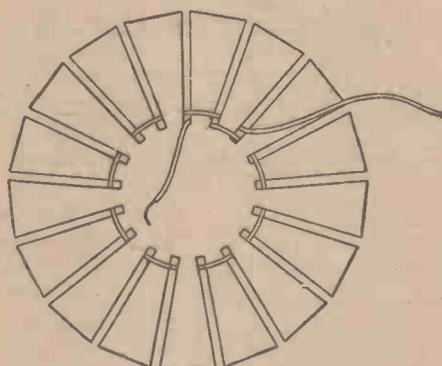


Fig. 4.—Method of Winding Inductance Coil.

sensitive all over, although some parts were better than others; on the best parts the signals came in much louder than on the zincite-bornite detector.

The manner in which the crystals were tried is shown in Fig. 1. Two No. 30-gauge wires were twisted tightly together and the ends then stripped, one end being twisted round the crystal and the other made into a spiral, the end of the latter resting lightly on the crystal. Fig. 2 shows how a detector was constructed. A hertzite crystal was enclosed in a glass tube, the crystal with wire attached being at one end. The other end was provided with a cork with a wire passing through it, the wire resting on the crystal.

Fig. 3 shows how a zincite-bornite detector of the same type may be constructed. The two crystals, with the wires attached, are placed in the tube, while a rather weak wire spring holds them together.

Faults in tuning are often due to the

sliding contacts, and as there are no sliding contacts in the tuning arrangement about to be described this trouble does not arise. No condensers are used, the in-

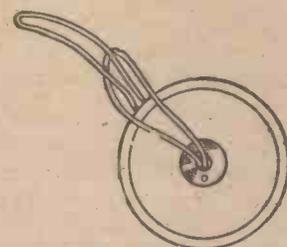


Fig. 6.—Spool for Aerial Wire.

ductance being altered by one coil acting on another, as in a variometer. The construction of the coils is quite simple; two pieces of stiff card, 4 in. in diameter, are cut, and a circle $1\frac{1}{4}$ in. in diameter is drawn on each. Seventeen slots are now cut from the outside edge to the centre circle; these slots should be about $\frac{1}{8}$ in. in width and equal distances apart. Some No. 30 d.c.c. wire should now be wound in and out of these slots until 58 complete turns of wire are on the cards—29 turns on each side. Fig. 4 illustrates the method of winding,

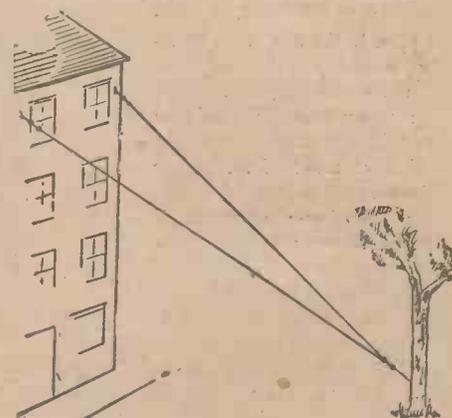


Fig. 5.—The Aerial Erected.

and a slider, the latter was inferior in results. Some may doubt these results, but I am sure even a beginner could get the same provided the aerial was erected in a good position and the connection to

the end of the wire being passed through a hole at the edge of the card. Any spare card round the edge should be cut off and the whole assembly well coated with shellac varnish to hold it together.

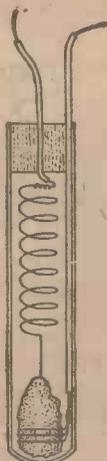


Fig. 2

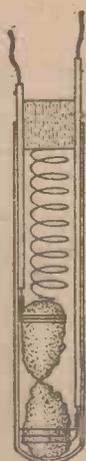


Fig. 3

Figs. 2 and 3.—Construction of Two Types of Detector.

In use the two coils are connected in series and one laid on the other. To alter the inductance the top coil is moved slowly over the other. For the aerial the wire used is No. 28 bare copper, the insulators being short lengths of cord, which answer very well if the weather is dry. The shape of the aerial is like a V, and it is wound on a typewriter ribbon spool. There should be two lengths of wire each

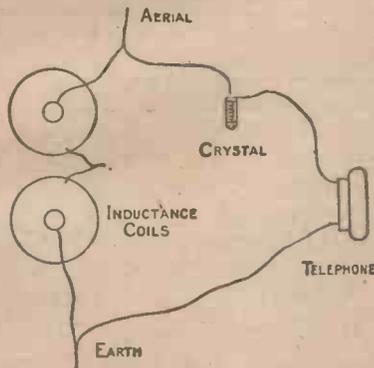


Fig. 7.—Connections of Receiving Set.

80 ft. long. These are wound on the spool together. The ends should be firmly attached to two loops of string and another piece of string, tied in a loop, should be carried to insulate the spool end.

To erect the aerial, the cord—with the two ends of wire attached—must be looped to any suitable support as high and as far apart as possible. Keeping both wires taut, they are carefully unwound. When as much wire as possible has been unwound the extra loop of cord must be passed through the spool, thus forming a loop of cord at each side of it, one of these being passed through the other and fastened to any convenient projection. Fig. 5 shows the aerial erected, and Fig. 6 shows how the loops on the spool are arranged. This arrangement grips the spool and holds it tight.

The most convenient earth connection is to a water-pipe, but if you happen to be situated where no water-pipe is at hand a large knife or iron bar stuck into damp earth will give nearly as good results.

Fig. 7 shows the method of connecting the apparatus up. To operate it one coil is slid over the other very slowly; if there are no results the top coil should be turned over and the sliding tried again.

Where portability is of consequence a single telephone of a thousand or more ohms may be used, but a headset gives better results.

If it is desired to increase the range of the set it can be done by connecting a fixed condenser of about .001 mfd. capacity across the two coils. J. E. M.

The total length of strip should be $2\frac{1}{2}$ in. and the width $\frac{1}{8}$ in. This is bent to shape as shown. At $\frac{1}{2}$ in. from one end make a right-angle bend, as shown at *a*, then a perpendicular straight piece to clear the adjusting screw *E*. At the point of contact of screw *E* make a goose-neck curve, ending in a horizontal straight piece about $\frac{1}{4}$ in. long; arrange this to register contact with centre of diaphragm of the receiver at *C*.

The most suitable telephone receiver is the 4,000-ohm type, although the 120-ohm type will answer when a telephone transformer is used.

Two flexible wires are taken from the fixing screw of spring *C* and clamping strap *B* (the strap, as mentioned, should make electrical contact with the metal case of the receiver), and these are connected to two terminals *T T*. There should now be a complete electrical circuit from one terminal *T* through the spring to the contact *C*, and through the diaphragm on to the metal frame of the receiver and *via* the brass strip *B* to the other terminal *T*, as is made clear in the diagram.

The relay operates as follows: When it is put into series with the operating coils of a small post-office relay (which requires .0068 amp. at 2 volts to work it), as shown in Fig. 2, the tongue *T* of the relay is held over and makes contact with the terminal contact *M*; then when a wireless signal vibrates the diaphragm of the telephone receiver a high-resistance contact is set up at *C* (Fig. 1), which allows the tongue of the relay to spring back to the *S* contact, thus closing this circuit. When signals stop, of course the diaphragm ceases to vibrate, and the relay receives its required operating current, and the working circuit is opened.

There is no sluggish action, and sounds such as dots and dashes can be made readable with a buzzer connected to *G*, as shown in Fig. 2. The signals must be

A Wireless-operated Relay

A SIMPLE relay which can be utilised for distant control of electrical circuits, and which can be easily constructed by the amateur, is shown in Fig. 1. A wiring diagram is given in Fig. 2, and this will suggest the possibilities of the instrument. Lighting a lamp, reproducing the Morse signals by a bell or buzzer, operating models, etc., are all within its capabilities. The whole relay can be made at very trifling cost by using one side of a set of telephone receivers.

The telephone receiver is mounted on the wood supports *A*, *A1* and *A2* in Fig. 1, the *A1* support being shaped at the top to receive the case of the receiver. A brass strip *B* is bent over the top of the receiver and screwed to the support *A1* as shown, taking care that it fits tightly round the metal part of the receiver and makes good electrical contact.

The centre of the receiver diaphragm is drilled to receive a short piece of silver wire of about 22-gauge, which is riveted over (see *C* in Fig. 1).

On the front side of the wood support *A2* is screwed a piece of $\frac{1}{8}$ -in. brass plate *D*, which should be 1 in. long and $\frac{1}{2}$ in. wide. This strip is drilled $\frac{1}{4}$ in. from one end to take a $\frac{3}{8}$ -in. wood screw. It is also drilled and tapped the same dis-

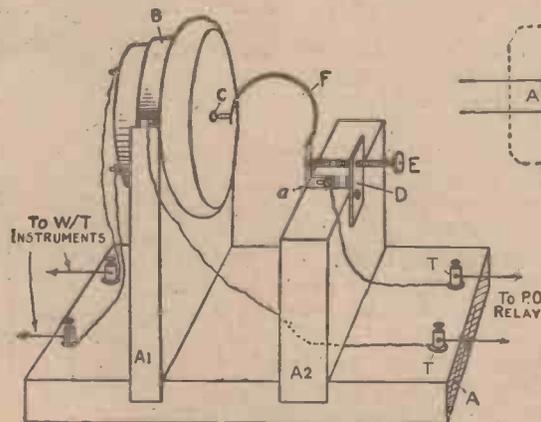


Fig. 1.—Wireless-controlled Relay.

tance from the other end to take a $\frac{1}{8}$ -in. by $1\frac{1}{2}$ -in. Whitworth screw, shown at *E* in Fig. 1.

On the top of *A2* a piece of thin phosphor-bronze strip, such as is used in non-magnetic hair-springs of clocks, is fixed.

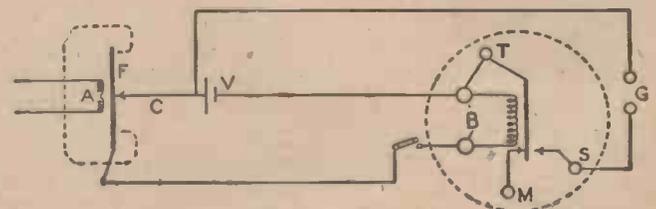


Fig. 2.—Complete Circuit Diagram of Apparatus.

of fair strength, but excellent results are obtained without amplifiers, and a crystal set will work it as well as the most elaborate valve set. The adjustments, of course, are made by screw *E* and the air-gap of the relay. SIDDOR.

Every reader of "A.W." should have at hand for reference a copy of the "Work" Handbook, "Wireless Telegraphy and Telephony: and How to Make the Apparatus," 1s. 6d. net.

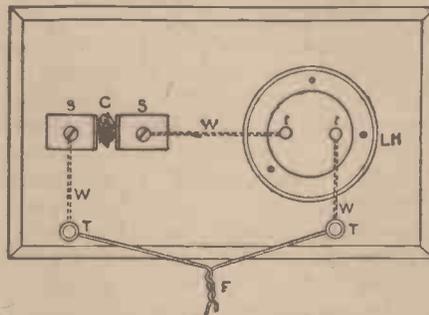
Re-sensitising Carborundum Crystals

AS is well known, carborundum crystals vary greatly in sensitiveness, and after a favourite piece has been in use some time it becomes less sensitive. The following treatment, however, will bring back this sensitive state, and make the crystal as good as, and sometimes even more sensitive than, its original condition.

The following materials, in addition to a supply of electric current, will be required: One piece of hard wood $\frac{1}{2}$ in. thick and 6 in. long and 4 in. wide; one electric light socket for a lamp (batten type); two pieces of brass 2 in. long and $\frac{1}{2}$ in. wide, and of about 22 s.w.g.; two ordinary terminals and a few odd screws; a length of electric-light twin flex, with a connector fitted to one end to fit into ordinary lamp-holder, and one electric bulb.

At 3 in. from the end bend the pieces of brass to form L-shaped pieces, and bore a hole in the centre of the short end as at s in the illustration. Screw the brass

pieces on to a wood base as shown, leaving a gap between the long ends of the brass $\frac{1}{8}$ in. wide. The screws should be long



Arrangement of Apparatus for Re-sensitising Crystals.

enough to go right through the wood to form terminals underneath for the connecting wires w.

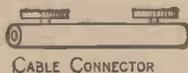
At the side of the brass pieces screw the

lamp-holder, as shown in the illustration, and provide connections as shown. TT are terminals for the flex from the electric light socket. F is the flex for connecting to the terminals TT. C is the crystal in place ready for treatment.

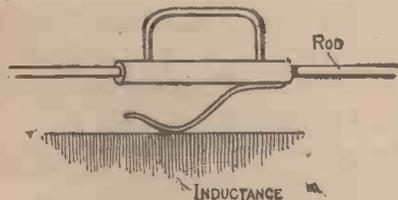
A 16-candle-power carbon-filament lamp should now be put into the lamp-holder if the circuit is 100 to 120 volts, and a 32-candle-power carbon-filament lamp for 200 to 240 volts. This lamp is for the purpose of limiting the current which is to be put through the crystal to approximately 1 amp. After connecting up to the lighting circuit, switch on the current, and the crystal will gradually warm up. When it gets cherry red, which will take from a half to one minute, switch off and allow the crystal to cool. When cool it will be in its best condition for wireless reception. Care should be taken before switching on to see that the crystal is firmly gripped by the brass uprights. C. H. R.

Simple Inductance Slider

FIRST procure an ordinary cable connector and remove the two set screws. Into the two holes solder a piece of wire to form a handle, and after filing the under surface flat solder a piece of springy brass or phosphor-bronze to form a contact.



CABLE CONNECTOR



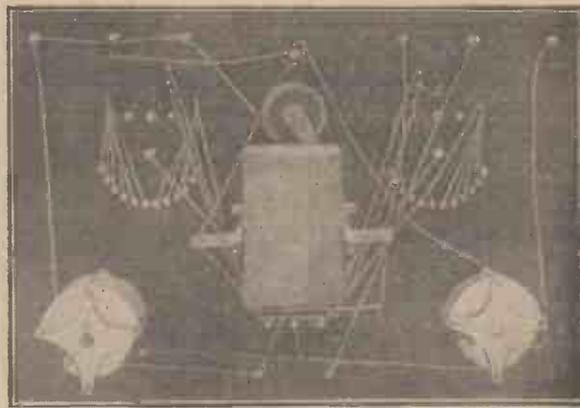
Inductance Slider made from Detector.

This is easily understood by referring to the figure.

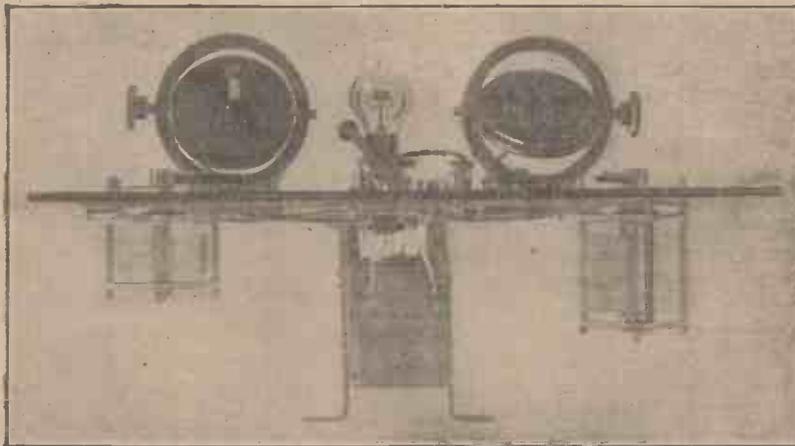
The rod should be a piece of round brass the length of the inductance and the same diameter as the hole in the connector. To insulate the slider bind the handle with insulating tape. When soldering the handle into the holes it is a good plan to slip the slider on to the rod so as to avoid pushing the wire too far down the holes, thus facilitating an easy and smooth sliding movement. J. C. F.

A SINGLE-VALVE RECEIVER

These two photographs show the internal arrangements and wiring of a valve panel provided with double tuning units for long- and short-wave reception. The condenser on the right is the aerial tuning condenser and that on the left the variable grid condenser. The apparatus directly under the valve is the variable loading coil. Photographs of the complete instrument were shown on page 185 of No. 10.



Under Side of Panel of Single-valve Receiver showing Connections.



Photograph showing Upper and Lower Sides of Single-valve Receiver.

Building a Short-wave Transmitter.—II

The Second Article on Amateur Transmitter Construction

SLIGHT constructional modifications to the specification in No. 12 may be made as long as the following essentials are borne in mind:

(1) The object is to wind as many turns of secondary wire as possible, all in the same direction and as close to the primary and core as possible. (2) The insulation throughout must be of the highest order, especially between the secondary and primary or core. (3) The make-and-break of the primary current must occur rapidly



Fig. 8.—Photograph of Condenser.

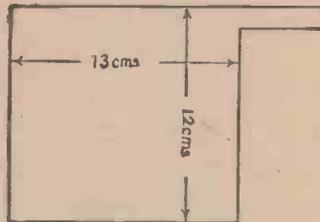


Fig. 9.—Plate of Condenser.

Item G: The Spark Gap

The form of gap shown in Fig. 7 (which differs a little from that in the photograph) consists essentially of a strong glass tube (say 1 in. bore by 3/8 in. thick and about 2 1/2 in. long) having two turned caps of brass or aluminium secured one to each end of the tube by means of plaster-of-paris or similar material. Each cap is to be drilled and tapped to take a 1/4-in. Whitworth or No. 0 B.A. brass screw, and one is to have a 1/16-in. air-hole drilled.

Item C: The High-tension Condenser

Upon the capacity of this condenser, together with the inductance of the primary of the oscillation transformer in Fig. 2, depends the frequency and wave-length of the closed oscillatory circuit.

A formula for the determination of wave-length with known values of inductance and capacity is as follows:

Wave-length (λ) = $59.6 \sqrt{L_{cm.} \times C_{mfd.}}$
 from which it follows that to obtain the desired wave-length of 180 metres many inductance-capacity combinations are possible, such as

(1) $L = 1,800$ cm. and $C = .005$ mfd., in which case

$59.6 \sqrt{1,800 \times .005} = 178.8$ metres;
 and (2) $L = 900$ cm. and $C = .01$ mfd., when $59.6 \sqrt{900 \times .01} = 178.8$ metres also.

Practical considerations, however, determine the maximum "capacity" which can be efficiently charged by a given power. In the present case a condenser, as in example above, with a capacity of .005 mfd., will be found quite large enough.

A very serviceable condenser (see Fig. 8) of approximately the required capacity may consist of sixteen sheets of thin zinc or copper foil, each 13 cm. by 12 cm., cut to shape as shown in Fig. 9, successive sheets of metal being separated by a sheet of glass (approximately 17 cm. by 16 cm.) 3/8 in. (say 3 millimetres) thick. In all seventeen of these glasses will be required.

E. REDPATH.

[We are obliged to hold over the conclusion of this article until next week.—ED.]

and regularly without excessive sparking at the contacts.

The two air-core chokes L_1 and L_2 (Fig. 2, p. 232) are placed between the secondary leads from the spark coil and opposite sides of the spark-gap to prevent oscillatory currents from the closed circuit discharging back into the coil and probably damaging it.

They each consist of from 150 to 200 turns of fine insulated copper wire (say No. 32 S.W.G., as used for the coil secondary) closely wound upon a wooden or cardboard former 1 in. in diameter by about 3 in. long.

This completes the charging circuit.

The closed oscillatory circuit consists of three items, namely, the high-tension condenser C and the primary of the oscillation transformer P . The letter references apply to Fig. 2 (see p. 232).

On account of the unpleasantly loud "crack" of the oscillatory spark when occurring in an open-type gap a little extra time spent on an "enclosed" type of gap, as illustrated in Fig. 7 (p. 233), will be fully repaid.

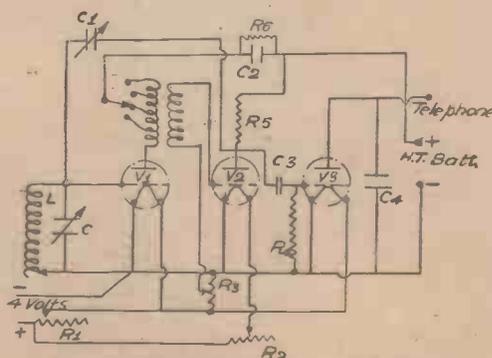
Two zinc electrodes are required as shown in the sketch, and these are to be drilled and tapped to suit the brass screws as fitted, one of which should be provided with an ebonite adjusting knob and a lock-nut. A terminal should be soldered on to each cap and the complete gap be mounted upon a rectangular piece of 3/8-in. or 1/2-in. ebonite.

The correct adjustment of the gap may be made under actual working conditions later, taking especial care to avoid accidental shocks.

Three-valve Amplifier Circuit

THE diagram below illustrates one type of amplifier circuit comprising one valve for high-frequency amplifying, one

valve for detecting or rectifying, and one valve for low-frequency amplifying, or more commonly termed note amplifying. The oscillating circuit is between the grid and the filament of the valve V_1 . The steady potential of the grid of the valve V_2 is controlled by the potentiometer R_3 , and the filament current for the same valve is controlled by the rheostat R_2 . The filament current of the valves V_1 and V_3 is controlled by the rheostat R_1 . The first valve, V_1 , acts as a high-frequency amplifier, and is coupled to the valve V_2 by an adjustable inter-valve air-core transformer. No. 2 valve, V_2 , does duty as a detecting valve, and is fitted with a separate filament rheostat R_2 and a grid potentiometer R_3 .



Circuit Diagram of Three-valve Amplifier.

(Continued on page 253.)



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- 2. Blocking Condenser between Ebonite Sheets
- 3. Crystal Detector, Complete with Special Crystal
- 4. 1 Brass Rod Cut and Drilled
- 5. Slider and Plunger
- 6. 1 Pr. Wooden Ends
- 7. Wooden Base 10 × 9
- 8. 3 Reel Insulators

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- 1. Inductance Coil 12 × 4½ wound 24 Enamelled Wire
- 2. Blocking Condenser, capacity '0002' between Ebonite Sheets
- 3. Crystal Detector
- 4. 2 Brass Rods Cut and Drilled to fit
- 5. All Necessary Terminals
- 6. Two End Boards
- 7. Wooden Base 15 × 12
- 8. 100 ft. 7/22 Stranded Aerial Wire. Best quality
- 9. 6 Reel Insulators
- 10. 2 Sliders and Plungers
- 11. Ivorine Tabs. Earth, Phone and Aerial

Price **25/-**. Post Free

BEAVER

NO. 3 CRYSTAL SET

27/6 each, Post Free

Complete, *assembled* ready for wiring

Consisting of:—Splendid Crystal Detector fitted with Special Crystal, and mounted on Ebonite Base. Blocking Condenser '0005, with well-made Chamfered top, Mounted in Oak Case. Inductance Tube 12 in. × 4 in., wound 24 gauge Enamelled Wire. Waxed Interior to prevent sweating. Fitted 2 Brass Rods complete with 2 Sliders and Plungers. All necessary Terminals marked with Ivorine Tabs. The whole Mounted on Solid Oak Base, Varnished 15 in. × 12 in.

27/6 each, Post Free.

Complete with Splendid, Tested and Guaranteed 4,000 ohm 'Phones,

50/-

BEAVER NO. 4 CRYSTAL SET,

Unassembled. **35/-** each, Post Free.

Consisting of:—

- 1. Inductance Coil, 12 × 4, wound 23 gauge Bronzed Wire
- 2. Beaver Variable Condenser '0005, as sold for 11/-
- 3. Crystal Detector complete with Special Crystal
- 4. 2 Brass Rods Cut and Drilled to fit
- 5. 6 Splendid Terminals
- 6. 1 pr. End Pieces of Oak
- 7. Solid Varnished Oak Base
- 8. 100ft. 7/22 Stranded Aerial Wire
- 9. 6 Reel Insulators
- 10. 1 6 in. or 9 in. Leading-in Tube of Solid Ebonite and Brass
- 11. Ivorine Tabs for Terminals
- 12. 2 Sliders and Plungers

A Thoroughly Reliable and Efficient Set

35/- each
Post Free

Complete with Splendid 4,000 Ohm 'Phones, **57/6**

BEAVER ELECTRICAL SUPPLY CO.,

Telephone: **GERRARD 1900**

109, REGENT STREET, LONDON, W.1.

All Cheques and Postal Orders to be crossed London Joint City and Midland Bank.

OPENED BY WIRELESS.
THE FIRST
INTERNATIONAL



CENTRAL HALL, WESTMINSTER,
SEPTEMBER 2nd to 8th,
FROM 11 a.m. to 10 p.m. DAILY.

WILL FOR THE FIRST TIME ON THIS PLANET BE OPENED BY
WIRELESS.

Licences for Transmitting and Receiving have been issued
by the Postmaster-General specially for the Exhibition.

The Exhibition is not confined to British Firms, and is
therefore representative of all the latest and best develop-
ments connected with Wireless.

Important Conferences daily at 3.30 p.m. and 7.30 p.m.
"Model Engineer" Day, Wednesday, Sept. 6th. The Editor
will receive all members of Wireless Societies on this day,
in the large Reception Hall.

Wireless Experts daily in attendance to give Free advice in
all matters connected with Wireless.

Competitions for (1) The Best Amateur piece of apparatus
(excluding aerials). Prizes £5, £3, and numerous other
prizes and diplomas.

(2) The best Juvenile set or piece of apparatus (excluding
aerials). Age limit, 16. Numerous prizes and diplomas
will be awarded.

(3) The Best Invention connected with Wireless. Prizes
and diplomas awarded.

Entry forms should be applied for immediately, and may be
filled in on arrival at Hall.

There is no Entrance Fee for any of these Competitions.
Numerous inventions connected with Wireless in the fields
of transit, telephony, telegraphy, etc., will be demonstrated
daily.

A Competition demonstrating the use of Wireless in the
detection and prevention of crime will be held daily. This
will be open to all visitors. No entrance fee will be
charged.

Admission 1s. 3d., including tax. Tickets in bulk to Secre-
taries of Wireless Societies 8d. each (including 2d. tax).
Motor Buses from all parts pass the Hall, which faces the
Houses of Parliament and Westminster Abbey. Nearest
Station, St. James's Park (District).

ACCUMULATORS

HIGHEST QUALITY. LOWEST PRICES.

In Celluloid Cases

4 Volt 40 Amp.	18/6	6 Volt 40 Amp.	26/3
4 Volt 60 Amp.	21/6	6 Volt 60 Amp.	31/9
4 Volt 80 Amp.	28/2	6 Volt 80 Amp.	37/3
4 Volt 100 Amp.	30/-	6 Volt 100 Amp.	41/6

SPECIAL PRICES TO THE TRADE ON APPLICATION

SPECIAL OFFER

- 6 Volt 44 ACTUAL Amp. hrs. set in three GLASS CELLS, sealed tops, and in well-made solid Teak crate, at 49/6.
- 4 Volt 24 Amp. in celluloid cases at 11/9 each.
- 2 Volt 16 Amp. in Ebonite cases, 5 plates Guaranteed, every one at 3/9 each or 3/6 each for three post free (special prices for quantities on application).
- 2 Volt 4 Amp. actual amp. in Glass cells at 5/6 each, post free, small square type (Boat type) in celluloid cases.
- 4 Volt 4 Amp. at 6/3, 4 Volt 6 Amp. at 7/6, 4 Volt 10 Amp. at 9/9.

AERIAL WIRE 7/20, 5/- per 100 ft. coil (wireless list ready shortly).
DYNAMOS, MOTORS, Electrical Accessories, Model Steam fittings.

Write for Lists Trade Enquiries Solicited

Foreign & Colonial Orders Special Attention.

F. YATES & SON, Ltd.

Wholesale Electricians,

144, Church Street, Kensington, London, W.8.

Phone Park 4276.

One Minute from Notting Hill Gate Station.

COPPER WIRES

PRICES PER POUND.

S.W.G.	COTTON		SILK		ENAMEL
	Single	Double	Single	Double	
20	2 2	2 3	4 8	6 2	2 5
22	2 6	2 8	5 0	6 8	2 6
24	3 0	3 6	5 6	7 4	2 8
26	3 7	4 0	6 8	8 2	2 9
28	4 2	4 8	7 2	9 0	2 11
30	5 0	5 4	8 0	9 9	3 5
32	5 8	7 0	9 2	12 9	3 11
34	6 8	8 0	11 0	13 8	4 4
36	8 0	10 0	13 0	15 0	4 8
38	10 8	11 4	16 0	19 0	5 9
40	13 4	14 8	19 0	22 0	8 6

Reels charged 3d. each (returnable).

PRICES PER OUNCE.

S.W.G.	SILK		ENAMEL
	Single	Double	
42	2 0	2 2	0 8
44	2 9	3 5	1 0
45	3 8	4 1	1 3
46	4 4	6 0	1 6
47	6 0	7 6	2 0
48	13 0	15 0	10 0
49	16 0	21 0	—
50	23 0	30 0	—

Reels not charged for.

Terms.—Net cash with order. Carriage paid on all orders over 10s., otherwise postage extra. (Allow 2oz. per item for reel and packing.) Any weight over a quarter-ounce. Special prices for half-pound reels and up.

Also Resistance Wires, Sleeveings, Tags, Terminals, and all small accessories.

CRYSTALS

Zincite, Bornite, Chalcopyrite, Copper Pyrites, Iron Pyrites, Galena, Carborundum, Gold Wire, Wood's Metal, all at 6d. box. Postage, 2d.

Tellurium (cast or in stick form), Selenium, 1s. box.

A. HINDERLICH, Central Hall, Southall, Mdx.

Phone Southall 121.

Stand 82, Radio Exhibition, Sept. 2—8.

"THREE VALVE AMPLIFIER CIRCUIT"—(continued from page 250)

so that the best adjustment may be made. The last valve V₃ acts as a note-magnifier, being resistance-capacity-transformer coupled. This last method is employed to eliminate, as far as possible, the inductance-capacity effect of inter-valve coupling. The resistance R₆ is provided so that there will be the same voltage drop in the plate supply to the valve V₁ as there is to the valves V₂ and V₃.

The condenser C₂ provides an easy path

for high-frequency current and prevents the setting up of a self-oscillation when it is not required. The condenser C provides adjustable-capacity coupling between the plate of the detecting valve and the oscillating circuit LC, so that by a suitable adjustment the variations in the plate current may be made to maintain a self-oscillation in the circuit LC when this is required for receiving a continuous wave. The telephones are joined in series between the plate of the valve V₃ and the positive of the battery HT. L. C.

for H.T. and L.T., so I connect up and plug in the H.T. first. Tragedy, a miniature arc, a half-watt lamp, anything you like, but a perfectly good valve gone in a flash. What a stupendous fool I felt, what a priceless ass, and what a price to pay for my carelessness!

Precautions

And yet it is within the power of anyone to do just exactly as I did. It is the easiest thing in the world to connect the H.T. across the filament and the L.T. on to the plate. When valves were cheap to the operator (but not to the country) during the war, "burn-outs" were the commonest things imaginable, and many ingenious devices were used to make sets fool-proof. Perhaps the best known was to have plugs and sockets of different sizes, the cables from the respective batteries were equipped with the sockets, the metal being left well below the ebonite holder to prevent short-circuiting when the leads were disconnected and lying about. The pins of the plug projected from the set. The positive plug and pin were made about twice the diameter of the negative, and the H.T. plug and socket had such a distance between the sockets that it was impossible to make connection across the filament pins.

Even with these precautions valves were burned out, the most general cause being the disconnection of the set with the filament resistance in the working position. Shortly afterwards the operator would go to light up, push on the socket, and yip—the filament went! It is one of the properties of accumulators that they recuperate to a certain extent during a rest, and, of course, the last working position of the filament resistance may be well above the safe point for the filament when either the set is reconnected or a fresh accumulator is put on.

Two Important Points.

My expensive experience brings out these two points in particular. In the absence of plugs as described the connecting wires from H.T. battery and L.T. accumulator should be of such a dissimilar appearance as to eliminate the possibility of error; the terminals on the set must also have a distinctive appearance. Tablets or engraving do not entirely obviate error, but if red flex be used for the L.T. and blue for the H.T., the L.T. terminals can be painted red and the H.T. blue. Wrong connection would then look too incongruous to be missed.

The second point is that extreme care should be taken to bring the filament resistance to zero on shutting down the set, and, in fact, when any alterations are being made to the filament supply. On starting up the set, light the filament first, bringing it up slowly, and then plug in the H.T.; if your connections are wrong the filament won't light and the error will be evident. It is better to be sure first than sorry later. N. T.

A Lattice-coil Winder

Simple Machine Made from "Meccano" Parts

THE following is a description of a machine for winding "self-supporting" coils made practically entirely of "Mec-

cano" parts. As arranged, the machine winds coils either 1/2 in. or 3/4 in. wide, but with slight modification the third throw of the eccentric could be utilised to make 1 in. coils.

The parts required are as under:

	Part
5 Perforated strips, 3 1/2 in. long...	" Meccano " No. 3
2 " " " 2 1/2 in. " ...	" " 5
3 Flat brackets ...	" " 10
6 Angle brackets ...	" " 12
1 Axle rod, 6 in. long ...	" " 14
1 " " 5 in. " ...	" " 15
1 " " 4 1/2 in. " ...	" " 15A
1 Bush wheel ...	" " 24
1 Contrate wheel, 1/2 in. diam. ...	" " 29
1 Gear wheel, 1 in. diam. ...	" " 31
3 doz. (approx.) bolts and nuts ...	" " 37
1 Double-angle strip, 2 1/2 in. X 1 in. ...	" " 46
2 Perford. flanged plates 5/8 in. X 2 1/2 in. ...	" " 52
1 " " " 3 1/2 in. X 2 1/2 in. ...	" " 53
4 Collars ...	" " 59
3 Couplings ...	" " 63
1 Strip coupling ...	" " 63B
2 Triangular plates, 2 1/2 in. ...	" " 76
2 Braced girders, 5/8 in. ...	" " 100
1 Triple-throw eccentric ...	" " 130
3 Axle rods, 1 in. ...	" " 18A



Photograph of Coil Winder.



Another Photograph of the Machine.

A. H. G.

cano" parts. As arranged, the machine winds coils either 1/2 in. or 3/4 in. wide, but with slight modification the third throw of the eccentric could be utilised to make 1 in. coils.

The bobbin for winding is screwed to the bush wheel, and is of a diameter to suit requirements, and preferably of wood with three or four wide saw cuts running lengthwise to allow the coil being bound before removal.

The wire guide may be a strip of cigar-

My Lost Valve

LIVING at the rate of £10,000,000,000 a year is an extraordinary speed for any person, yet the slightest carelessness on the part of an experimenter makes him capable of this, but only, fortunately, for the twentieth part of a second.

The Accident

I had re-designed my single-valve receiver. Signals had been strong and clear

on the first temporary set, but the finish left everything to be desired. Terminals must be procured, a nicely finished base-board must be wired up, and the connections must be made trim and soldered. Certainly the result was creditable to look at, but how would it work? After all, signals, and not polish, are the desired end. I would have a try out. Everything is neat and tidy, there are the four terminals

INTERNATIONAL RADIO EXHIBITION AND WIRELESS CONVENTION

THE above exhibition will be open at the Central Hall, Westminster, from September 2 to September 8 (11 a.m. to 10 p.m.), and is the first wireless exhibition on such a scale to be held.

The Central Hall, Westminster, faces Westminster Abbey and the Houses of Parliament, the nearest station being St. James's. Omnibuses pass the door.

A feature of the exhibition is to be its opening by means of wireless control. Conferences, demonstrations, debates, lectures, etc., are being arranged. The lectures include one by Mr. George Sutton, A.M.I.E.E., on wireless club matters. This is to be given on Monday, the 4th, at 7.30. On Tuesday, at the same time, Captain T. Mittle will lecture. On Thursday Mr. W. Sholl, A.M.I.E.E.A., will lecture on wireless in the home.

All members of the wireless clubs will be received by Mr. Percival Marshall, who will be in the chair at the debates.

The use of wireless in connection with submarines will be demonstrated daily by telegraphy and telephony.

Prizes and diplomas are to be awarded for the best piece of wireless apparatus.

Special concessions in the matter of tickets are being made to *bona-fide* clubs.

"Amateur Wireless" is to have a stand at the exhibition, where a very complete range of technical books published by the proprietors of this journal will be on sale.

A.F.A. Accumulators, of 58a, Buckingham Palace Road, Westminster, are showing various types of A.F.A. stationary cells, most of them of a portable nature. Among the latter are the well-known "Duros" cells, one of the special features of which is that, although supplied in a dry state, they are fully charged, and before being put into use merely require filling with acid. An outstanding feature of the A.F.A. portable cells is that they contain no separators of any kind, the plates being held in grooves provided in the glass boxes.

Fullers United Electric Works, Ltd., Woodland Works, Chadwell Heath, London, E., are showing a wide range of specialised apparatus in the design of which they have departed from standard

practice in order to get improved results. An instance of this is their patent valve-holder, in which barriers are provided between the contacts of different potential in order to minimise leakage. The construction of the sockets also insures that they will not pull out when a tight valve is removed. This firm also have a transformer of patent construction which is enclosed in a metal case; the metal case being of magnetic material has the advantage of reducing stray fields. Other items are filament resistances, condensers, lead-in insulators, and both high-tension and filament batteries.

A large range of all classes of insulating materials will be exhibited by H. Clarke and Co., Manchester, Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

As has been frequently pointed out in these pages, ebonite is not absolutely essential in the construction of receiving apparatus. Fibre may be used in a great number of instances, providing that the apparatus is kept in a dry atmosphere. This material is more easily worked, and is stronger than ebonite, and is about half the price, its one detrimental quality being its hygroscopic nature, though even this last-named is of no account when it is used for knobs, etc. Messrs. Spauldings, Ltd., 40, Gloucester Street, Clerkenwell, E.C., are specialising in all kinds of fibre parts, including knobs, panels, valve-holders, discs, condensers, end plates, coil heads, in addition to vulcanised fibre sheets, tubes and rods.

Another firm specialising in composition insulating material are Messrs. Barrett and Elers, Ltd., Wallace Road, Hackney Wick, London, E.9. This firm are the makers of the well-known "Belleroid" composition, which they claim will withstand any voltage up to 20,000; also it is claimed to be unaffected by heat up to 300 deg. F., is non-hygroscopic, and unaffected by 10 per cent. acid or alkaline solutions. It can be drilled, turned and moulded. Their exhibits will comprise a number of finished parts.

H. J. Brewster and Co., 11, Queen Victoria Street, London, E.C.4, are well known as makers of the "Aerowave" wireless specialities. They sell all types of crystal receivers for telephony reception. Their great feature is the "Aerowave" crystal set, which sells complete with aerial equipment (less mast) at a figure well within the reach of everyone's

pocket. They also specialise in valve-detector units and panels, in addition to every accessory required by the wireless enthusiast.

A very special interest will attach to the stand of Autoveyors, Ltd., of 84, Victoria Street, Westminster, London, S.W.1, who are showing a wireless equipped car with a loop aerial for the reception of broadcasting. Another very interesting feature of this stand will be the teletype apparatus, which will both transmit and receive type-written matter either by wire from all parts.

On the stand of A. Hinderlich, Central Hall, Southall, Middlesex, there will be instrument wires of all descriptions, exemplified by small reels of copper wire in various gauges enamel covered s.s.c. and d.c.c., single and double white and green silk, also "Litzendraht"-type wire, resistance wire, tinsel cord, silk and cotton sleeveings. Mr. Hinderlich undertakes the rewinding of telephones to any resistance.

The whole range of wires used for wireless instrument and aerial apparatus will be exhibited by the Concordia Electric Wire, Ltd., 155, Victoria Street, Westminster, S.W.1. In addition, they are showing insulating material.

The Electric Appliances Co., Ltd., 7 and 8, Fisher Street, Southampton Row, London, W.C.1, are making a speciality of a complete single-phone receiving set, including an aerial, at £3 18s. 6d.

Various specimens of raw mica and the manufactured article will be shown by Messrs. Mica and Micanite Supplies, Ltd., of Mica House, Offord Street, Caledonian Road, N.1, who specialise in this and other insulating materials.

A neat, portable crystal receiving set named the "Multum in Parvo" is being made a feature of by the Consolidated Trading and Manufacturing Co., of Cromwell House, High Holborn, London, W.C.2. In addition, this firm are marketing a unit system comprising a two-valve receiving panel, a two-valve note-magnifier, and a short-wave tuner, all of which can be coupled together.

B.N.B. Wireless, Ltd., are showing a large variety of general apparatus and sundries.

A Jacobean cabinet receiving set is a speciality of Mr. H. Scruby, 11, Victoria Street, Westminster, London, S.W.1.

"Two Emma Toc" on a One-valve Set

I KNOW little about wireless matters, but was enabled by the instructions in the "Work" handbook on that subject to make the short-wave receiving set and single-valve panel described therein. You know the doubts of listening-in and receiving nothing—not knowing whether the set is O.K. or whether there is any telephony going. I suffered those doubts at 7.45 p.m. on Tuesday evening, Aug. 22, when slipping on the telephones, I listened-in and juggled about with the various knobs—somewhat disturbed by consideration of the great number of possible combinations of positions of them and not knowing whether I was doing the right or the wrong thing. At 7.59 p.m., however, I heard a hum in the 'phones. Perhaps the carrier wave I had read about; and then, "Hullo, CQ, Hullo, CQ . . . Writtle speaking," and a repetition of that sentence. "Our first item will be 'His Master's Voice' gramophone record No. 6,728, 'Hark to the Lark.'" Writtle is seventy miles away from me, but the record was as audible as if it were being played in the next room, the articulation being particularly clear. Then followed a poem in doggerel and some telephony relating to the letters received in connection with the previous

concert, in which the operator thanked those who criticized "the rotten transmission."

"Hullo, CQ, Hullo, CQ . . . Writtle closing down for two minutes." . . . By this time I had found the best position of the—of the—well, knobs will do, and I carefully noted them. Again, "Hullo, CQ, . . . Hullo, CQ . . . Next item will be a gramophone record No. 47,953, 'Beautiful Ohio Waltz.'" This was received with particular clarity, so much so that I was enabled to write down the tonic solfa notation of it. Followed a story told by Leslie of the "Follies" entitled "Some says one thing and some says another." "Writtle closing down for another two minutes," and then, "Next item will be a gramophone record No. C63, 'If I might only come to you.'" I know that song, and unconsciously chanted an alto to the voice from the ether. The doggerel poem, "They kissed—I saw them do it," was then given to music, and a record No. 02,542—I lent the 'phones to a friend at this juncture and missed the title. Some further prattle by the wag who manages to get humour into the stereotyped announcements of the items, and "Writtle closing down"—this at 8.30.—OMEGA.

likely to interfere with any other station which may be working. No consecutive transmission shall last more than ten consecutive minutes, and each transmission shall be followed by a period of not less than three minutes' listening-in on the wave-length used for transmission. Listening-in must in all cases be performed by a qualified operator. Transmission shall at once be discontinued or postponed at the request of any Government or commercial station.

(3) The call signal 5 WH (five WH) has been temporarily allotted to your sending station, and this call signal shall be sent three times at the beginning and end of each period of transmission and on every occasion when the wave-length is changed.

(4) The stations shall be opened to inspection at all reasonable times by duly authorised officers of the Post Office.

(5) The stations shall not be used in such a manner as to cause interference with other stations. In particular, any oscillating valves used for reception must not be directly coupled with the aerial circuit, and must be incapable of energising the aerial in such a manner as to cause radiation over the range of wave-lengths between 300 and 500 metres.

(6) You shall not divulge or allow to be divulged to any person (other than a duly authorised officer of His Majesty's Government or a competent legal tribunal) nor make any use whatsoever of any message received by means of your apparatus, except messages from the sending station as above and time signals, musical performances and messages transmitted by any station in Great Britain for general information.

(7) The apparatus and aerials shall be dismantled and removed as soon as possible after the conclusion of the exhibition.

(8) This permit is subject to withdrawal or modification at the Postmaster-General's discretion should occasion arise.—I am, sir, your obedient servant,

J. W. WISSENDEN,
For the Secretary.



FORTHCOMING EVENTS

Nottingham and District Radio Experimental Association. Aug. 31, 7.30 p.m. At Room 74, Mechanics Institute, Nottingham. Meeting.

West London Wireless and Experimental Association. Aug. 31. At Belmont Road Schools, Chiswick, W. First meeting after vacation.

Croydon Wireless and Physical Society. Sept. 2. Meeting.

Lenton and District Horticultural Society. Sept. 2, 3 and 4. Wireless telephony demonstration. Special concerts, 5-9 p.m.

Ilkley and District Wireless Society. Sept. 4, 8 p.m. At Regent Café, Cowpasture Road, Ilkley. Morse practice.

Tuxford and District Amateur Wireless Society. Sept. 7. Morse practice. Condensers. Care of valves.

TELEPHONY TRANSMISSIONS

Eiffel Tower (F L), 2,600 metres. Each afternoon (Saturdays and Sundays excepted).

Writtle (2 M T), 400 metres. Sept. 5, 8 p.m.

The Hague, Holland (P C G G), 1,085 metres. Aug. 31, 8-9 p.m., and Sept. 3, 2.30-5 p.m.

Exhibition Wireless Demonstrations

THE following is a copy of a letter received by the organisers of the International Radio exhibition, from the Postmaster-General giving permission for transmission and reception. The information contained therein is of interest as showing the conditions that are to be complied with in respect of such events.

Demonstrations of Wireless Telegraphy

SIRS,—With reference to your letter of the 9th inst., and your representatives' call upon us on the 16th inst., I am directed by the Postmaster-General to say that he authorises you to give demonstrations of wireless reception at the Radio Exhibition at the Central Hall, Westminster, S.W.1, from the 1st to the 8th proximo inclusive, using apparatus for that purpose (including valves) and an aerial of which the combined height and length shall not exceed 100 ft. He also authorises you to transmit to the above station from a temporary sending station (connected with an indoor aerial only) in the same building, during the days in question.

It is necessary to stipulate:

(1) That the power used for transmission shall be the minimum required for the purpose, and in any case shall not exceed 5 watts. Waves from 150 to 200 metres (inclusive) may be used for spark, C.W., I.C.W., or telephony, and a further fixed wave of 400 metres for C.W. and telephony only.

(2) No transmission shall commence without listening-in on the wave-length which is to be used in order to ascertain whether the proposed transmission is

SEE THE
"A.W."
STAND
AT THE EXHIBITION

FOUR "NOVEL AND USEFUL"

Item No. 1

A Simple Loud Speaker

ANYONE possessing an old worn-out cabinet gramophone can easily make

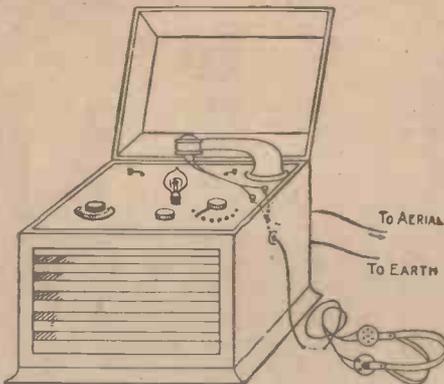


Fig. 1.—Loud Speaker Made from Gramophone.

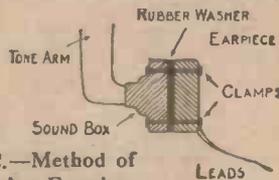


Fig. 2.—Method of Attaching Ear-piece.

a novel self-contained receiver and simplified loud speaker somewhat on the lines shown by Fig. 1.

The motor and its fittings are first removed. The tone-arm and the internal horn are retained, however. On the motor board are fixed the components of the receiving set, and this is where ingenuity must be exercised to get them neatly stowed away into the space between the motor board and the internal horn. Some fittings, such as the valve or valves (if any) and the controlling knobs, will, of course, appear above the board. Care must be taken that these are placed so that the lid can be closed properly. If necessary the depth of the lid can be increased by screwing fillets of wood all round, but this should be carefully done so as not to spoil the appearance of the cabinet.

All the fittings should be well insulated, the motor board being preferably faced with a sheet of ebonite. Failing this, all screws or connections passing through the board should be bushed with ebonite.

Holes should be bored and bushed in the back of the cabinet for the aerial and earth leads.

The telephone leads can be brought out of the hole through which the winding key originally passed.

To make use of the internal horn as a loud speaker, one of the earpieces of the "phones" (or a separate watch receiver) is clamped to the sound-box, the diaphragm and stylus-bar of the latter having been removed.

A rubber washer placed between the sound-box and receiver before clamping will make a tight joint (see Fig. 2).

The sound from the receiver, passing along the internal horn, will be magnified (though, of course, not nearly as much as with a real loud speaker).

The tuning-in is done with the lid raised. The lid is then closed and the instrument is ready for use. Owing to the good appearance of the cabinet the instrument will not be out of place even in the drawing-room of the average home.

W. E. M.

Item No. 3

A Novel Inductance Coil

THE coil about to be described provides for a finer adjustment than is possible

with the usual type for two reasons. Owing to the cone shape adopted the

Dimensions are not given as, of course, the size of coil adopted will vary according to the type of instrument it is intended to be used with. It should be observed, however, that compared with the orthodox cylindrical-shaped coil it will be necessary, in order to wind on the same amount of wire, to either increase the diameter of the base end of the cone or increase the length, or, alternatively, compromise by increasing both.

The cone should first be constructed. (Continued in first column of page 258.)

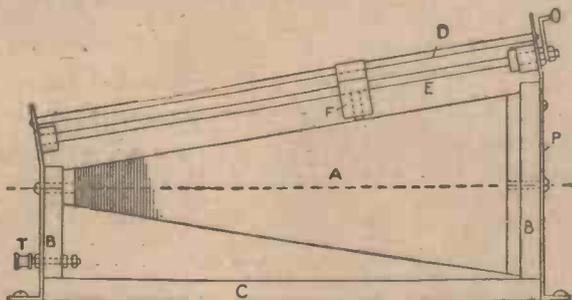


Fig. 1.—Side Elevation of Conical Coil.

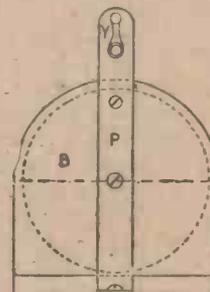


Fig. 3.—Support for Large End.

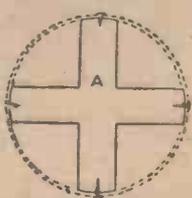


Fig. 2.—Detail of Former.

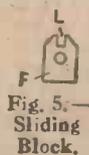


Fig. 5.—Sliding Block.

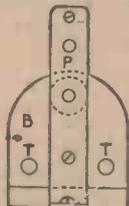


Fig. 4.—Support for Small End.

length of each turn of wire decreases in regular progression from the base to the apex. By the use of a screw-driven slider it is possible to move the latter over one turn of wire at a time, which is very difficult when a slider is hand-operated in the ordinary way.

Fig. 1 shows a general view of the arrangement drawn approximately to scale.

Which Item G

IN Nos. 1 to 5 of "Amateur Wireless" was announced a Prize Competition in which a wireless receiving set was offered for a brief description (with illustrations, if necessary), of the most novel and useful item in wireless apparatus—in its design, material, making, electrical connections, etc., etc. The Editor and his assessors have chosen the four articles printed on this double page as being the best of all the efforts submitted and they suggest that our readers

UL " COMPETITION ITEMS

New Uses for Sparking Plugs

Item No. 2

THE ordinary sparking plug such as is used for petrol engines readily lends itself to a number of wireless uses. As plugs are intended to withstand the high-tension currents used for ignition purposes, the insulation has to be very good. Those fitted with mica insulation are the most desirable for wireless purposes.

One such use is in the construction of a lightning arrester.

The illustration (Fig. 1) will make the construction of this device quite clear. The baseboard is made of wood 4 in. square by $\frac{3}{4}$ in. thick. About $1\frac{1}{2}$ in. from one edge a hole is bored right through of the same diameter as the threaded portion of the plug body. One leg of an old "button stick" or a similar piece of sheet brass of fairly heavy gauge is used in order to mount the gap-adjusting screw A.

About 1 in. from the end drill a hole large enough for the gap screw A to fit comfortably. The other holes for the terminal C and the two little screws E can then be drilled.

One of the nuts on the adjusting screw A should be temporarily removed and soldered into position on strip B. To prevent the solder running into the threaded part of the nut, and to ensure the nut remaining in position while being fixed, a match stalk is inserted through the nut and the hole in the strip. The gap-adjusting screw is then screwed into position, the second nut being used for locking purposes.

The strip B is fixed on the baseboard so that the screw A is exactly central in the plug hole. The terminal C can then be fixed.

A stout copper wire D is looped round the body of the plug before it is screwed home, and connects the plug body to the terminal, thus utilising the gap of the plug itself as well.

The adjustment is very simply carried out by means of a telephone and a weak battery connected across the terminals in the following manner. The screw A is carefully screwed in until a click in the phones indicates that it touches the central

electrode of the plug. Then it is slowly and very carefully screwed out until a
(Continued in first column of page 258.)

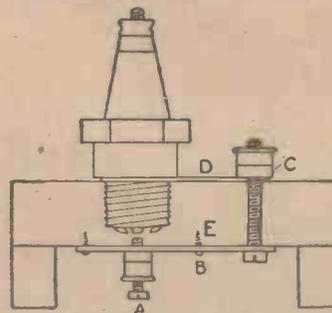


Fig. 1.—Sparking Plug Used as Lightning Arrester.

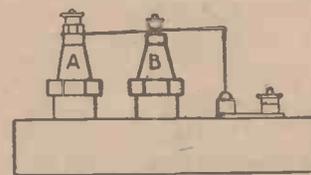


Fig. 2.—Crystal Detector made from Sparking Plugs.

A Cheap High-tension Battery

Item No. 4

EACH cell of the battery about to be described develops 1 volt and 0.3 amp. approximately. Thus to make a 30-volt 0.3-amp. battery there must be thirty cells. Other voltages may be arranged accordingly.

Since the best size for each cell is $1\frac{1}{2}$ in. wide by $1\frac{1}{2}$ in. long by $2\frac{1}{2}$ in. deep, and the most convenient shape of battery case is oblong, arrange the cells in rows of ten for a 30-volt battery, side by side as shown in Fig. 1. Make the battery box out of thin three-ply wood or

any other easily workable thin wood (about $\frac{1}{8}$ in. thick). With a fretsaw cut one piece of wood 5 in. by $16\frac{1}{2}$ in. (for the

base), two pieces $2\frac{1}{2}$ in. by $16\frac{1}{2}$ in. (for the sides), eleven pieces $2\frac{1}{2}$ in. by $4\frac{3}{4}$ in.
(Continued in second column of page 258.)

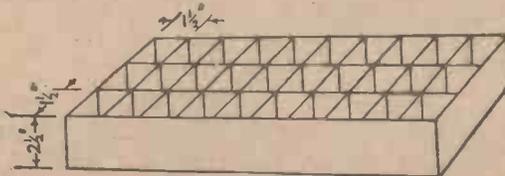


Fig. 1.—Battery Case.

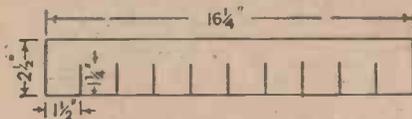


Fig. 3.—Long Dividing Piece.



Fig. 6.—Top of Cell.

Fig. 5.—Zinc Element.

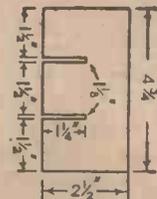


Fig. 2.—Short Dividing Piece.



Fig. 4.—The Positive Element.

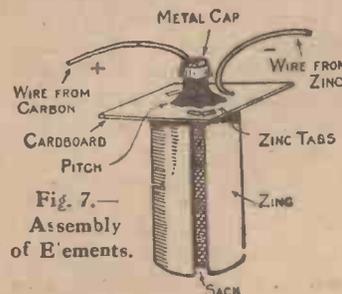


Fig. 7.—Assembly of Elements.

lets Your Vote?

generally should decide the matter by postcard vote. Each reader is therefore cordially invited to send the Editor a postcard (to reach him not later than first post, Friday, September 8th, 1922), saying which item in his opinion should be awarded the prize. All the postcard need give is the number of the item the reader favours. Querists may enclose votes with their questions. The authors of the three unsuccessful items will not be forgotten; they will receive special remuneration.

Four "Novel and Useful" Items

Continued from the preceding pages.

Item No. 2: New Uses for Sparking Plugs

(Continued from upper part of column 3, page 257) second click indicates that the circuit is broken. Then, while the screw A is held firmly in position, the lock nut is screwed up tight.

The crystal detector shown in Fig. 2 is made with two mica-insulated plugs. The fixed end of the spring is attached to the terminal of plug A by means of an additional nut which is screwed down tight by means of a spanner. The ordinary terminal secures the aerial lead.

The terminal nut of plug B is used for adjusting the spring. W. J. G. C.

Item No. 3: A Novel Inductance Coil

(Continued from lower part of column 3, page 256) This cone is made of moderately stout cardboard with a lapped joint glued together. The lapped edges should be skived with a sharp knife so as to make as neat a joint as possible.

To facilitate mounting, and also to act as a stiffener to the cone, a cross-shaped piece (see Fig. 2) is cut out of a single piece of hard wood about $\frac{1}{2}$ in. thick and of sufficient diameter to fit flush inside the large end of the cone, being secured therein by tacks at the extremities as shown. A wooden disc glued in the small end completes the cone.

The framework to hold the coil consists of the end uprights (Figs. 3 and 4) and the base. Hard wood $\frac{3}{8}$ in. to $\frac{1}{2}$ in. thick will be suitable for these. The pieces P to take the sliding mechanism (Figs. 3 and 4) are made of $\frac{1}{8}$ -in. brass $\frac{3}{4}$ in. wide.

Fix the wooden ends B (Fig. 1) to the base C by small screws from underneath. After bending the brass strips as shown the position of the various holes to take the guide rod D and screwed shaft E (Fig. 1) should be marked out. The guide rod may be either square or round and of about $\frac{1}{4}$ in. diameter, drilled and tapped at each end to take the small screws. The screwed rod E can be bought in 13 in. lengths with the thread already cut along its whole length. A small block of brass (Fig. 1) is soldered to the inner side of each brass strip to act as a bush for the screwed shaft E. In order to provide smooth ends for the latter to revolve in a short piece of thin brass tubing should be driven on each end to act as a bushing. If the tubing is sawn through one side longitudinally and then pinched together a tight friction fit on the spindle will be secured.

The brass block (Fig. 1) must now be drilled to take the bushed ends of the

spindle comfortably, the latter projecting a little to take two small nuts (Fig. 1), by means of which the handle is secured.

The sliding block F (Fig. 1) is of brass. This is fitted with a small plunger with a rounded end and pressed down by a light coiled spring above it. The centre hole (Fig. 5) is drilled and tapped to take the threaded spindle E (Fig. 1), or, if preferred, the hole can be slightly enlarged and a nut soldered on each side of it for the spindle to work in. The top slot L (Fig. 5) is to take the guide rod D (Fig. 1), and may be filed out square as shown, or the block can be made a little higher and a hole drilled to take the guide rod, but unless the two holes in the block are truly parallel there is bound to be trouble. A small bush (Fig. 1) with set screw prevents end movement of the screwed shaft.

If all the parts are made as shown the fitting up will present no difficulty. The following few hints, however, may be useful. The cone should have two or three coats of shellac varnish before winding on the wire which, of course, must be commenced from the smaller end, a short length of the wire being first threaded through holes made in the cardboard. The cone should be mounted temporarily on a makeshift jig so as to facilitate winding, the wire being guided on with the left hand whilst the cylinder is slowly revolved with the right. Use enamelled wire, as this simplifies the rubbing off of the insulation for the slider contact. The wire should come to about $\frac{1}{4}$ in. from each end of the cone. The terminals for the necessary connections can be screwed into either of the end uprights. The small plunger (Fig. 1) must be quite round at the end, as, if slightly flat, it will cover more than one turn of wire at a time, and thus reduce the fineness of the adjustment. A small brass ball, in fact, would be the most ideal plunger.

In the foregoing only one sliding contact is employed. Should, however, two be required, it is merely a question of duplication, placing one on each side of the cone. The wiring connections are the same as with the ordinary cylindrical coil.

L. B.

Item No. 4: A Cheap High-tension Battery

(Continued from lower part of column 3, page 257) (two for the two ends and nine for the partitions). Nine of the eleven pieces to be used for the partitions must have two slits cut in each with a fret-saw (see Fig. 2). Next cut two pieces $2\frac{1}{2}$ in. by $16\frac{1}{4}$ in. (for the long partitions, Fig. 3). Now nail (use small fret nails) and glue the sides, ends and bottom of case to-

gether and slide the interlocked partitions in and nail them to the sides as in Fig. 1.

All that has to be done to finish the case is to paint it inside and out with enamel to make it waterproof. When the paint is dry, coat the inside of the cell with melted paraffin wax (a couple of melted candles will be sufficient to prevent the sal-ammoniac solution, which is the electrolyte to be used) from having any action on the enamel. Incidentally it will block up any holes due to faulty workmanship. When the wax has set the case is finished.

Now procure ten old used up, standard size, pocket electric-torch dry batteries (the 3-cell type). Remove their paper wrappings, disconnect the zinc cylinders, carefully breaking away the pitch at the top so as not to break the carbon rods. With the aid of a penknife, remove the zinc from each cylinder and extract the core—a carbon rod surrounded by a sack containing certain ingredients (Fig. 4). Now solder a wire 2-3 in. long to the metal cap on the carbon rod (this is the positive element of each cell). Next procure from an ironmonger a sheet of zinc and cut it up with an old pair of scissors into thirty plates, as dimensioned in Fig. 5, proceed to roll them into cylinders thus, and solder a piece of wire 2-3 in. long on their sides. Now cut out thirty fairly thin pieces of cardboard $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. and soak them in melted paraffin wax, and when dry cut one big hole in centre and two slits each side (with a small chisel), and a small hole on one side similar to Fig. 6.

Assemble the three components—slip the tabs of the zinc through the slits in the cardboard and bend them over, also slip the wire which is to be soldered to the zinc through the small hole, then thrust the positive element up the zinc cylinder so that the carbon rod projects through the large hole in the cardboard to hold it in place, as shown in Fig. 7 (the "sack" should just touch the cardboard). Now fill each cell of the battery case with sal-ammoniac solution so that when the elements of the cell are placed in the cell the solution nearly reaches the cardboard. Place one of the thirty elements in each cell and connect up in series and 30 volts and approximately .3 amp. will be obtained.

Of course, if each row of three cells be connected up "in parallel," and the front row of ten be connected up in series, 10 volts 0.9 amp. will be obtained, and if three such batteries be connected up in series 30 volts .9 amp. would be the output. This type of battery is quite suitable for supplying plate-current. T. S.

Radiograms

MR. L'ESTRANGE MALONE, M.P., who has taken a very active part in the debates on wireless telegraphy in the House of Commons, and from whom a letter on the broadcasting position appears in our correspondence columns, has been associated with wireless telegraphy for a number of years. In 1911, serving as a lieutenant in H.M.S. *Essex* in the South Atlantic, he manipulated a kite aerial to receive "Poldhu" when out of range of the aerials of all the ships of the Fleet. Later, in 1912, he was the first naval airman to carry out experiments with wireless telegraphy in naval aeroplanes.

It is understood that in the matter of licences it has been decided to make a distinction between the genuine wireless experimenter and the person who procures a set for the specific purpose of "listening-in" to broadcast news and music. It is probable that those who intend to use their apparatus for the reception of broadcast matter only will be rigidly restricted to British-made sets.

Important experiments have been made successfully during the past fortnight in transmitting news to Canada and Australia from the Post Office station at Oxford.

Press messages dispatched from Oxford have been picked up as far distant as Perth, Western Australia.

According to the "Daily Express" an ingenious system for the clarification of wireless messages has been invented by Mr. A. F. R. Cotton and Mr. E. W. Russell, two Cambridge undergraduates, and they are able, by the use of artificial crystals which exhibit a piezo-electric effect, to produce perfect articulation of the human voice and reproduction of all musical sounds. The invention may also be adapted to a gramophone, which, although outwardly silent, will then reproduce sound with extraordinary clearness when a wireless receiving headgear is put on.

Bridlington has adopted wireless as one of its attractions. It is possible for visitors to listen-in for ten minutes for a moderate charge.

St. Asisi, near Melun, 27 miles S.S.E. of Paris, is now the largest wireless station in the world. There are seventeen masts, each one 800 ft. high, and four

transmitting plants. The station is able to transmit at the rate of between 500 and 600 words a minute.

There is now reason to believe that within a very few weeks the permission of the P.M.G. will be granted for the instalment of a receiving apparatus in cinemas.

The number of amateur licences in this country has risen during the last two or three months from 8,000 odd to over 13,000.

CORRESPONDENCE

Valve Patents

SIR,—We beg to draw your attention to a statement on page 234 of your issue of the 26th instant, as follows:

"The Metropolitan Vickers Co. own the heterodyne patent, and, as is well known, an action against the Marconi Co. has been begun."

The statement that an action against the Marconi Co. has been begun by the Metropolitan Vickers Co. is a very serious one and is totally incorrect, and we shall therefore be obliged if you will be good enough to correct this statement in your next issue.

—Yours faithfully,
MARCONI'S WIRELESS TELEGRAPH CO., LTD.
ADRIAN SIMPSON,
Deputy Managing Director.

[We quoted the statement, as we said at the time, from a technical contemporary, and beg to express our regret that we should have given extended publicity to anything incorrect or misleading.—EDITOR, "Amateur Wireless."]

Appreciation

SIR,—The correspondence *re* "Can Any Reader Explain?" I take it is now closed. However, with your kind permission I would take it as a favour to be allowed once more to use a little of your valuable space to express my thanks to the many scientific readers who have so eagerly responded to my letter in the fifth issue. I am especially indebted to P. T. B., of Ware. Like myself, he does not state anything as absolute fact, but bases his "opinions" upon existing theory. He favours the electron theory. I also have a strong leaning in the same direction. I may say I am carrying out a series of unique experiments on the above subject, and perhaps at a future date may be able to give some further "opinions," and also, no doubt, ask to be helped by fellow scientists in some of the difficulties one always encounters.—G. B. (Sacriston).

Broadcasting

SIR,—May I trespass on your valuable space to put a suggestion before your readers who comprise the bulk of those

who are interested in broadcasting and who hope to benefit by it?

The British Broadcasting Company is about to be formed, and will apparently control our destinies so far as wireless broadcasting is concerned.

The company is to be a private concern, and, I am credibly informed, it is not proposed to issue any prospectus in connection with it.

How are the rights of users and listeners to be protected?

There is a grave danger that this company may develop into a combine which will further bleed the amateur receiver, and that the undesirable legislation now before Parliament will strengthen the power of those who by patents already extract extortionate monopoly prices for essential parts which are required by everyone and could be purchased far cheaper abroad if the company did not prevent it. I might instance the fact that owing to the high cost of valves many amateurs are forced to be content with crystal sets.

I have myself, with other Members of Parliament, attempted to modify this legislation by putting down amendments. These, however, will not be discussed until the House reassembles in November.

I suggest that there should be on the board of this company representatives of the users elected by the wireless societies or in any other way that seems desirable. It would be their duty to try and protect the hundreds of thousands of persons who hope to make use of broadcasting.—Yours faithfully,

CECIL L'ESTRANGE MALONE.

House of Commons.

August 21, 1922.

CLUB DOINGS

Sutton and District Wireless Society, Surrey

Hon. Sec.—E. A. PYWELL, "Stanley Lodge," Rosebery Road, Cheam, Surrey.
TIME of meetings changed from Thursday to Wednesday, commencing August 9th, (8-10 p.m.). Applications for membership are invited.

Clapham Park Wireless Society

Hon. Sec.—MR. J. C. ELVY, 3, Fontenoy Road, Bedford Hill, S.W.12.
THE above society has now been formed and applications for membership are invited.

Fulham and Chelsea Amateur Radio and Social Society

Sec.—MR. R. S. V. WOOD, 48, Hamble Street, Fulham, S.W.6.
AN informal meeting took place on Aug. 1st at the Stanley Ward Conservative Club, 428, King's Road, Chelsea, for the purpose of forming the above society. A committee was appointed and it was then agreed that the next general meeting be called after the committee had sat to consider the necessary rules and details.

The Hornsey and District Wireless and Model Engineering Society

Hon. Sec.—MR. H. DAVY, 134, Inderwick Road, Hornsey, N.8.

(Continued on page 260)

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Wireless Telephony

Q.—Is it possible to buy a wireless telephone for private use with a radius of about five miles?—L.C. (1970)

A.—The question regarding the installation of a radio-telephone set or sets for purposes of private intercommunication has been taken up with the Post Office authorities, and the following is an extract from their letter on the matter: "Although facilities for experimental purposes may be granted, the P.M.G. is unable to grant authority for the use of wireless telegraph or telephone apparatus for private communications, either for business purposes or otherwise. Numerous applications for such facilities have been made, but it has been found necessary to refuse them all on the ground that if many wireless stations were used for ordinary communication, the reception of messages would, in the present stage of wireless development, be rendered impracticable by reason of the interference of the stations with each other and with Government and commercial stations."—CAPACITY.

CLUB DOINGS (continued from page 259)

A MEETING was held of the above society on Aug. 1st, when a 2-valve capacity-resistance set was tried out. Also a single-valve set was demonstrated and music and telephony from several amateur stations were listened to, as well as 2M.T.

Wireless Society of Highgate

Hon. Sec.—MR. D. H. EADE, "Gatra," 13a Sedgemere Avenue, East Finchley, N.2. ON July 21st and August 4th, Mr. J. F. Stanley, B.Sc., gave the fifth and sixth of his series of lectures on the theory of wireless. In these he dealt very fully with the valve and its action, outlining the electron theory and then going on to deal with characteristic curves. He showed how by operating the valve on various points of its curve, rectification or amplification could be obtained. After going thoroughly over this ground, Mr. Stanley explained and contrasted amplification at high and low frequencies, and finally described the special methods of reception necessary to receive continuous wave signals. On July 28th,

Mr. F. L. Hogg gave the second of his lectures on the construction of wireless apparatus. He dealt with the various methods by which a one-valve set could be increased to form a multi-valve set, and fully described the various types of high- and low-frequency amplifiers.

The Hon. Sec. will be pleased to receive inquiries regarding membership.

West Hartlepool Y.M.C.A. Radio and Experimental Society

Hon. Sec.—S. TILLOTSON, 34, Tristram Avenue, West Hartlepool. AMATEURS in the district are invited to join the above club.

Wireless Society of Hull and District

Hon. Sec.—H. NIGHTSCALES, 16, Portobello Street, Hull. THE meetings of the Society are held at the Signal Corps Headquarters in Park Street, on the second Monday and fourth Friday in each month, at 7.30 p.m. Intending members will be welcomed.

The Malta Radio Society

Hon. Sec.—P. BONNICI, 49, Sda. S. Giorgio, Hamrun.

A WIRELESS society has been formed under the above name for the advancement and popularisation of the science of wireless telegraphy and Telephony.

Those desirous of joining should write to the hon. secretary.

Stoke-on-Trent Wireless and Experimental Society

Hon. Sec.—F. T. JONES, 360, Cobridge Road, Hanley.

At a meeting of the above society on August 17th, several members complained of the interference caused by some local amateurs, who when listening in to wireless concerts allow their sets to oscillate and so interfere with the reception of the concerts by other amateurs in the district. It was thought that these amateurs were doing a great deal of harm, and if the practice continued, the Postmaster-General would prohibit the use of

regenerative circuits altogether. This needless annoyance was, no doubt, not caused purposely but was due to the ignorance of the owners.

The Beckenham and District Radio Society

Hon. Sec.—MR. J. F. BUTTERFIELD, 10, The Close, Elmers End, Beckenham. AT a general meeting, held on August 17th, it was decided to hold the meetings of the society on Thursday evenings at 8.15 at 114, High Street, Beckenham. On August 19th a very successful demonstration was given by the members at the Technical Institute, Beckenham, the occasion being the annual fete of the Beckenham Allotment Society. By special permission of the P.M.G., Lieut. Walker (2A.M.) Brentford, kindly transmitted music at various intervals which were received with marked enthusiasm by a very large number of "listeners-in."



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

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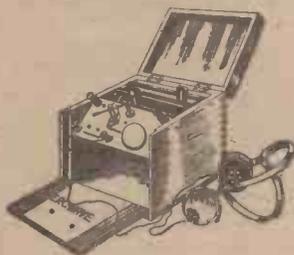
Send 1d. stamp for List of Valve and Crystal Sets and all Sundries.

MANUFACTURERS OF HIGH GRADE RADIO APPARATUS.

KERR & THOMAS,
BARR HILL WORKS, DALBEATTIE, SCOT.

LISTEN IN

on the "Aerowave" Receiver



PRICE
£6 6s.

with complete
Equipment.

HENRY J. BREWSTER & CO.,
11, Queen Victoria St., London, E.C.4.

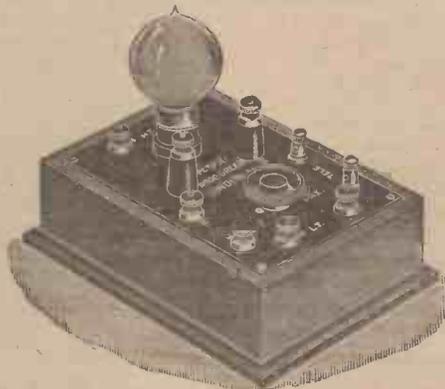
COMPLETE SET OF PARTS TO BUILD

Combined Crystal and Valve Receiver

- 4 in. by 3 in. Prepared Cardboard Former 6d.
- 1 lb. No. 20 D.C.C. Copper Wire 9d.
- 2 oz. No. 26 S.C.C. Copper Wire 6d.
- 3 in. of 1/4 in. Brass Rod fitted with Ebonite Handle 9d.
- Velvet 4-leaf Laminated Switch Arm 2/6
- 7 Studs, each fitted with 2 Nuts 10d.

The Most Suitable Valve Panel to use with above.

COMPLETE
SET
PARTS



15/9
Post
9d.

Contains Velvet Filament Rheostat ready made, Sphinx Tubular Grid Leak, 2 Meg.,
Grid Leak Condenser, Insulating Sleeving, Wire and all Terminals; blue print.
Polished Mahogany Cabinets to fit (extra) 3/6.

BUILD YOUR OWN CONDENSER.

Set of Parts Complete.

- '001 21/-
- '005 14/-
- '0003 11/-
- '0002 8/-
- '0001 7/-

Supplied with Knob Pointer and Scale for Panel Mounting. If required for Box
Mounting Send 1/- extra.

Send 6d. for our ENLARGED ILLUSTRATED CATALOGUE "A" with list
of stations. Crammed full of the latest and best.

PETO SCOTT, The Condenser King,

FEATHERSTONE HOUSE, 64, HIGH HOLBORN, LONDON, W.C.1.

HULLO EVERYBODY!!

Call Here and **SAVE 10/-** in the £

HEADPHONES. 100 sets of double receivers, best French manufactured, highly sensitive. Ball and socket adjustment, very light, tested and guaranteed, all 4,000 ohms.

21/- NOTHING 22/6 BETTER 25/- OBTAINABLE

Complete Sets of Parts for Making Variable Condensers.

Approx. Capacity in Micro-farads	No. of Plates	Price
.001	57	7/6
.00075	43	6/9
.0005	29	5/6
.0003	19	3/6
.0002	13	2/6
.0001	7	2/3

These sets are complete ready for assembling and consist of following parts: Necessary Aluminium Vanes (fixed and moving), all standard size, large and small Spacer Washers, Centre Square Spindle with Knob screwed 2 BA, 3 round screwed Rods for sides, necessary Nuts and Washers, Brass Pointer, Engraved Scale, 2 Terminals, Lock Nuts, bush and 2 bronze, coil Spring Washers. Every part guaranteed best workmanship and quality. If Ebonite for top and bottom required, price 1/- pair extra (4" x 4").

Registered post and packing 1/- set extra, (.001 1/3 extra).

Aluminium Condenser Vanes, accurate to gauge. Fixed and moving, 1d. each; 1 doz. 9d.; 4 doz. 2/8; 6 doz. 4/3; 12 doz. 8/-; per gross, pairs, 14/- Larger quantities cheaper. (Reduction to callers.)

Large Spacer Washers, 5d. doz.; 6 doz. 2/4; 12 doz. 4/- Quantities cheaper.

Small Spacer Washers (all to .0001), 3d. doz.; 6 doz. 1/4; 12 doz. 2/6. Quantities cheaper.

Knobs for Centre Spindle, drilled 2 BA, each 4d.; 2/9 dozen.

Knobs. Very good quality with 2 BA nut in centre, 6d. each, 2/6 for 6, 4/9 doz.

Spring Coils Washers, 4d. dozen.

Engraved Scales, 0-180, 4d. Do. extra quality, 6d.

Ebonite Silder, complete with plunger, each 6d.; 5/6 dozen.

Slide and Plunger, complete with 1 1/2" brass square rod, 9d. (Postage and package, 9d.)

Aerial Wire, 100 feet hanks, 7/22 stranded copper, 3/2, (post and packing, 1/-), quantities cheaper.

Valve Legs complete with nut and washer, 4 for 5d.; 1/1 doz.; 6/- 6 dozen.

Best Quality Ivorine Engraved Scales, (0-180), 6d. each, cheaper quality, 4d.

Please include sufficient for packing and postage. The above prices are too low to admit of being sent otherwise.

Trade Supplied over the Counter only.

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27, LISLE STREET, W.C.2.

Right Opposite Daly's Gallery Door.

To avoid mistakes, this address is close to Charing X Road and Leicester Square Tube

Phone: Gerrard 4637.

PREPAID ADVERTISEMENTS.

Xmas Chocolate Clubs.—Spare time agents wanted. Good remuneration. No outlay. Best makes only supplied. Particulars free.—Samuel Driver, South Market, Hunslet Lane, Leeds. [10 r
B.A. Strews, Nuts, and Washers, assorted gross, 2s.; list, 2d.—J. H. Bennett, Station Road, Willesden Junction. [24 r

Trade Agencies Wanted, wireless instruments, material, accessories. Send trade lists, catalogues, terms, etc.—Radio Agencies, 54, Bowden Road Observatory, C.P., South Africa. [27 r
Make the "Long-wave Tuner for 10s." (see page 164, "Amateur Wireless," Aug. 5). The two hardwood formers, 3s. 6d. (post free, 4s. 3d.). Teak, mahogany cut to size, wood turning for wireless.—"Bonds," 449, Harrow Road, London, W.10. [39

Aeroplane Transmitting Sets, as illustrated in this paper, all sound and complete, 17s. 6d. each, carriage and packing 2s. extra.—Below.

Huge Purchase of ex-Government Wireless Stock. Write for list giving full details. 150-watt dynamos, 4/1; hedgehog coils, 7s. 6d.; potentiometers, in case, with battery, 12s. 6d.; loud speakers, 200 ohms, 7s. 6d.; 1-in. spark coils, 10s.; 1 1/2-in. spark coils, 12s. 6d.; mouse tapping keys, 3s., etc. etc., etc. Three days' approval against cash, or please call. Write for detailed price list of all goods.—E. J. Galpin, 16, Loampit Hill, Lewisham, S.E.13, London. [13

Wireless Experimenters. Ebonite sheet, 1/4 in., 9 by 6, 2s.; 15 by 9, 3s. 6d.; 1/2 in., 10 by 7, 1s.; 12 by 4, 6d. Polished teak cabinets, various sizes, for panel mounting, from 2s. 6d. each; postage extra. State your requirements. Everything wireless. Stamp for list. Turner Bros., 49, Heaton Road, Peckham, London. [28

Accumulator. Batteries, Willard 6-volt 80-amp. hour, continuous rating. Regular price, 115s., our price, 90s., or fully charged, 93s. 6d. f.o.r. Liverpool; packing 3s. 6d. extra, returnable. These batteries are in ebonite boxes and wood crates with handles, and will give real satisfaction. They are not the cheap ignition or intermittent rated cells in celluloid boxes which need such frequent charging. Money refunded if not satisfied and battery returned in good condition within seven days.—Herd and Smith, Ltd., Electrical Specialists, 9, Edmund Street, Liverpool. [A

Short-wave Receiving Set, as illustrated in "Work" Handbook. Panel as shown on page 75. 15s. 9d., post free.—Manufacturer, 12, St. Thomas's Road, Harlesden, London, N.W.10. [48

Special Note to Advertisers.

ADVERTISEMENT INSTRUCTIONS and copy for "Amateur Wireless" should be at the Office by First Post on Saturday morning at latest.

Advertisements in the Miscellaneous Sale and Exchange column must be prepaid. The rate is 3d. per word; minimum 3/-.

EVERYTHING FOR WIRELESS SPECIAL OFFER THIS WEEK

Complete set of parts for making a handsome variable condenser, 0001 mfd., with transparent casing, only requires assembling, 10/6. Complete single valve set, 2/3 10s. Comprising: Aerial Wire, Insulators, Pulleys, Lead in Tube, Tuning Coil, Valve, Panel, Valve, 4,000 ohms Phones, 2 Variable Condensers, High and Low Tension Batteries.

Write for Price List. Trade Supplied. D.S.S. Eng. Co., Alma Rd, WINDSOR. Phone: 356.

ACCUMULATOR (The N.S.) The Cell that will not sulphate. In strong Ebonite containers and well finished hardwood outer cases. Guaranteed. Newly made and fresh from Factory. Not Government surplus. 4 volt 45 Amp. hour, 45/- each f.o.r. All other capacities in stock. HUNTER AND WALSH, 31, North John Street, Liverpool.

STRONG IRON AERIAL POLES

Well Made in 2 and 3 Sections. BRITISH MANUFACTURE. 20 ft. poles, £1 ea.; 30 ft. poles, £1 10s. ea. Accessories for Aerials also supplied.

THE ELECTRIC SUPPLY CO., MAIL ORDER DEPT., 82, FORT RD., LONDON, S.E.1.

BUY of ACTUAL MANUFACTURERS!

Saving All Intermediate Discounts

Compare Prices and Remember
WE GUARANTEE

There is nothing on the market that can approach our instruments and accessories for finish, accuracy, sensitiveness, or value.

SATISFACTION

B.R.M. Set No. 1. Crystal. Entirely complete for receiving, with **H.R. 4,000 Ohm Phones.** Slide inductance, condenser, Crystal Detector, Aerial, Insulators, Lead-in, pulleys, etc., and mounted neatly in polished, lid-closing walnut cabinet, £4 15s. Postage and packing free.

OR

B.R.M. Set No. 1. Single Valve. Comprising Valve holder, Grid leak and condenser, **H.R. 4,000 Ohm Phones,** '002 condenser, low wave tuner, filament resist, Aerial, Insulators, Lead-in, pulleys, etc., and mounted complete on ebonite panel, encased in neat, lid-closing, polished mahogany cabinet ready for receiving, £5 19s. Postage and packing free. THERE IS NOTHING ON THE MARKET AT THIS FIGURE.

FULL COST OF PURCHASE REFUNDED

'001 Condensers assembled ...	17/6	Crystal Cups ...	5d.
Vanes, 3 1/2 in. ... pair	2d.	4,000 ohm Phones ...	28/6
Spacers, Large ... doz.	4 1/2d.	Sullivan Headphones, 8,000	
Spacers, Small ... doz.	2 1/2d.	ohms, few only ...	36/6
Condenser Spindles, '0001 to		etc., etc.	
'001 ... upwards	3d.		
Fixed Condensers, '0001 to		POSTAGE FREE OVER 5s!	
'001 ... each	1/9	We will have much pleasure in forwarding you a free catalogue on application. Trade supplied. Inquiries invited for any branch of special instrument manufacturing, or parts of any description.	
Complete Valve Panels ...	22/6		
Terminals, neat, polished doz.	1/9		
Valve Sockets, complete four	9d.		
Aerial Wire, 7/32, 10 ft. ...	4/9		
Slider Rods, 12-in. lengths, 1/4 sq.	7d.		

BRITISH RADIO MANUFACTURING CO.
(Desk 2) ATHENÆUM WORKS, HAMPSTEAD, LONDON, N.W.
also at 75, Heath Street, Hampstead. Tel. Hampstead 3237

HELLO! HELLO!! HELLO!!!

The **STUART WIRELESS**
TELEPHONY CO.

calling :—

We cordially invite
you to call and
"Listen-in."

Demonstrations All Day.



EARLY DELIVERY OF OUR SETS
FOR CASH OR EXTENDED PAYMENTS.

WE ARE SPECIALISTS IN SPARE PARTS
LARGE STOCKS — TRADE SUPPLIED.

The
Stuart
Family
3-Valve
Set,
£26 10s.

Send for our Illustrated Booklet
4d. post free.

Transformers,
High Frequency
Anode Tuners,
Magnavox and
Brown's Loud
Speakers, etc.,
from stock at
lowest prices.
Please send
inquiries.



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SCIENTIFIC APPLIANCES

DALE & HOLLINS.

All Wireless Radio Parts & Electrical Material

See full advertisement—last week and next week.

Come to look at our show all the week and you will come in to Buy. Ask for List.

In Centre of London, top of Kingsway.

11 & 23, SICILIAN AVENUE, SOUTHAMPTON ROW, W.C.2.

THAT BOOK YOU WANT ON WIRELESS OR ANY OTHER TECHNICAL SUBJECT

Foyles have it or will quickly obtain it,
1,000,000 Vols. (Second-hand and New) on Techni-
cal and every other conceivable subject in stock.
Books sent on approval. Write for Catalogue 10s (free) mentioning
requirements. Books Purchased.

FOYLES, 121, Charing Cross Rd., London.

WE PUBLISH PRIZE WINNERS, Issue 12th August, 1922

Question: Why did the Grid Leak?

A Parcel of Goods has been sent to:

Mr. W. GRIFFIN, 27, Melvin Road, Anerley, S.E.20,
for the following:

"Because Fila. ment 2 MT it but forgot. (Mr. D. Short—
D. Good, but too D. Short, as you were ohmless. Besides
Mother would be vexed)"

Aerial Wire, 7/32's Enamelled Hard Drawn Copper, 6/-
per 100 ft.

Aerial Pulleys, 2 1/2 in., 1/2, 5 in, with tackle hook and
bucket, 2/6.

Aerial Insulators, Shell type, 2 1/2 in. x 2 1/2 in., 1/6 each.

"Batteries." For H.T. Reel type, 2 in. diam., white, 4d. each.

Batteries, 5/- doz. Make your own. Flash Lamp

Buzzers for Morse practice, new improved line, best
quality, 4/6.

Condenser Discs, Ebonite, 3 1/2 in. diam., 1/4 each.

Condenser Discs, Engraved, fine finish, 2 1/2 in. dia., 1/9 each.

Condensers. Fixed. Exceptional quality. Made with
copper foil; from '0001 to '001, 2/6 each.

Condenser Vanes. Not rubbish. Best strong Aluminium.
Fixed 3 1/2 in., Moving 2 1/2 in. 1/- doz.

Condenser Spacing Washers. Remember they must be
accurate. Small, 4d. doz.; large, 6d. doz.

Condenser Screwed Rod. Brass, 12 in. lengths, 2 B.A.,
or 4 B.A. 6d. each. 2 B.A. and 4 B.A. nuts 7d. doz.

2 B.A. and 4 B.A. washers 2d. doz.

Contact Studs. Studs, not rubbish, 1/6 doz.

Copper Foil Sheets. 10 in. x 4 in., 6d. each.

Core Wire, soft iron, 2/4 per lb.

Ebonite. Best quality. Any size, rod or sheet, 5/- per lb.

Filament Resistances. For panel mounting, with knob
pointer and good contact. A speciality. 4/- each.

HEAD RECEIVERS. Light, sensitive, of good design and
superior finish. Tested and guaranteed perfect. Complete
with cords. 140 ohms 30/- each, 4,000 ohms 32/-
each, 8,000 ohms 33/- each. Postage 9d. each.

Inductance Tubes. 12 in. long. Specially impregnated.
2 1/2 in., 6d.; 3 in., 7d.; 3 1/2 in., 8d.; 4 in., 10d.; 4 1/2 in.,
1/4; 5 in., 1/2; 6 in., 1/6 each. Postage od. each.

Inductance Slider Rod, 1/2 in. square in 13 in. lengths,
Not jagged but smooth. 6d. each.

Insulating Tubing, 6d. per yard.

Ivory Scales. 0 to 1000. Engraved (not printed), 1/2
each.

Ivory Tablets. Strong, Engraved, not printed. Aerial,
Earth, Primary, Secondary, On, Off, Reactance, Phones,
H.T. + H.T., L.T. + L.T., A.T.I. 2d. each.

Knobs. Ebonite. 1 1/2 in. diameter. Superior finish.
Knurled, 7d. each.

LOUD SPEAKERS. Exceptionally efficient. 70 ohm, 2,000
ohm, 4,000 ohm. £2 10s. each.

Mica. Pure Ruby. Pieces, 3 in. x 3 in. x .002 in. thick,
6d. each.

Paraffin Wax, 1/- per lb.

Resistance Wires. "Elsi" brand. 22's (1 ohm per
yard), 24's (1 1/2 ohms per yard), and 28's, enamelled
(4 ohms per yard), 2d. per yard.

Switch Arms. Exceptionally strong and well made, 2/6
each.

Terminals. A very neat wireless terminal. Polished,
complete with nut and washer, 2/6 dozen.

Tin Foil. Free from lead. Sheets, 26 in. by 13 in., 4d. each.

Valve Sockets. With nut and washer. Fine finish, set
of four, 8d.

Valve Holders. Best quality ebonite, with nuts, 1/4 each.

Woods Metal, 4d. per packet.

Crystals. Carborundum, copper pyrites, galena, bornite,
iron pyrites, silicon, manganese, 8d. per packet.

SUPERIOR QUALITY WIRE. British Made.
All wire wound free. Post extra.

S.W.G.	S.C.C.	D.C.C.	Single Silk	D. Silk	Enamelled
12	1/10	1/11	4/-	5/4	1/8
14	1/11	2/-	4/-	5/4	1/9
16	2/-	2/3	4/2	5/6	1/10
18	2/1	2/3	4/4	5/6	1/11
20	2/3	2/3	4/8	6/2	2/6
22	2/6	2/11	5/-	6/8	2/8
24	3/-	3/6	5/6	7/4	2/8
26	3/7	4/1	6/8	8/2	3/2
28	4/4	4/7	7/2	9/-	3/6
30	5/-	5/6	8/-	10/-	3/10
32	6/-	7/3	9/2	13/-	4/2
34	7/-	8/3	11/6	14/-	4/4
36	8/8	10/2	14/-	15/6	4/8
38	11/3	13/2	16/-	19/-	5/3
40	15/-	18/-	18/6	22/6	6/6
42	17/3	21/-	31/6	34/-	9/-

At per lb.

Carriage extra. Please remit ample postage, balance returned. Orders over £2 carriage paid. Money back if not satisfied.
[Phone Cent. 4209.] **J. L. CARTWRIGHT & Co.,** Manufacturing Electrical and Radio Engineers, Dept. W, 130/132, London Road, Manchester. [Grams: "Pladuram," Manchester.]
Special Terms to the Trade. Price Lists 3d. Post Free. WORKS: BERRY STREET.

IMPORTANT NOTICE.

Owing to recent advertisements in the Wireless and Daily Press seriously reflecting upon the quality of the Radio Head-phones at present being offered for sale by us, we have invited opinions from our customers on the general quality and efficiency of these phones and reprint below a few typical replies. We refuse to believe that the Wireless public will allow themselves to be prejudiced against the quality of the goods we offer in the face of such overwhelming evidence.

BROWN "A" TYPE.

120 ohms 42/6

(Maker's price, 58/-)

8,000 ohms 49/6

(Maker's price, 66/-)

Postage 1/- extra.



SULLIVAN

8,000 ohms 36/6

Postage 1/- extra.

Every order executed within 4 hours of receipt, per Registered Post.

Cords 2/9 per pair.

WE GUARANTEE

- (I) That these are in brand new condition, and have never been used.
- (II) That they have never been reconditioned.
- (III) That they are equally efficient to any Headphone on the market.
- (IV) That should they fail to give absolute satisfaction in any shape or form, and the phones are returned to us within seven days,

WE WILL FORTHWITH REFUND THE FULL AMOUNT PAID



The "Parliphone" Louder Speaker.

(Prov. patent No. 21,967.)

32/6

THE LATEST WIRELESS SURPRISE

The "Parliphone" Loud Speaker.

Made in one solid piece of moulded Ebonite. Interior screwed, and made to receive Brown's Standard Pattern Receiver.

LOOK OUT FOR OUR STAND AT THE EXHIBITION.

THE CITY ACCUMULATOR CO.,

79, Mark Lane, E.C.3.

Room 116 (4th Floor).

'Phone: "Avenue 91" (3 lines).

Agents: London. A. W. Gamage, Ltd., Holborn.
Selfridge & Co., Ltd., Oxford Street.

South Wales. South Wales Wireless Installation Co., Ltd.,
18, West Bute Street, Cardiff.

North Wales, The "All British" Wireless Manufactures Co.,
Lancashire and Ltd., 70, Central Buildings, 41, North John
Cheshire. Street, Liverpool.
Gloucestershire. The Bristol Wireless Co., 52, Cotham Hill, Bristol.
Yorkshire. The Barnsley British Co-operative Society, Ltd.,
Barnsley.

August 19th, 1922. 47, Baron Road, Chadwell Heath, Essex.
Having purchased from you a pair of Brown's 'Phones 8,000 ohms for £2 9s. 6d., I was naturally interested in the recent announcement by Messrs. S. G. Brown, Ltd. I already possessed two pairs of Brown's 'Phones; one pair which have been reconditioned and one pair of the new series, so I decided to test them against those I purchased from you. You will, no doubt, be gratified to learn that the pair purchased from you are equal in every way to the new pair of the new series but considerably more sensitive than the pair which have been reconditioned. All three pairs are used directly in circuit with an anode voltage of eighty to one hundred. Had they been old stock they would have burnt out consequent on deterioration of insulations and windings. I have no hesitation in saying that the pair purchased from you are all that could be desired, and I have already recommended them to my several wireless friends. (Signed) GEOFFREY M. JONES.

August 20th, 1922. 4, Surrey Street, St. Paul's, Bristol.
In reply to yours of the 18th inst. re 'Phones. These have been tried and the result has been highly satisfactory, also the quality of same are A1. (Signed) L. POTTER, junr.

14, Mill Hill Lane, Leicester.
Your letter to hand re S. G. Brown, Ltd. "A" Type head-phones as supplied by you. I have not had a trial with the test by wireless, but have tested them in various manners, and they appear to be in good order. I am thoroughly satisfied, and if the makers can get 16s. extra for an improved diaphragm "good luck to them!" (Signed) E. L. SMITH.

August 20th. 18, Bold Street, Altrincham, Cheshire.
With reference to your letter of the 18th inst., and in line with your request for my opinion of the "Wireless Telephones" you supplied to me recently. Although I have not yet had a real opportunity of testing them, they are, in my opinion, in perfect condition, and appear to be as new and unused. I am perfectly satisfied with same and they are a bargain, considering the market price for new phones of same make. (Signed) P. GREEN.

August 21st, 1922. 30, Rokeby Avenue, Redland, Bristol.
In reply to your letter of the 19th inst., the head-phones, recently supplied by you were purchased for my son, who has a one valve set. They appear of excellent quality, and so far have fulfilled all requirements. Since the receipt of your letter I have had them examined by a local expert, who has an eight valve set, and he pronounced them to be perfect in every respect. (Signed) M. W. JONES.

August 21st, 1922. 102, London Road, Preston, Lancs.
Messrs. The City Accumulator Co., 79, Mark Lane, E.C.3.
In reply to your letter of inquiry dated August 19th, regarding quality of Brown's 8,000 ohms phones supplied to me, I beg to state they are working splendidly and quite as good as I expected. I am quite satisfied. Have compared them with other Brown's Phones 8,000 ohms which cost more than mine, and I find signal strength quite equal. You can use this letter as you think necessary. (Signed) H. WELSH, Marine Wireless Operator.

"PALMERFONES"

These Super-Sensitive
HEAD PHONES
EXCELLENT VALUE



DELIVERY FROM STOCK
Every Set is thoroughly tested. Very light and comfortable. Standard resistance 4,000 ohms.

EACH COMPLETE WITH DOUBLE HEAD GEAR WITH CONNECTING CORD

PRICE
29/- OVER COUNTER **29/6** BY POST

Marconiphones, at £4 13s. 6d., £5 5s., £8 19s. 6d., and £25 each.
Metropolitan Vickers Sets, from £4 10s.
Beaver Baby Grand, complete receiving set, less phones and aerial, 19s.
"Federal" Head Phones, 2,200 ohms, 35/-.
Ditograph Radio Head Phones, 3,000 ohms, 35/-.
Brown Loud Speakers, 110/-.
Magnavox Loud Speaker, "Junior" Type, 210/-.
Magnavox Loud Speaker, "Senior" Type, £20.
2-Valve Power Amplifier, complete with valves, but less batteries, (for Magnavox), £22 10s.
3-Valve Power Amplifier, complete with valves, but less batteries (for Magnavox), £35.
Aerial, Earth and Phone Labels, each, 3d.
Aerial Wire, 100 ft. 7/22, with 2 insulators, each set, 4/6. [2/6.
Aerial Silicon Bronze Wire, 18 gauge, per 100 ft., Wireless Masks, in 4 sections, 11 ft., 4/9.
Ebonite Valve Holders, 4 legs, with nuts and washers, 1/-.
Ebonite Valve Holders, complete, best quality, 1/9.
Ebonite Slider and Plunger, 8d.

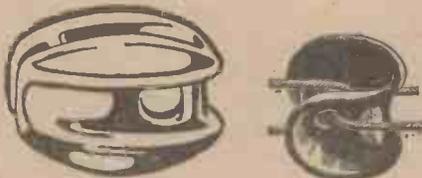
CASH REFUNDED IF NOT SATISFIED

GEORGE PALMER, WIRELESS AND SOUND TRANSMISSION SPECIALIST,
47, GERRARD STREET, LONDON, W.1.



Ebonite Knobs, 1 1/2 in. in dia., knurled edges tapped 2BA, 6d.
Contact Studs, with nuts and washer, per doz., 8d.
Valve Legs, with nuts and washer, each set, 3d.

Ebonite Sheets, various thicknesses (cut to any size), 4/6 per lb.
Switch Arms, complete, 2/6.
Condenser, fixed and moving vanes, aluminium, per doz. pairs, 2/-.
Condensers Spacer Washers, large and small, per doz. pairs, 1/3.
Condensers, complete, 4/6.
Condensers (Dubilier), 0.001, 0.002 and 0.003, 3/- each.
Ditto ditto fitted with grid leaks, 7/6 each.
Crystal Cups (small and large), each 2d. and 6d.
Crystal Detector, 5/6.
Lightning Arresters, 2/-.
High-Frequency Transformer Former (8 divisions), 4/6.
Leading-in Tube, 6 in. long, 2/-.
Copper Foil, 4 X .002, per lb., 2/8.
2-Coil Holder, with extended arm, complete for panel mounting, 12/9.
3-Coil Holder, with extended arm, complete for panel mounting, 17/6.
Inductance Tube, 5/-.
Valve Pin, 2d.
Terminals, complete, small and medium, per doz., 1/8.
Terminals, complete, large, per doz., 2/-.
Square Brass Centre Rods for Condenser, 6d.
Sets of Rods, 1 square 3 round, screwed 2BA, complete with nuts and washers, 100s, the set, 1/6.
Ditto ditto .001, 1/3.
Ditto ditto .0003, .0002, .00075, the set, 1/-.
Ditto ditto .0001, .00005, the set, 10d.
2 B.A. Brass Screwed Rods, 12-in. lengths, 6d.
Brass Nuts, 2BA, 4BA, and 5BA, per doz. 4d.
Tuning Bar Square Brass Rod, in 13-in. lgths., 6d.



Insulators, porcelain, small egg shape, 3d.
Insulators, porcelain, 2-in. reel, 4d.
Insulators, large shell type, 8d.
Ivory Scales, 6d.

ELECTRADIX RADIOS.

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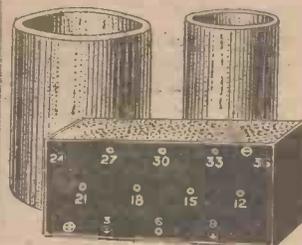
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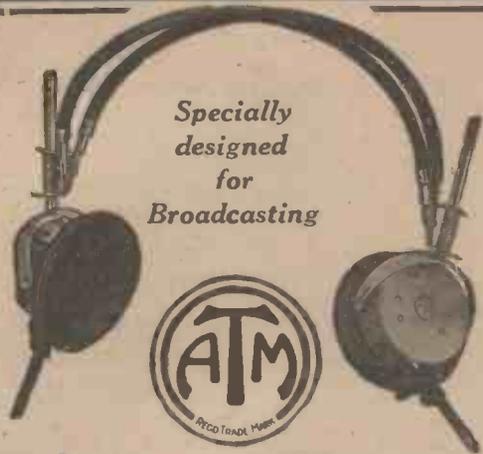
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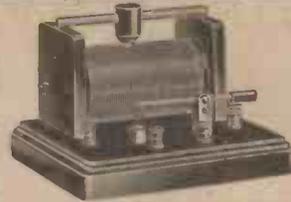
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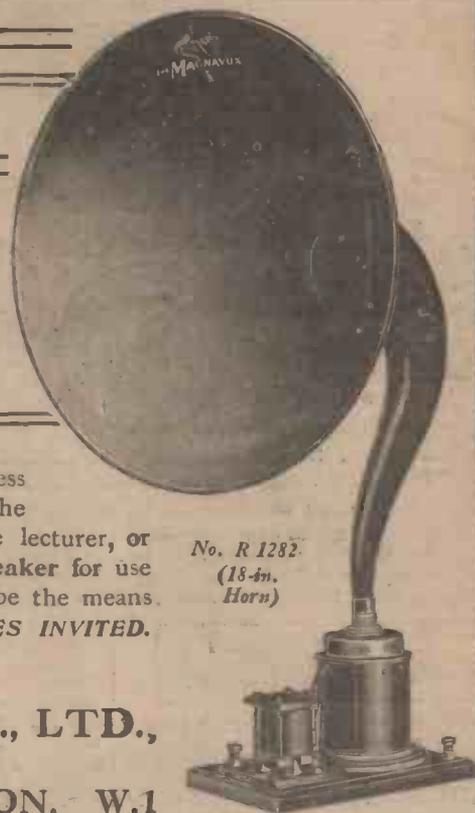
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No. 14

SATURDAY, SEPTEMBER 9, 1922

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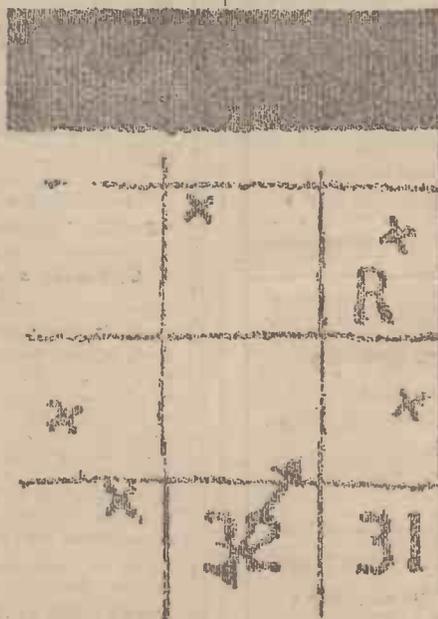
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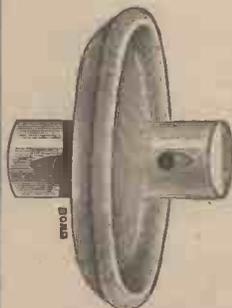
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Amateur Wireless

and Electric

No. 14

September 9, 1922

AERIAL MATTERS OF FACT

POINTS TO REMEMBER

THE aerial has, like all the other apparatus, little peculiarities of its own, and amateurs would do well to learn some of them.

Supposing your aerial is not level, that is, one end is higher than the other. In a case of this sort the lead-in must be taken from the lower end or you will only get very weak signals, if at all. This you may know; but there is another point in this connection with more far-reaching results, that is, you must not take your lead-in from the farther end even if it be lower, or you will set up oscillations and turn your aerial into a transmitter, which will effectually jam all other transmitters and receivers around you.

The Lead-in

Yet another point about your lead-in—keep it as short as possible, and see that your joints are well soldered and your wires well insulated. What your lead-in tube shall be made of is a matter of taste, of course, but make it as long as you can and never buy one with a turned-up end. I have found from experience that in dry weather this collects no end of dirt, and in the rainy season acts as a water-pipe, and you will have a miniature drain in your room.

Other Points

If you cannot afford ebonite, a good substitute that is simple and yet gives long service can be made from stiff brown paper rolled on a round ruler, stuck with shellac and soaked in paraffin wax.

The best wire for aerials is 14 S.W.G. copper wire.

Insulators can be improvised from a ginger-beer bottle neck, a mineral water bottle neck, a cotton reel soaked in paraffin wax, a short piece of rubber hose pipe, the base of a round fuse box, or the china core of an electric lamp switch.

If possible have your aerial "end-on" to the nearest station for broadcasting, and if there are houses or trees near use a twin aerial at least 35 ft. long and as high as possible.

Do not let your aerial get too tight; slackness is a good fault. I have found a twin aerial using a 4 ft. 6 in. stretcher gives the best results.

R. W.

THE ROOF AERIAL

WHERE inconvenience arises in fixing up an ordinary outside aerial of the necessary height it is a simple matter to fix one in the roof. It can then be supported by hooks screwed into the beams at each end of the roof, and thus a high aerial is obtained without the trouble and expense of erecting masts, etc. There is a further slight advantage in the fact that the insulators are protected from the rain, and a consequent leakage in wet weather is avoided.

Against this there are the disadvantages of "shielding" by the roof, and usually a rather short aerial. A slate roof does not appear to shield the aerial badly, and the

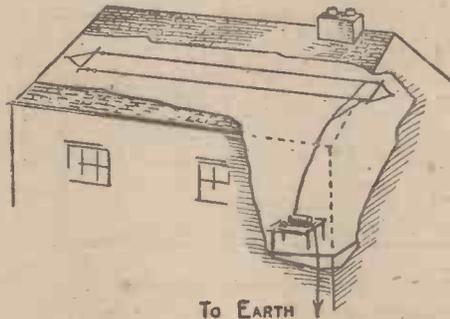


Diagram showing Aerial Erected in Roof.

writer has obtained excellent results from a two-valve set on an aerial of this type 36 ft. long. Even with a home-made crystal set, using a single ear-piece of about 750 ohms, quite good results were obtained.

The chief requirements are that the roof should not be lower than those of the surrounding houses, and there must be a good earth.

It is not usually possible to get a span of more than 30 ft. to 50 ft. in an ordinary house, and therefore a twin aerial of the L type is advisable. The lead-in wire can be taken through a small hole in the ceiling, carefully insulating it at this point.

Where the instruments are in an upper room it is best, if possible, to take the earth wire to a water-pipe outside the house, keeping it away from the side of the house. If this is done the earth wire will to a certain extent act as an additional length of aerial. A good earthing switch should be fitted and the aerial always be earthed when not in use.

W. E. H.

A PRACTICAL EXPERIMENT

IT is, of course, an understood thing that stranded wire is superior to ordinary wire for aerials, because the currents produced in the aerial by the incidence of the ether waves are high-frequency currents, which prefer surface to solidity.

Also it is urged upon us that the insulation of the aerial must be very good or the high-frequency currents will leak away to earth without performing the work we are expecting them to do. What more natural, then, than that we should take a convenient length of standard rubber-covered cable, and, seeing that the ends are sealed up against contact with anything which would "earth" it, lay it along an accessible parapet of a big building. This the writer did, making a good earth connection to a convenient water-pipe. Upon testing the installation, however, the result was nil, and a little thought made the reason apparent. The rubber covering caused the trouble.

Another Experiment

A further experiment was made with a bare single copper wire, supported by means of short poles projecting over the parapet, the wire being attached to insulators fastened on the poles. With this arrangement the signals were clear and strong; but another difficulty had developed. Electric motors driving machinery in the building had part of their anatomy "earthed," and so disturbed the earth zero potential by leakage to an extent that rendered reading the signals extremely difficult while the motors were running, though as soon as they stopped the signals came in clear and distinct.

The experiment of running the discarded rubber-covered cable along the ground in a straight line immediately under the plain wire aerial was tried, and without any electrical contact of the cable to earth a beautifully quiet set resulted, without any of the humming which had previously made reception very difficult.

Now, why should a piece of rubber-covered cable, which made a bad aerial, succeed in making a good "earth," though it was not earth connected? Just because a counter capacity had been provided, and the inductance coil of the receiver, when tuned, was able to oscillate

to the wave-length to which it was tuned or resonant. The bare wire aerial formed a part of the tuned circuit, but the rubber-covered false earth did not need to oscillate, but only to provide a viscous or sticky equaliser of the charges arriving at the station.

To understand a little of this it is necessary to study wave propagation, perhaps most usefully by way of analogy. We allow a stone to drop into a smooth pond of water, and immediately a wave begins to form where the stone dropped, and the wave travels outwards in an ever-widening ring till it reaches the edge.

We can consider the bottom of our pond as having a rich deposit of black, slimy mud. If the conditions of the pond were reversed, so as to have the mud on the top and the water underneath, the falling stone would make no wave; there would be just one "plop," and a splash of mud-drops thrown up, and no ripple or wave to travel outwards. This condition in the analogy is the counterpart to the experiment of when the rubber-covered cable was in the air. The rubber made the ether too muddy and sluggish to allow it to oscillate quickly enough.

GAMMA.

away to earth through the high resistance of the leak. Upon changing the condenser I stopped this effect, proving my suppositions to be correct.

Perhaps a few constructional details might be of interest to anyone making the set. We will deal first with the tuned plate. A slab-wound coil is generally the best to use. Procure two discs of wood of about 4 in. diameter, fix them about 1/4 in. apart on a spindle, preferably in a lathe or some form of winding machine. Use No. 30 S.W.G. enamelled wire and take tappings at about every 1/4 in. of the coil as the wire is wound on. Dip the whole thing in wax, allow to set, remove the wooden discs, dip in wax once more, and the coil is finished. The tappings should now be connected to a rotary pick-off switch, with a very small variable condenser across it. This completes the plate tuner, which should be connected between the plate of the first valve and + H.T.

The coupling condenser should be about .0005 mfd., the leak to earth about 2 or 3 megohms, and the remainder of the circuit follows usual practice.

So much has been said about aerials that I need only add that I use a 70-ft. twin with 8-ft. spreaders, the average height being 45 ft.

Results

Now for the results obtained using this circuit with three valves working.

The Dutch concerts are just audible all over my room, which is about 15 ft. square. My aerial is non-directional for PCGG and points north.

The aeroplanes on the Continental airways can be heard on a good day until they reach Le Bourget, whose speech, by the way, is quite distinct.

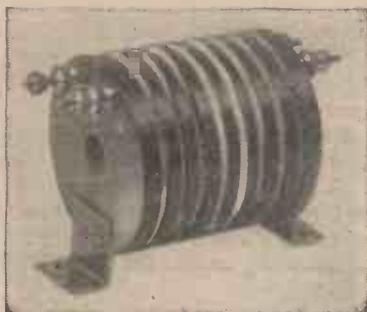
American stations come in well with the 'phones on the table.

Croydon, 2L O, 2F Q, etc., are too loud on three valves to be able to wear the 'phones in comfort.

HIGH-FREQUENCY AMPLIFICATION

A Personal Experience

BEFORE I started to use high-frequency amplification I was working two valves, one rectifying and one as a low-frequency note magnifier.



Intervalve High-frequency Transformer with Air Core.

The circuit I decided upon was then little used, and opened up great possibilities of extensive experiments. It is known as the "rejector circuit." A diagram of the connections is given here. The great disadvantage of transformer-coupled high-frequency is the limited wave-length range which one can operate on, hence my intention of using the circuit shown.

The coil must be tuned to the same wave-length as the aerial, when it will stop all high-frequency currents except those exactly in tune with the aerial circuit. Also the resistance to low-frequency currents is only a matter of 10 ohms or so.

High-frequency resistance-capacity coupling employs a 50,000-ohm leak in place of the tuned plate, as this coil is called, but it is not efficient below 1,000 metres, whilst the rejector circuit will work efficiently down to about 100 metres.

Any difficulty in making the set oscillate on a low wave-length is easily overcome when the plate is exactly in tune.

The condenser connecting the first plate to the second grid is functioning as a

coupling condenser for impressing the impulses of the first plate on to the second grid. A rather interesting point can be demonstrated with this condenser if it is at all leaky.

In my set I can cut in the H.F. valve or the L.F. valve, or both as I wish. Now, if the aerial inductance is broken anywhere

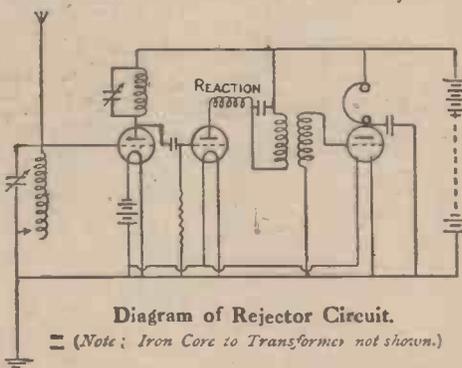
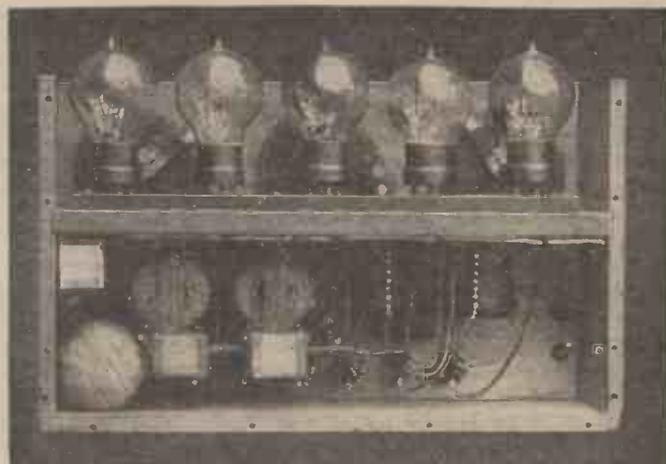


Diagram of Rejector Circuit.

the A.C. hum from the electric light mains is generally audible. Make the grid leak as high a resistance as possible and work on the H.F. valve with the A.T.I. broken. The A.C. hum is now rather faint. Switch off the H.F. valve; no hum will be heard until after the lapse of about seven seconds, when the hum will appear and grow in volume. My theory of this phenomenon is that the grid of the rectifying valve was charged 60 volts positive through the leaky condenser when the H.F. valve was in. On cutting it out the positive feed was cut off, and the charge gradually leaked



A 5-valve Amplifier as described in the Handbook, "Wireless Telegraphy and Telephony."

Paris (FL) can be heard over 100 ft. away in the open with a strong side wind blowing. A. G. W.

Condenser Capacities

And How to Measure Them

THERE are many amateurs who are unable to measure up the value of a condenser, and to whom therefore the following information will be of use.

In the writer's 2-valve set all the condensers are home-made, and they are very efficient and equally as good as bought ones. The variable condensers are made up of zinc sheets with glass dielectric, and are of the sliding type where the moving vanes slide in and out between the glass plates. The fixed condensers are made of tinfoil with mica dielectric, though wax-paper has been tried for the dielectric with very good results.

The formula used in the measuring of capacities is as follows:

$$\text{Capacity of condenser} = \frac{A \times B \times C}{D}$$

$$4 \times 3.1416 \times D \times 900,000$$

Where A = specific inductive capacity value of dielectric.

B = area in sq. centimetres of each sheet of dielectric under strain.

C = number of sheets of dielectric.

D = thickness of each sheet of dielectric in centimetres.

The following are a few specific inductive capacity values of the principal dielectrics used in the making of condensers: Glass = 6 to 8; mica = 6 to 8; ebonite = 2; waxpaper = 2 to 2.5; air = 1.

The following example will help to clear up a point or two that readers may be puzzled about.

letters A, B, C, D in the formula are changed into figures thus:

A = specific inductive capacity of glass = 6

B = area of plates = 3 × 3 cm.

C = number of dielectrics = 1

D = thickness of dielectric = .1

Our formula now is:

$$\frac{6 \times 3 \times 3 \times 1}{4 \times 3.1416 \times .1 \times 900,000} = \frac{1}{20944} =$$

nearly .00005, which is a suitable value for a grid condenser.

Condensers should always be tested before being used in any circuit or there may be trouble. This is very easily done by trying to pass a direct current through them. If the current passes through the condenser is useless, as some of the zinc plates are touching each other, which, of course, they should not do under any circumstances. C. F.

How to Connect Your Telephones

IN the No. 6 issue of AMATEUR WIRELESS mention was made of the possibility of telephones being connected up in such a way as to demagnetise them.

The writer has tested telephones by the method now to be described, which he strongly recommends as being absolutely reliable.

The ebonite ear-cap of one receiver is removed and the diaphragm slipped to one side, so that part of the edge of it is just over the poles. The receiver is now inverted, so that the diaphragm is underneath and only remains on the telephone by the force of the magnet's strength. A current of electricity is now sent through the 'phone, when one of two things will happen—(a) the diaphragm will drop right off the poles, or (b) it will stick to

them with more force. If the first thing happen, the correct connection for the 'phone is opposite to that of the present polarity; that is, if the positive terminal of the battery is fastened to one lead, when connecting up to the

instrument, this lead must be affixed to the plate of the valve so that the current flows through the 'phone in the opposite direction to the test direction.

If the second thing happen, the current should be reversed, when (a) will happen. If this does not come about, the position of the diaphragm on the poles should be carefully adjusted and the operation gone through again.

This will give the correct current direction for this particular ear-piece, so that demagnetisation does not occur. If the 'phones are old or second-hand, it is just as well to remove the other ear-cap and test this receiver for the correct direction without disturbing the relative connection of the ear-piece. R. W. E.

A Shell Amplifier

CONSIDERING the question of resonance horns for wireless telephones and other purposes, the writer has often been struck with the beauty of line of the spiral shell of the whelk and other marine snails, and how the shell appears to enlarge with the theoretical perfection of an acoustical instrument, the area of cross section increasing proportionately with the length. He had long been on the look-out for a suitable shell by which to test his ideas, and at last fortune favoured him, and he found in a second-hand furniture shop the specimen shown by the photograph.

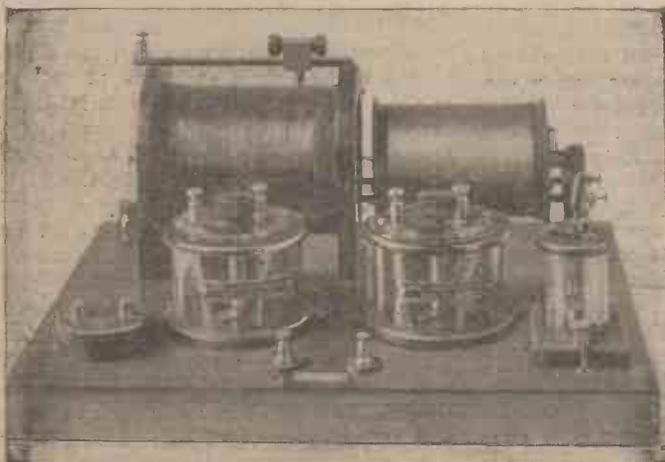
It was found that there were three partitions in the shell, and therefore the point



Resonator made from a Shell.

had to be removed before an uninterrupted passage was found.

The shell was then tried on a wireless receiving set by using a rubber ring to make an airtight joint with the ear-piece; amplification was the result. G. W.



Condensers Employed on Crystal Receiving Set.

Supposing it is desired to know the capacity of a condenser made up of two sheets of zinc 3 cm. by 3 cm. separated by a sheet of glass .1 cm. in thickness (quarter plate negatives used by photographers are about this thickness). The

Building a Short-wave Transmitter.—III

The Concluding Article on Amateur Transmitter Construction

The Condenser (continued)

THE method of building up the condenser will be understood on reference to Fig. 9 and the photograph of condenser Fig. 8, as shown in the last instalment of this article, the latter showing the old accumulator case into which the assembled condenser is fitted, together with the ebonite top carrying the two condenser terminals.

When the assembly is complete the containing case may be filled with a saturated solution of paraffin wax in paraffin oil, special transformer oil, or, for greater portability, may be sealed by having molten paraffin wax poured in and allowed to set hard.

The condenser should not be so sealed, however, until the transmitting set has been completed and tested as regards wave-length. On account of the differences in quality of various kinds of glass, which results in various specific inductive capacities, the removal or addition of a plate or two may prove necessary in order to obtain the correct capacity which, in conjunction with the inductance of the primary of the oscillation transformer, will tune the closed circuit to the desired 180-metre wave-length.

Items P and S: The Primary and Secondary of the Oscillation Transformer

This is often referred to as the jigger. It is convenient to deal with these two items at the same time for reasons which will presently be obvious. Fig. 10 shows the wooden formers (6 in. square) on which the wires forming the primary and secondary are to be wound. The wire to be used is 7/22 electric lighting cable; two complete turns (commencing and finishing at the under side of the movable hinged portion) will form the primary, whilst from eight to twelve turns will be required for the secondary, according to the dimensions of the aerial with which the set is to be used. The adjacent turns are separated approximately $\frac{1}{8}$ in.

In the writer's set no adjustments are provided; surplus turns were removed entirely after the set was correctly tuned to 180 metres.

Item M: The Tuning Lamp (or Hot-wire Ammeter)

In the former case this consists merely of a 2-volt flash-lamp bulb in a suitable holder, one terminal of which is to be attached to the earth-end of the jigger secondary and the other direct to the earth lead. That is to say, the lamp is in series and all oscillatory currents in the aerial circuit have to pass through the

lamp filament, which if burnt out will leave a break in the aerial circuit.

A hot-wire ammeter, which nowadays may be purchased quite reasonably, is somewhat of a refinement, and besides being extremely useful adds considerably to the appearance of the completed set. In this case the oscillatory currents in the aerial have to pass through a very fine wire in the ammeter. The heat thus generated in the fine wire causes it to expand, and, being subjected to tension due to a spring, movement occurs and is registered by means of a needle moving over a graduated scale. If it is not desired to keep the lamp flashing (or the ammeter reading) during signalling, they may easily be short-circuited.

This completes the constructional work,

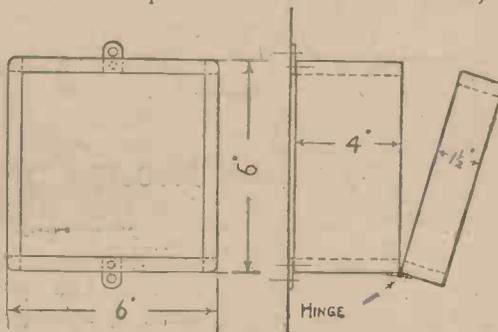


Fig. 10.—Wooden Formers for Oscillation Transformers.

and it remains to mount the various components in position and connect up, taking great care to keep all connecting wires as short and as straight as possible. Conductors of sufficient sectional area should be used, especially in the oscillatory circuits (the 7/22 cable as used for the inductances will be satisfactory). Joints and connections should be carefully soldered.

Adjusting and Tuning

When all connections are satisfactorily completed the adjustments and tuning of the set should be proceeded with as follows:

1. Entirely disconnect the aerial.
2. Connect up the accumulator battery, press the transmitting key, and adjust (a) the trembler contacts and (b) the distance separating the spark-gap electrodes until a crisp, regular spark occurs instantly each time the key is pressed, and the note emitted by the spark is clear and as high in pitch as possible.
3. With the aerial still disconnected, check the wave-length of the closed oscillatory circuit. For this purpose either a wave-meter with crystal detector and telephones or a calibrated

crystal receiving set is required. The closed circuit of a Mark III tuner is very suitable for this purpose. The wave-meter or receiving set should be placed a few feet away from the jigger primary of the transmitting set, and whilst the latter is sparking the tuning of the former should be varied until maximum strength of signals as heard in the telephones is obtained, indicating resonance between the "meter" and the closed circuit. If the measured wave-length should prove to be much out, the addition or removal of a plate of the main condenser will probably be found to effect the necessary correction. For accurate wave-meter readings it is important that the receiving instrument be as far as possible from the circuit under test, and that their relative positions be not varied throughout.

4. Connect the earth-wire to the near end and the aerial to the far end of the jigger secondary; bring the primary up close to the secondary—that is, effect a close coupling between the two coils and press the key for a three- or four-second dash whilst observing whether any glow appears in the tuning lamp (or reading upon the hot-wire ammeter). If an appreciable glow (or movement of the needle) occurs, loosen the coupling until only a slight glow (or reading) shows and endeavour to improve it.

For this purpose several strong pins should be temporarily inserted through the insulation and into the conductors of the cable forming the secondary, one pin in each turn, commencing at, say, the eighth turn from the earth end, and proceeding to the far end of the coil, the aerial being connected to each pin in turn by means of a small spring clip (such as an ordinary tie-clip). The transmitting key should be pressed and the tuning lamp or ammeter observed as the number of turns in the aerial circuit is varied a turn at a time.

This will speedily show on which adjustment the aerial circuit is most closely in resonance with the closed circuit. The smaller the amount of coupling between the circuits the more exact will be the tuning. When this is found to the nearest full turn the effect of half- and quarter-turn variation should be tried, and, when the best possible tuning is obtained with a moderately loose coupling (say with the hinged primary making an angle of about 20 deg. with the secondary), as indicated by the glow of the tuning lamp or ammeter, any surplus turns on the secondary should be removed and a permanent aerial connection made. E. REDPATH.



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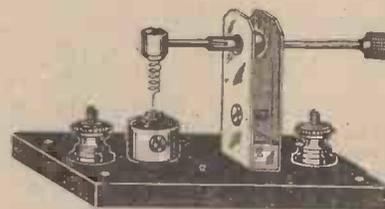
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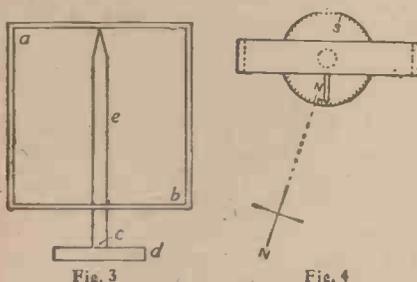
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Location and Direction Finding

The Third Instalment of the Article on the Methods Employed in Navigation

THE explanation that has been given in Nos. 10 and 12 shows simply enough the main principle underlying one method of position-finding by wireless. Something



Figs. 3 and 4.—Diagrammatic Elevation and Plan of Directional Frame Aerial.

more is required, however, to explain how it is actually utilised in practice. There are two essential conditions: (1) The operator at each station must be able to determine the "bearing" (the direction line) of the transmitting station with reference to some common fixed point, for example, the true north; (2) the operators must be able to communicate their results to each other by some means, such as by telephone.

In order to fulfil the first of these conditions each aerial must be fitted with a pointer and a circular card showing the points of the compass. The latter is fixed on the operating table with its north point set at "true north," and from the centre of it rises the spindle which carries the frame aerial. The pointer is attached to the base of the aerial (at right angles to its plane) and revolves with it. Thus when the zero-point of the received signals is found the bearing of the transmitting station from true north will be indicated by the pointer on the compass card. This is shown in Fig. 3, which represents a front view of the frame aerial *ab* revolving round the central spindle *e*. The point *c* is the tip of the pointer fixed at right angles to the base of the frame, which moves over the surface of the compass card *d*. In the plan (Fig. 4) it will be seen that the pointer indicates a bearing line of about 20 deg. W. of N. In practice, therefore, both operators can, by interchanging their results, ascertain the position of the transmitting station.

From this brief description of the principles upon which this method of direction-finding is based its value as a means of guiding moving craft will readily be appreciated. A ship or aeroplane can be informed of its exact position at any moment of the day or night. By completely reversing the process we have been

considering a ship fitted with a frame aerial can determine her own position from signals received from two transmitting stations of known position. In the case of aircraft, however, this application of the "minimum method," as it is called, is impossible. The noise of an aero engine is such as to prevent all possibility of locating a zero point with any degree of accuracy. A special application of this method has been developed for use in aircraft. It comprises two frame aerials fixed at right angles to one another in such a way that a high degree of sensitivity can be obtained with maximum signals. By means of it aircraft can also be navigated from received signals.

Other Aerials

For various reasons, however, it is not always desirable to use an indoor frame aerial for direction-finding purposes. Sometimes a much larger outdoor aerial is employed. Obviously it would be both difficult and costly to rotate such an aerial. The difficulty is overcome by using what is known as a "balanced-aerial" system. It really comprises two single-wire aerials

fixed at right angles to one another. They are usually in the form of big rectangles hung from four masts, their planes being set to run north-south and east-west. Sometimes they are in the form of two triangles with a common apex at the top of a single mast.

The extremities of the aerials are brought into the receiving room at equal distances from each other, and are conducted in parallel lines to the four terminals of a rectangular box known as the "radiogoniometer." These four terminals are connected in pairs to two small coils wound at right angles to each other on a hollow vertical cylinder within the box. Inside this cylinder there is a third coil, the ends of which are connected to the receiver. This coil can be rotated by means of a handle on the top of the box. A pointer fixed to the handle indicates the direction of received signals on a circular compass card.

The three systems discussed are in constant use in various connections to-day.

[Further articles on direction finding will explain the construction of amateur experimental apparatus.—ED.]

THE SKIN EFFECT

IT is most important that the wireless experimenter should clearly understand the behaviour of high-frequency currents in conductors and the provisions that must be made for it.

In an ordinary solid conductor carrying a unidirectional current the distribution is uniform over the area of cross-section. This is shown diagrammatically in Fig. 1. For low-frequency alternating currents the distribution is very nearly uniform, but not quite, especially if the area of cross-section is large. Fig. 2 shows this also diagrammatically.

When high-frequency currents, such as are met with in wireless work, are considered the distribution is quite different. The current is not spread over the area or cross-section of the wire, but flows along the surface as shown in Fig. 3.

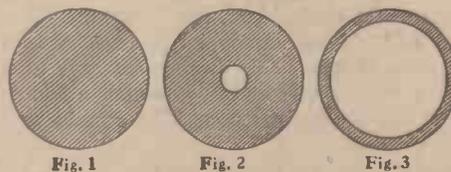
From this it is obvious that the resistance of a wire to high-frequency currents is greater than its resistance to direct or low-frequency currents.

High-frequency currents may be anything between 3,000,000 periods per second and 10,000 periods per second, correspond-

ing to wave-lengths of 100 metres and 30,000 metres.

As the currents induced in an aerial system are very small, it is necessary that special precautions should be taken to see that the system has negligible or very low high-frequency resistance.

For this reason stranded wire is used for aerials, as by this means a large area of cross-section can be obtained in a small



Figs. 1 to 3.—Diagrams showing Distribution of Unidirectional, Low-frequency and High-frequency Currents in Conductors.

space. Stranded wire is nearly useless unless the strands are insulated from each other. In ordinary electric light flex the strands are not so insulated, but as there is such a large number, usually 40, the total carrying capacity is sufficient. D. S. R.

Can You Hear the North Pole?

ALTHOUGH there is as yet no wireless installation as far north as the Pole, yet amateurs in England will soon have an opportunity of intercepting signals from that region.

Captain Amundsen, the explorer, left Seattle in June last for Alaska, where he has by now been joined by his exploring vessel the *Maud*. Commencing in October, when he reaches far enough north, a daily weather report will be broadcasted by the *Maud*, and will be intercepted and relayed to the U.S. weather bureau by intervening land stations. The *Maud* is equipped with both spark and continuous wave installations. The spark set, operating on a 600-metre wave, is said to have a range of 1,000 miles, and the C.W. set, operating on a wave of 2,000 metres, will be able to span a distance of 2,000 or more

miles. The most likely times at which the *Maud* will be operating are from 3-4 p.m. G.M.T. and 12.30 to 1.30 a.m. G.M.T.

Amateurs who intend to try for the *Maud* should become familiar with the adjustments of their receivers. Good tests as to what distance they may expect to cover can be made by listening-in to the many continuous wave sets now equipped in the British Merchant Marine, and operating frequently throughout the day and night on a 2,100 metre wave.

The call letters LWZ have been allotted the *Maud*, and it is understood that in January next special attempts will be made by the operator of that ship to transmit a message to an amateur living in the north of England. So, in due course, listening in for LWZ. E. D.

Too Much Condenser?

WHILE the utility of the variable condenser admits of no doubt, it is not adequately realised that its indiscriminate employment with a view to adapting unsuitable coils to varying wave-lengths is a practice largely based on laziness engendered by ignorance of the proper function of the variable condenser and of its limitations.

It will be generally admitted that the condenser is provocative of immense losses of the already exiguous amount of energy that reaches our aerials. The majority of amateur stations are not only severely restricted by regulations as regards dimensions, but are inevitably hampered by local conditions that cramp expansion even within the prescribed limits. We must accept this as an undoubted if unfortunate fact, and, having accepted it, must do all in our power to extract the highest standard of efficiency from our apparatus. But do we? If we employ large capacity condensers in the aerial circuit in order to tune in a variety of stations in which we have not the faintest interest, it is certain that we do not. I am not now referring to the enthusiastic experimenter, but to the increasing numbers of those whose interest is confined to the reception of music and telephony, who possess no knowledge of the Morse code nor desire to do so. Now at present and, as far as can be gathered, in the future music and telephony will be confined to certain well-defined wave-lengths. The longest will probably be the Eiffel Tower at 2,600 metres.

The Eiffel Tower sends out a telephonic weather report at twelve noon in addition to the evening one at ten minutes past six, the latter, of course, being supplemented by music. Croydon, Lympne, and Pulham are all on 900, Marconi House on 360, and The Hague on 1,070. We have not, then, a large amount of wave-lengths for which to cater. The ideal, and an ideal that is easily attainable if one is willing to devote a little time to the attainment, is to employ coils wound exactly to the requisite wave.

The most I allow myself is a three-plate condenser, and the improvement in audibility and volume is astounding and has well repaid me for the time spent. Inductance, or rather the calculations involved in its exact estimate, are beyond the majority of us, and we have, perforce, to rely upon a system of trial and error. This system, clumsy though it may be, has much to recommend it, and if basket coils are used, as in my case, the process is neither a difficult nor unduly prolonged one.

Results are much improved by the addition of a similar three-plate condenser to supplement the grid condenser of the detective valve. When winding coils do not forget that it is easy enough to shorten your wiring, but untidy, difficult, and unscientific to add to them; so start with an excess number of turns. Exact tuning is infinitely more essential for music and telephony than for Morse signals, and that is why the majority of text-books do not suffi-

ciently insist on the importance of the low capacity of variable condensers. These text-books are largely written for the man who prefers the reception of a multiplicity of sufficiently clear signals to that of certain defined stations or wave-lengths.

CONDENSER.

Technical Terms

IT is feared that many people who fluently use technical terms do so with a quite imperfect knowledge of their exact significance, while others, understanding them even less, are content to let well alone, as they think and express themselves more or less exactly in common or loose language, often to a considerable length. One must be verbose in describing something very exactly if he has no single expression which will convey all his meaning, and this latter is the object of technical terminology.

The use of technical terms often frightens a prospective student of science if he is thinking of adopting a study of the application of that science as a hobby. If it is a professional matter with him he knows he has got to face the problem of the addition to his vocabulary of a new set of words proper to the description of the circumstances of his adopted profession.

We may perhaps be allowed to digress a little to consider how some technical terms originated. When the first steam pumping engine was set up it was necessary at a recurring point in its operation to lift a valve which ordinarily closed a chamber in which a vacuum has been created. The inrush of air following the lift made a snuffling noise, and the man whose duty it was to operate it was adjured by the call "snift Benjie," and the "snift" valve it became.

As trades and professions multiply and become specialised such terms must gain in number, for it is to meet the recognised need for words meaning exactly one thing and one thing alone that technical terms are continually being invented.

It is only perhaps in the editorial offices of a technical journal that one gets even a faint idea of the looseness of expression. It is more or less natural, after the daily papers have told us that a man was electrocuted with a current of 50,000 volts, that people should talk about the voltage of a current. Small wonder then that a query turned up lately from a correspondent who wanted to be instructed of the current in volts, amperes, and ohms. Such a one would never dream of wearing out a dinner, or eating a bottle of wine, of putting on a walk, or making a swim in the river. Such expressions as putting on the kettle to boil, or pulling up the river are perhaps excusable as they are largely idiomatic, but in the realm of science there is no room for idiom. GAMMA.

BROADCASTING - - A RUMOUR

A DISTURBING rumour reaches us—one to which we hesitate to extend our credence. It is to the effect that the Postmaster-General's reply in Parliament in which he stated that amateurs' receivers would be restricted to types submitted by the broadcasting companies is to be construed as meaning that the only apparatus licensed will be that made and sold by the broadcasting companies. The rumour goes even so far as to say that sets built from component parts bought from the trade will not be allowed. Personally we refuse to believe that such an absurdity is possible, but knowing that strange things do happen, we take a very early opportunity of giving the rumour for what it is worth, and express our strong conviction that public opinion would soon be brought to bear upon the authorities concerned in such a way that any such construction or intention would soon be modified in favour of the amateur.

We were assured some weeks ago by a highly-placed member of the trade that

positively no interference with amateur-made apparatus was intended. We are going to hold fast to that belief. We do not think that even the official mind would be foolish enough to attempt any improper interference. Amateurs should be free to make and use whatever apparatus they like—with one important exception. They should not be allowed to do anything that would cause trouble and inconvenience to others, and the proposed restriction by which amateurs, unless specially licensed, will not be allowed to employ reactance circuits or any circuit that will re-radiate oscillations into the ether is quite good and proper. Beyond that let the authorities mind their own business, and let the amateur retain his freedom to enjoy his hobby and to assist, as he cannot help assisting, in discovery and development which will ultimately be to the good of wireless.

We admit that the problem of making the "listener-in" pay for the music and other entertainment which the broadcast-

ing companies will provide is a difficult one; but any attempt to solve it by ridiculous and unjust interference with the liberty of the individual cannot possibly be successful. Should the authorities really persist in making such an absurd regulation as the rumour would suggest, we are quite certain that Parliament, under pressure of public opinion, would soon bring about an alteration of the regulation or even of the law under which the regulation derives authority.

Short-sighted people might think it to be to the advantage of the trade that such regulations should be made, but we know otherwise. The number of amateurs would be enormously restricted, development would be impeded, and ultimately the trade would languish, whilst the very large number of firms that live by supplying the amateur with parts and materials for wireless apparatus would soon go out of existence.

But, again, we refuse to believe that such an absurd intention is entertained.

CLUB DOINGS

Castleford and District Wireless Research Society

Hon. Sec.—MR. W. BRUNNING, 24, Carlton Street, Castleford.

THE above society commenced its winter session on September 1st, for which a number of instructive and interesting lectures and demonstrations are being arranged. The society, formed a little over a year ago, is hoping greatly to increase membership during the coming session. Meetings every Tuesday, buzzer practice and elementary theory; every Friday, lectures and demonstrations.

Prospective members will receive full particulars from the secretary.

Stoke-on-Trent Wireless and Experimental Society

Hon. Sec.—MR. F. T. JONES, 36, Cobridge Rd., Hanley.

At a meeting of the above society on August 24th it was announced that permission to utilise the mast over the Dew Drop Inn to support the free end of the aerial had been refused by Messrs. Worthington. A fresh scheme is being devised, and this is being left in the hands of the technical committee. An interesting discussion took place on several points raised by some of the newer members concerning the working of their apparatus. The exhibition which the society hopes to hold in Hanley at the end of the year or the beginning of the new year was discussed, and inquiries are now being made to find a suitable hall in which it can be held. An interesting programme is being drawn up for the next few weeks, commencing with a demonstration with the aid of an indoor aerial and the society's three-valve set.

South Derbyshire and Ashby Wireless Society

Hon. Sec.—MR. FRED W. EDWARDS, "Fair Haven," Castle Gresley, New Burton-on-Trent. APPLICATIONS for membership are invited.

The Durham City and District Wireless Club

Hon. Sec.—MR. GEO. BARNARD, 3, Sowarby Street, Sacriston, Durham.

THE fourth meeting of the above was held at headquarters (Y.M.C.A., Claypath) on August 18th, when a most interesting lecture was given by Mr. Geo. Barnard, the hon. sec., on "The Production of High Frequency Oscillations." He confined his remarks chiefly to the "spark" method, leaving the more advanced "valve" transmission to be discussed at a future meeting. After pointing out clearly the difference between static charges of electricity and electro-dynamics, he demonstrated the effects of static induction and described thoroughly the action of a condenser. Frequency, amplitude, wave length and damping were shown diagrammatically upon the blackboard. Inductance and capacity were explained in a most elementary fashion, the lecturer using several helpful analogies. Open and closed oscillatory circuits were shown upon the blackboard. The methods adopted to vary the amount of inductance and capacity, thereby varying the wave-length produced, were also shown.

After the announcements a most lively discussion took place. Questions were asked concerning the last lecture on "The Electromagnetic Theory," and also upon the lecture just given. Atmospheric were discussed and the secretary pointed out the advantage of a "double pole change-over switch," so that the apparatus could be disconnected from the aerial at will, at the same time connecting the aerial to earth, the aerial when so connected acting as a first-class lightning conductor. The secretary also described the existing theory concerning the reception of tremendous

wave lengths from the unknown. He did not give the "Mars" theory much credit, but considered it highly probable that these great wave lengths were the result of oscillations of tremendous energy, set up by the discharge and vice versa, of electrified clouds of gas surrounding the sun. Mr. Sargent, F.R.A.S., of the "Observatory," Durham, has consented to give a lecture discussing these phenomena in more detail.

Wolverhampton and District Wireless Society

(Affiliated to the Wireless Society of London). Hon. Sec.—MR. J. A. H. DEVEY, 232, Gt. Brickkiln Street, Wolverhampton.

A MEETING of the above society was held on August 23rd, when a lecture was given by Mr. D. P. Baker on "Tape Recording by Wireless." The lecturer dealt very ably and lucidly with the subject, explaining the necessity for rectification and the use of two relays to operate the inker, also demonstrating with the actual apparatus and with diagrams.

North Middlesex Wireless Club

Hon. Sec.—MR. E. M. SAVAGE, "Nithsdale," Eversley Park Road, Winchmore Hill, N. 21.

THE 97th meeting of the North Middlesex Wireless Club was held on August 23rd at Shaftesbury Hall, Bowes Park. Before the meeting was formally opened, Mr. Holton gave a lecture to the more elementary members present on the subject of aerial construction. He explained the reasons for the different types of aerials, and showed why the single-wire type was to be preferred for receiving short waves, although the two-wire pattern was better for the longer waves. He also pointed out that it was important when using a T aerial to connect the down-lead in the middle of the aerial. If this was not done, fine tuning would be impossible. The meeting was then formally opened by Mr. Evans taking the chair at 8.30, and calling on Mr. A. J. Dixon for his talk on "Commercial Wireless

(Continued on page 284, third column.)

The International Radio Exhibition

THE International Radio Exhibition and Wireless Convention was opened at the Central Hall, Westminster, on Saturday, September 2, the method of the opening being in its way unique. A mile away, at the Air Ministry, Brig.-General Sir W. S. Brancker, K.C.B., A.F.C., gave the opening speech, which was sent by wireless and then broadcast throughout the exhibition hall.

At the luncheon held subsequent to the opening the chairman, Maj.-General Sir W. G. Brancker, in proposing the toast of "The Radio and Wireless Trade," said that most of his wireless experience was in

had performed a great service. He hoped that it was the first of many more to come.

Major Raymond Phillips, I.O.M., in replying, said that the exhibition was the first to be held in this country, and he referred to the control of mechanism by wireless that was now being undertaken and would undoubtedly lead to big things.

As "Amateur Wireless" is published throughout the country on Thursday, there is yet time for us to remind readers that the exhibition will be open until 10 o'clock on Friday evening, September 8, and we advise everybody who can to go along and see everything that is to be seen.

venience is well served. The Houses of Parliament, Westminster Abbey, and many other notable public buildings, also hotels, theatres, etc. etc., are all close to the Central Hall.

In our last issue we gave some preliminary details of the exhibits and demonstrations at the exhibition. Since that date further details of other exhibits have become available which we give below.

The City Accumulator Company, of 79, Mark Lane, London, E.C.3, are making a speciality of the "Parliphone" radio speaker which is of special interest. The apparatus comprises a loud-speaker horn with a special fitting and a stand; the fitting is moulded in one solid piece of ebonite, and the interior is grooved to fit Brown's standard receiver. A feature of its construction is that no metal whatever is used, which obviates any metallic ring. Other exhibits by this firm are the Fuller block-type accumulators, in all capacities from 8 to 10 ampere-hours. They also have for sale a number of Brown's A-type head 'phones of 120 ohms and 8,000 ohms resistances at prices of £2 2s. 6d. and £2 9s. 6d. per pair respectively. These 'phones are in new condition and have never been used, and they are sold under a guarantee. They also have Sullivan's 'phones of 8,000 ohms resistance at 36s. 6d. per pair. Another note regarding the special type of accumulator which they are exhibiting is given in another column.

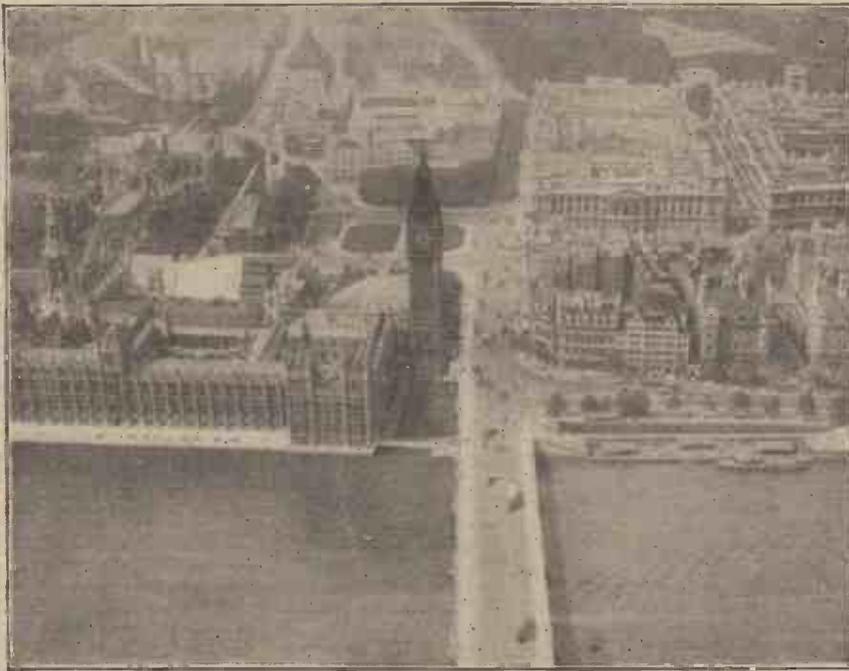
The British L. M. Ericsson Manufacturing Company, Limited, of 60, Lincoln's Inn Fields, London, W.C.2, are showing their well-known headgear in addition to complete receiving sets.

A super antenna, which it is claimed makes an outside aerial unnecessary, is shown by the Wireless Exploitation Corporation, Beck House, 91, Shaftesbury Avenue, London, W.C. This firm are also showing dictagraph head sets.

A demonstration is being given of the wired-wireless system, an account of which has already appeared in our paper.

The Radio Ebonite Supplies are a firm who specialise in insulating material, either plain, sheet, rod or the manufactured article. They are also exhibiting some special inductance tubes.

On opposite page we are reproducing a plan of the exhibition hall and a list of the exhibitors and their stand numbers.



Aerial Photograph of Westminster.
(Arrowhead is immediately over Central Hall)

connection with aviation, and that there was no doubt that wireless had come into its own and was largely responsible for the upkeep of the British Empire.

Major L'Estrange Malone, M.P., in the course of his reply, advised the radio trade not to overdo the boom in wireless. He suggested that manufacturers should take care that no monopoly was set up for the providing of apparatus, and that they should form some kind of protection society to look after their interests, so as to get the maximum benefit for the trade.

Mr. G. H. Roberts, M.P., in proposing "The Success of the Exhibition," congratulated the organisers on their enterprise in arranging such an exhibition, and said they

Look in at "Amateur Wireless" stand. We shall be showing there not only "A.W." itself, but a whole series of electrical handbooks with which the wireless amateur might like to become acquainted.

The photograph, taken from the air, of Westminster is reproduced on this page because it includes a view of the Central Hall where the exhibition is being held. The arrow at the top of the photograph indicates the dome of the building. Readers will see at a glance how very accessible the hall is. Victoria is a few minutes from it. So are Westminster and St. James's Park stations. Many lines of buses pass the door. Anyone wishing to include the exhibition in a general visit to the sights of London will find his con-

An
Article
Written by
Dr. Alfred
Gradenwitz

WIRE TELEPHOTO

AN INTERESTING ACCOUNT OF
FOR THE WIRELESS TRANSMISSION

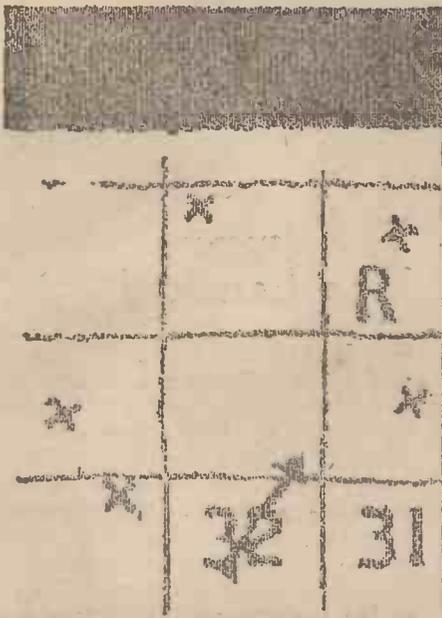


Fig. 6.—Chart of Gun Positions sent by the Telautographic System.

DURING the last stage of the war, the German army tried to develop wireless telephotography for the rapid transmission of drawings, sketches, reports, etc., from aeroplanes to stations located on the ground or on board ship. Inasmuch as the armistice luckily cut short all warlike pursuits of the "civilised" world, these tests were not followed by any practical realisation, but the method seems to be a good one and is likely now to be put to peace-time applications.

The method is the invention of Dr. Max Dieckmann, director of the Research Laboratory for Radio Telegraphy and Atmospheric Electricity at Grafelfing, near Munich, and can, of course, with but slight alterations, be as well adapted for telephotographic transmission over telephone or telegraph lines. Figs. 1 to 4 show the arrangement of the transmitting and receiving stations as well as of the synchronising device.

The sending station comprises a standard sender for damped or undamped waves. A telautographic transmitter is connected up in parallel to the key. This consists of clockwork *a* (Fig. 2), which drives a cylinder *b*, carrying at its circumference the picture to be transmitted, and

a contact style *c* which, as the cylinder is turning, explores the picture in a helical line. The cylinder and contact style are connected up to the key either directly (in the case of small senders) or (in the case of big senders or if an inversion of the picture from "positive" to "negative" is desired) through the intermediary of a relay. Inasmuch as the picture, etc., is drawn with conductive ink, the circuit will be closed and a train of waves sent out into space, each time the style is in contact with some portion of the picture.

The aerial at the receiving end is connected up to a standard receiver for damped or undamped waves working on a telephone over a sound amplifier. The telautographic receiver is inserted in the place of the telephone receiver or in parallel to it and, like the sender, mainly consists of clockwork *d* (see Fig. 2), a cylinder *g* driven by the latter and carrying at its circumference the recording paper, the recording style *q* and, finally, an arrangement for "synchronising" the sending and receiving cylinders, that is, for ensuring uniform working of the two cylinders. Connection with the amplifier is not made directly, but through the relays R^2 , R^3 and a rectifier. A short description of the synchronising device is given in the following:

According to the D'Arlincourt principle, the uniformity of working between the sending and receiving cylinders is, in the case of telautographic methods, generally obtained by causing one of the cylinders to complete each rotation slightly before the other, arresting it the time required for the other cylinder to make up for its delay and, eventually, releasing it by the action of an electro-magnet.

Now, in order not to have to use two forms of current—differing as to their intensity, direction, wave-length, etc.—for

actuating the synchronising device, on the one hand, and reproducing the original picture, on the other, Dr. Dieckmann uses the following ingenious arrangement:

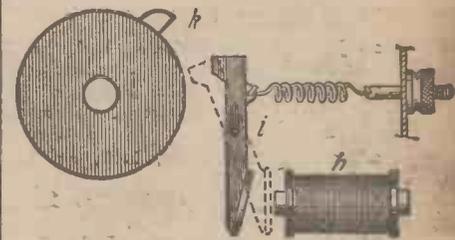


Fig. 3.—Automatic Locking Device.

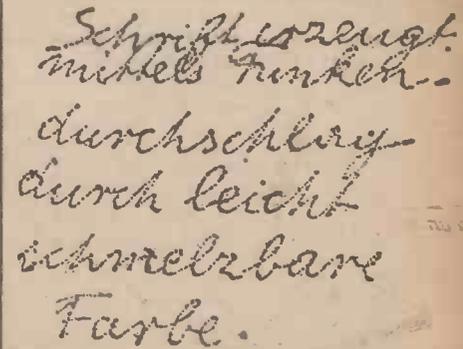


Fig. 7.—Reproduction of Writing Sent by the Process Described.

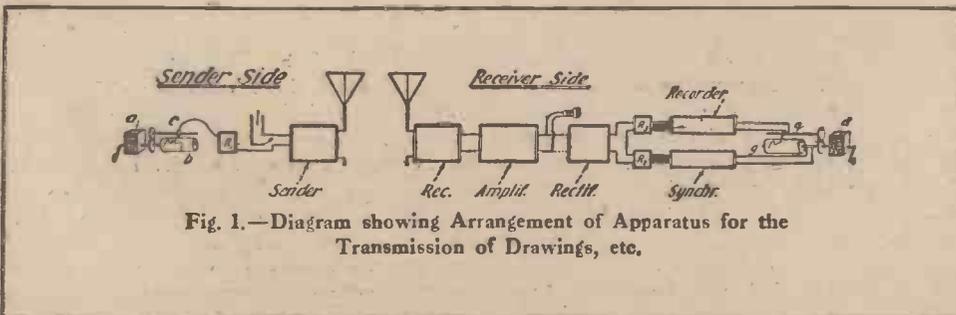


Fig. 1.—Diagram showing Arrangement of Apparatus for the Transmission of Drawings, etc.

Of the total time available for each rotation of the cylinder, part is used exclusively for picture transmission, and part exclusively for synchronising. Figs. 2 to 4 will serve to make this clear. For the sake of simplicity, Fig. 2 has been drawn on the hypothesis that the receiver and sender communicate directly over a wire, it being, of course, immaterial whether the recorder receives its impulses over a line of conductors or by wireless from a radio station. The dotted sections of the line in Fig. 2 should, therefore, be replaced by the organs of wireless transmission.

As seen also in Fig. 1, the sending cylinder *b* is set rotating by a clockwork, the contact device *c* being at the same time shifted so as to explore the circumference

LESS TOGRAPHY

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THE DIECKMANN PROCESS MISSION OF DRAWINGS, ETC.

of the cylinder *b* along a spiral (helical) line, a current being closed or opened in accordance with the conductive or non-conductive condition of the various por-

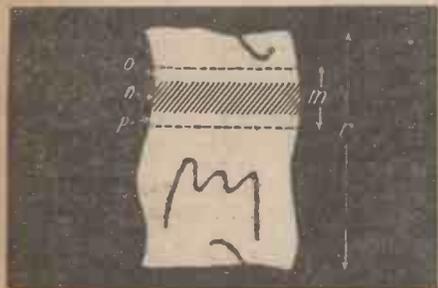


Fig. 4.—A Developed View of the Cylinder showing the Marks Used for Synchronising the Receiving Apparatus.

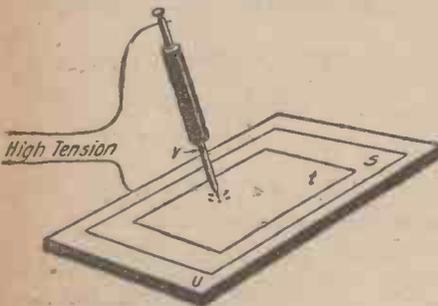


Fig. 5.—Method of Producing Coloured Marks.

tions of the picture. The clockwork at the receiving station will, in a similar way, set the shaft *d* (Fig. 2) rotating, which through the friction clutch *f* carries along the receiving cylinder *g*, unless this be stopped by a locking device.

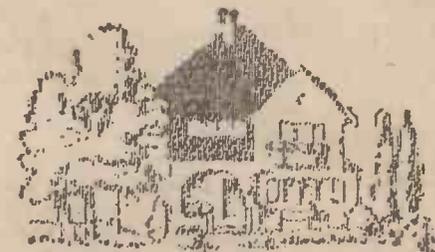
This locking device, as represented apart in Fig. 3, comprises an electro-magnet *h*, a stop lever *i* kept back by a spring, and a cam *k* rigidly connected with the receiving cylinder. The current at the receiving end simultaneously flows round the electro-magnet of the recording style *q* and that of the locking device *h*.

When no current is flowing through the electro-magnet, the receiving cylinder *g* is free to rotate, and the same will be the case if some current flowing through the

electro-magnet *h*, the lower part of the stop lever is attracted (see dotted position in Fig. 3), provided that the cam *k* is not opposite the upper end of the stop lever. Only in case the passage of the cam in front of the upper part of the lever *i* coincides with the excitation of the electro-magnet *h*, will the receiving cylinder be stopped, the time taken by the current through the magnet *h* to cease and by the stop lever *i* to be released by the spring.

A band of a width corresponding to *m* (Fig. 4), and transversal to the direction of rotation is; on the receiving cylinder, reserved for synchronising. This band comprises three sections, the central picture section *n* lying between two sections *o* and *p* free from any telautographic reproduction. The width of the central section should be such as to make the time required for passing through it greater than any possible difference in the working of the two cylinders.

While the sending cylinder is rotating, current impulses will be sent out in a sequence corresponding to the conductive or non-conductive portions of the picture the style is sliding over, and these impulses will in the receiver both actuate the recording style *q* and excite the magnet *h*. If the cam *k* then has once been stopped by the stop lever, while the contact style *c* was sliding over the picture section *n*, it will with the next revolution again find the stop lever *i* ready to stop for synchronisation, provided that the width of *n* is sufficient in proportion to the necessarily higher number of revolutions of *g*. If there is a possibility of the receiving cylinder *g* rotating at double the speed of the sending cylinder *b*, the band section *n* will have to be of a width more than half the height *r* of the picture. If the possible difference in the rotation of the two cylinders is less, *n* may, of course, be narrower.



Grüßling München



Fig. 8.—Another Picture Sent by the Telautographic Method.

This synchroniser is so safe in working and so substantial that ordinary gramophone motors with coarse regulators may be used to drive the sending and receiving cylinders.

As regards, finally, the production of electrically conductive (or non-conductive) drawings to be used for transmission to a distance, a number of methods have been suggested, the use of "fat" pencils for drawing on non-varnished metal foils having proved quite suitable. On the other hand, there was no simple method available for the immediate reproduction of coloured marks at the receiving station. Dr. Dieckmann, therefore, designed a new process allowing coloured marks to be produced in a most simple manner and which would seem to be suitable also for a number of other purposes. Fig. 5 will make the underlying principle clear.

To the recording surface *s* there is applied a thin paper or tissue coated with a layer of an easily melted colour, which is turned toward the recording surface. Below the recording surface there is placed the conductive lining *u*. If now a small electric spark be made to pass between the

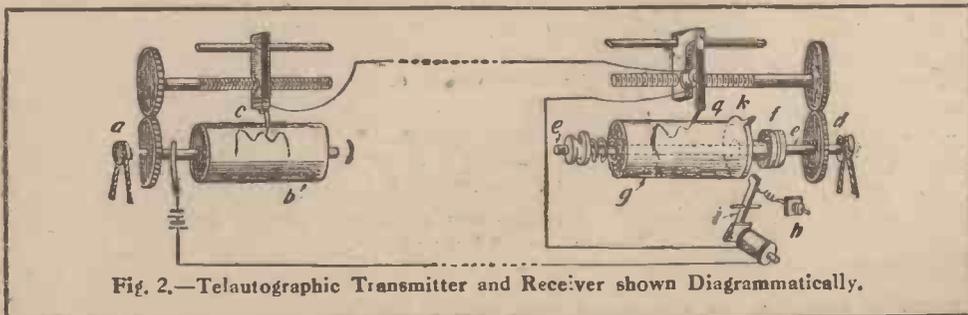


Fig. 2.—Telautographic Transmitter and Receiver shown Diagrammatically.

point of the recording pencil *v* and the lining *u*, the heat of the current will be sufficient to melt the colour at the point pierced by the spark and to reduce it to a liquid condition. The recording surface at that point is thus covered with an adherent colour solidified immediately as the spark ceases. Some brands of carbon paper, such as used in typewriting, are quite suitable, both the carbon and recording sheet being chosen as thin as possible.

A comprehensive set of tests was made between ground stations as well as between aeroplane and ground stations. Each original sheet was 13 by 18 centimetres in area, of which about 13 by 15, or about 200 square centimetres, corresponded to the picture proper. With screws having an 0.8 mm. thread, the width of the picture comprised about 180 strokes, while in the case of a satisfactory adjustment the length of the shortest marks likewise was about 0.8 mm. The available picture area thus could be covered with 160 by 180 = 28,800 picture elements. About five to six minutes were required to cover the whole picture sheet, 80 picture elements being produced in less than a second and 4,800 in a minute. This limit should be warranted in order to ensure reliable working of the electromagnetical relays.

Figs. 6, 7, and 8 are examples of wireless-transmitted sketches and reports, etc., from aeroplanes to the ground.



The South London Wireless & Scientific Club Exhibition

A WIRELESS exhibition was held at St. John's Institute, Narcom Street, London, S.E.17, on August 24, 25 and 26. The exhibition was opened by the Mayor of Southwark, Councillor J. Hill, J.P. A number of very interesting exhibits were made, including a collection of high-frequency apparatus and various other wireless apparatus. Captain De Villiers, who is a member of the club, kindly demonstrated with his wireless-controlled airship at frequent intervals, a feature that attracted a great amount of attention. Among others the trade exhibits were represented by: Ace Radio, 1, South Street, Greenwich, S.E.10, portable and collapsible indoor aerial frame and general apparatus; Selwyn Electrical Engineering Company, 184, Walworth Road, S.E.17, accumulators and accumulator repairs, also receiving sets and accessories; Lightfoot Bros., 5, St. Georges Road, S.E.1, wireless apparatus and component parts; "Systoflex" sleeving exhibit by Mr. Harris; Carston, Sutherland Square, S.E.17, valve and crystal sets and accumulators.

Ask "Amateur Wireless" to send you a list of practical books. Sent gratis and post free.

Radiograms

A FEATURE of the air station at Croydon is the wireless telephone exchange. By means of this an air pilot may hold conversation while in actual flight with any office on the aerodrome.

It is now understood that the articles of association of the proposed Broadcasting Company have been submitted for the approval of the Postmaster-General. Mr. Kellaway is away on holiday, and as it will be necessary for him to examine them before the broadcasting licence can be granted no definite information as to the inauguration of the scheme is available.

The Postmaster-General of the Union of South Africa has approved of the establishment of broadcasting services in various parts of the Union. The regulations are very similar to those which are expected to obtain in this country, namely, that broadcasting stations will not be permitted to circularise advertising matter nor handle commercial traffic. The stations will be assigned definite wavelengths and districts.

The Eiffel Tower is now broadcasting the market prices of vegetables and fruit.

This year, at the annual inventors' exhibition held in Paris, there is a great preponderance of wireless apparatus.

The International Union of Scientific Radio Telegraphy was organised two years ago for the purpose of furthering the systematic study of the fundamental problems of wireless communication. Recently systematic measurements have been made at receiving stations in the United States of the intensity of signals received from various French stations, and by a continuance of these measurements it is expected that more comprehensive knowledge will be obtained of the phenomena of wireless transmission. A meeting of the American section was held very recently, at which various committees reported on the study of wave intensity, atmospheric disturbances, variations of wave direction, measurements of radiations which cause interference, and electron tubes.

The wireless telephone has been introduced in the operations of the Paris police force with promising results, and regular communication is now maintained between one police aeroplane, two police ambulances, and headquarters, all four being equipped for sending as well as receiving.

Specifications for the dielectric strength of mica vary for different uses. Some specifications call for a dielectric strength of not less than 25,000 volts for each 1/64th-in. thickness.

The amount of energy actually transmitted by wireless is practically nil, and it is computed that for one horse-power to be transmitted across the Atlantic one hundred million horse-power would have to be radiated through the transmitter.

Messages from an aeroplane flying between Amsterdam and Rotterdam have been picked up clearly by operators at Croydon.

A motorbus fitted with a wireless receiving set is now in the service of the Lancashire United Tramways, Limited.

A wireless message from Greenwich has been received on a train between Limoges and Chateauroux.



FORTHCOMING EVENTS

Leeds and District Amateur Wireless Society. Sept. 8, 8 p.m. Lecture by Mr. H. Mortimer: "Automatic Telephony."

Belvedere and District Radio and Scientific Society. Sept. 8, 8 p.m. At Erith Technical Institute. General meeting and enrolment of members.

Tuxford and District Amateur Wireless Society. Sept. 14. Morse practice. Cells and care of accumulators. Reception on society's apparatus.

TELEPHONY TRANSMISSIONS

Eiffel Tower (FL), 2,600 metres. Each afternoon, 6.10-6.30 p.m. (Saturdays and Sundays excepted).

Writtle (2 M T), 400 metres. Sept. 12, 8 p.m.
The Hague, Holland (P C G G), 1,085 metres. Aug. 7, 8-9 p.m., and Sept. 10, 2.30-5 p.m.

CLUB DOINGS (continued from page 279)

Instruments, and How They Work." Mr. Dixon explained the principles on which the Magnavox, the Brown loud speaker, the Brown head receiver, and several other well-known instruments work. Particulars of the club may be had on application to the hon. secretary.

Proposed Wireless Society for Tottenham and District

Will all interested please communicate with Mr. R. A. Barker, 22, Broadwater Rd., Bruce Grove, N.17.

Hornsey and District Wireless Society

Hon. Sec.—MR. H. DAVY, 134, Inderwick Road, Hornsey, N.8.

THIS society, which was recently founded, has now a membership of over thirty, and is anxious to increase its numbers still further. Full particulars can be obtained from the hon. sec. at the above address. A full meeting was held on August 18th, and a programme was formed for future meetings as follows:

Aug. 29th, Lecture by Mr. Pugh—"Crystal Sets in Theory and Practice."

Sept. 1st, Construction by members of apparatus for incorporation in the club's set.

(Continued in third column on page 286)

OWING TO THE SUCCESS OF OUR CAMPAIGN WE HAVE DECIDED TO CONTINUE THIS OFFER FOR A FURTHER WEEK

THIS OFFER WILL BE WITHDRAWN ON SEPT. 16th

HENRY J. BREWSTER & Co. (Manufacturers of "Aerowave" Specialities) have decided to extend their offer as part of their Advertising Campaign, knowing that satisfied customers are the best possible recommendation.

FOR THIS WEEK ONLY

We will accept
HALF THE USUAL PRICES

SINGLE VALVE

"RELIANCE" No. 1 SET
(£12 12 0 less 50%)

SPECIFICATION

- 1 Polished Oak Cabinet
- 1 8 in. x 6 in. Ebonite Panel with all terminals
- 1 Filament Resistance
- 1 Mullard "Ora" Valve
- 1 Vernier Condenser
- 1 Grid Leak and Condenser
- Set of Tuning Coils covering broadcasting wave lengths
- Set High Resistance Head Phones (4000 ohms)
- 1 H.T. Battery (30 volts)
- 1 Accumulator (4 volts)
- Complete Aerial Equipment
- Full Instructions and Blue Print

Price This Week, £6 6 0

TWO VALVE

"RELIANCE" No. 2 SET
(£15 15 0 less 50%)

SPECIFICATION

- 1 Polished Mahogany Cabinet
- 1 10 in. x 8 in. Ebonite Panel with all terminals
- 1 Separate Filament Rheostat
- 2 Mullard "Ora" Valves
- H.F. Transformer Socket
- Grid Leak and Condenser
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Write distinctly, give all necessary details and keep to the point. Ask one Question at a time—never more than two. Send a Stamped and Addressed Envelope. Send the Coupon cut from this page.

Loose-coupled Tuner

Q.—Will you please give me constructional details of a loose-coupled tuner having a range of wave-lengths from 180 metres to 2,600 metres?—A. E. H. (2638)

A.—The principle of the loose-coupler given below differs slightly from that generally employed by amateurs, inasmuch as the primary slides in the secondary. It is not a new departure, however, as the method is now in general use in professional circles. The reason for the coils being disposed in a reverse manner is to enable the coupling of the reactance to the secondary to be effected with ease. A suitable size for the primary former would be 9 in. long by $3\frac{1}{2}$ in. in diameter. Allow a space of $\frac{1}{2}$ in. from the end of the former and then commence winding, using No. 24 S.W.G. enamelled-copper wire. If the turns are wound closely together, it will be possible to wind 300 turns of wire, approximately $\frac{1}{2}$ lb. in weight. Tappings should be effected at the following turns, 15th, 60th, 120th, 210th, and the finish total 300 turns. The base for the tapping studs and switch arm should be fixed at the outer end of the coil and the tappings brought along the inside. The secondary former may be $9\frac{1}{2}$ in. long by $4\frac{1}{2}$ in. diameter, and it should be wound with No. 30 S.W.G. enamelled-copper wire, the total number of turns being 600. Begin winding $\frac{1}{2}$ in. from one end, as before, taking taps with the bights external to the coil at the following turns, 20th, 60th, 100th, 150th, 240th, 330th, 420th, 510th and 600th. The formers may be constructed of impregnated cardboard, ebonite, paxolin, fibre, or any other insulating material. The tapping studs and switch arms should be mounted on ebonite. One end of the secondary tube should be fitted with a circular piece of wood or ebonite, tacked or glued in position to strengthen the former, and also to enable a rod to be fixed for supporting the sliding coil. The two coils may be mounted on a wooden base and a support provided for the free end of the secondary coil. To obtain intermediate tuning over a range of wave-lengths from 100 metres to 3,000 metres approximately, use a .001 mfd. variable condenser connected in parallel with the primary coil, and a .0005 mfd. variable condenser connected in parallel with the secondary coil.—L. C.

CORRESPONDENCE

Variable Condensers

SIR,—A frequent source of trouble in variable condensers, particularly cheap ones, is the touching of the plates. The defect is easily noticeable by reason of the noise produced in the 'phones each time the condenser indicator passes a certain spot, and often, when reaction is used, it is so loud that signals are drowned completely. It is a mistake to endeavour to rectify the fault by probing the plates apart where they touch, though this is a method commonly employed by amateurs.

It may be expedient for the time being, but sooner or later the springiness of the metal will bring the plates together and the trouble will be just as bad again. Moreover, such a method often results in badly denting the plates or otherwise distorting, with consequent alteration in the capacity of the instrument because of the thickness of the air dielectric being changed.

The most reliable method of rectifying the fault is to take the offending plates right out and iron them with a heavy hot iron on a firm and flat surface. This should be done until the metal is perfectly flat. If there are any small protuberances on the surface they should be carefully filed off with a small file. It is always worth while when buying condensers to make sure that the plates are of the cast variety, for in this way not a little trouble might be avoided.—L. B. P. (Birmingham).

Atmospherics

SIR,—With reference to the letter from L. P., of Birmingham, under the above heading, perhaps the following experience on a direction-finding station during the war may be of interest. The system of direction-finding used was that invented by Messrs. Bollini and Tosi, which is generally adopted for permanent stations. It was arranged so that the radiogoniometer could be switched out of circuit and either the N.S. or W.E. aerial connected direct to the tuner. Reception on one aerial would perhaps be rendered very doubtful owing to atmospherical disturbances. When the aerials were changed, however, a decrease in the strength of the atmospherics was noticed and the reception of signals made easier. An attempt to measure the direction of the atmospherics closely met with little success owing to their continuity and varying intensity, and a rough idea only was obtained. Your correspondent has raised an interesting subject which is worthy of experiment, and other readers' views and experiments would make an interesting study.—H. B. (Sheffield).

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CLUB DOINGS (Continued from page 284)

Sept. 5th, Listening-in on 1 valve set loaned by member.

Sept. 8th, as Sept. 1st.

Sept. 11th, Lecture by Mr. Davy: "The Practical Construction of an Amateur Receiving Station."

It was arranged that the club set should consist of 3 valves—one high-frequency, one detector, and one low-frequency.

On Tuesday, August 22nd, the members present enjoyed music and speech from 2 O M and 2 F Q as well as Morse signals from various stations, including loud signals from G F A, on a 2-valve set.

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

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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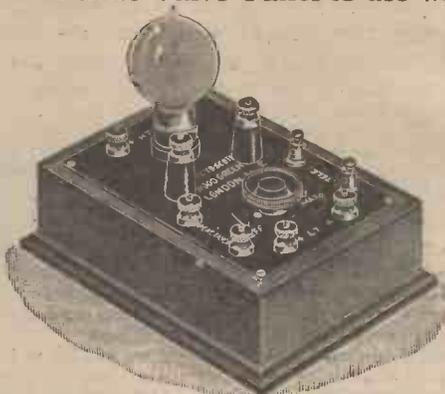
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These sets are complete ready for assembling and consist of following parts: Necessary Aluminium Vanes (fixed and moving), all standard size, large and small Spacer Washers, Centre Square Spindle with Knob screwed 2 BA, 3 round screwed Rods for sides, necessary Nuts and Washers, Brass Pointer, Engraved Scale, 2 Terminals, Lock Nuts, bush and 2 bronze, coil Spring Washers. Every part guaranteed best workmanship and quality.

Registered post and packing 1/- set extra, (.001 1/3 extra).

Aluminium Condenser Vanes, accurate to gauge. Fixed and moving, 1d. each; 1 doz. 9d.; 4 doz. 2/8; 6 doz. 4/3; 12 doz. 8/-; per gross, pairs, 14/- Larger quantities cheaper. (Reduction to callers.)

Large Spacer Washers, 5d. doz.; 6 doz. 2/4; 12 doz. 4/-. Quantities cheaper.

Small Spacer Washers (all to .0001), 3d. doz.; 6 doz. 1/4; 12 doz. 2/6. Quantities cheaper.

Knobs for Centre Spindle, drilled 2 BA, each 4d.; 2/9 dozen.

Knobs. Very good quality with 2 BA nut in centre, 6d. each, 2/6 for 6, 4/9 doz.

Spring Coils Washers, 4d. dozen.

Engraved Scales, 0-180, 4d. Do. extra quality, 6d.

Ebonite Sllder, complete with plunger, each 6d.; 5/6 dozen.

Slide and Plunger, complete with 13" brass square rod, 9d. (Postage and package, 9d.)

Aerial Wire, 100 feet hanks, 7/22 stranded copper, 3/6 (post and packing, 1/-). Quantities cheaper.

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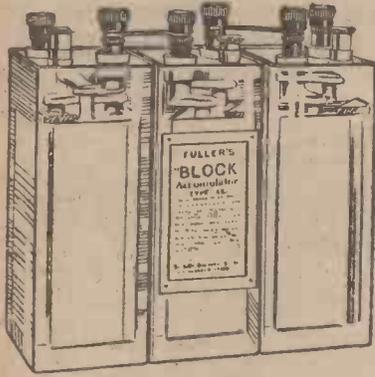
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4 B K	4	18	9 6	14 0	B L 455	4	110	4 1 0	2 15 0
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240	2	40	1 7 6	16 3	B J 2120	2	120	2 4 0	1 8 0
440	4	40	2 15 0	1 12 6	B J 4120	4	120	4 8 0	2 16 0
640	6	40	4 2 6	2 8 9	B J 0120	6	120	6 12 0	4 4 0
BL 12a	4	50	2 12 6	1 16 0	B L 280	2	160	2 4 6	1 12 6
BL 13a	6	50	3 48 0	2 18 0	B L 480	4	160	4 9 0	3 4 0
2 A D 9/s	2	64	1 2 6	18 0	B L 680	6	160	6 13 6	4 16 0
4 A D 9/s	4	64	2 5 0	1 16 0	B L 2110	2	220	3 0 6	2 0 0
6 A D 9/s	6	64	3 7 6	2 14 6	B L 4110	4	220	6 1 0	4 0 0
2 A D 9/c	2	70	1 6 3	1 0 0	B L 6110	6	220	8 9 0	6 0 0
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B L 440	4	80	3 10 0	2 8 0	S L 630	6	30	2 3 6	1 7 0
B L 640	6	80	5 5 0	3 12 0	S L 280	2	80	1 3 0	14 0
B L 21	4	94	3 8 0	2 12 0	S L 480	4	80	2 6 0	1 8 0
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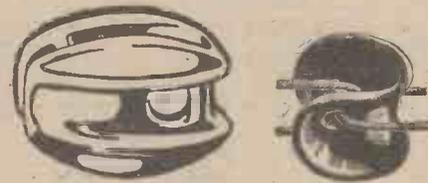


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34	—	—	7 3	8 0	3 11
36	—	—	8 3	9 6	4 2
38	—	—	9 9	11 9	4 6
40	—	—	13 0	15 6	5 0
42	—	—	15 6	19 0	6 6
44	—	—	20 0	25 6	8 0
46	—	—	40 0	57 6	12 6
48	—	—	85 0	132 6	19 6
47	—	—	115 0	160 0	30 0

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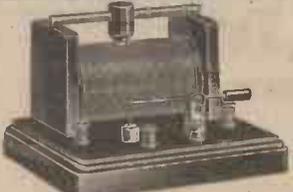
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Amateur Wireless And Electrics

No. 15

SATURDAY, SEPTEMBER 16, 1922

Price 3d

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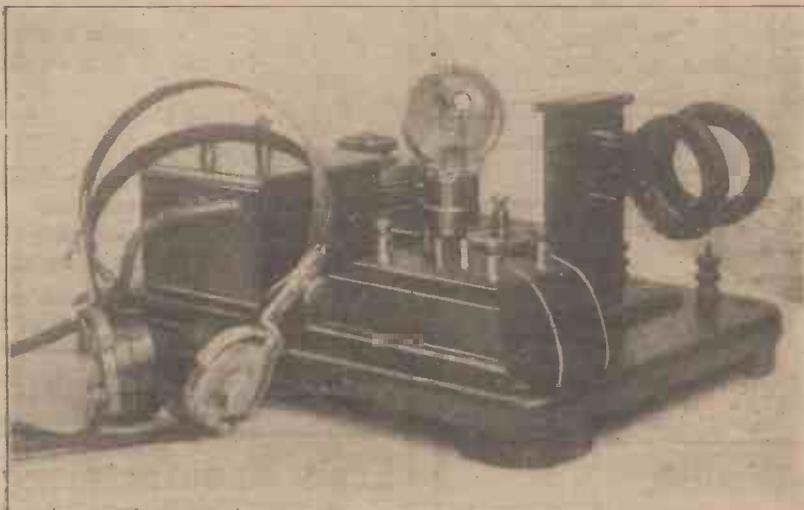
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A SINGLE-VALVE HETERODYNE RECEIVER COMPLETE (see p. 309)

Information Bureau

Forthcoming Events Etc.

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Amateur Wireless

and Electrics

No. 15

September 16, 1922

THE FILAMENT BATTERY

Its Care and Use :: Terminals :: Adding Acid :: Sulphating

THE filament battery, which in most cases is not a battery in the strict sense of the word but an accumulator, requires a certain amount of care and attention if it is to give unfailing service at all times. As primary cells are really unsuitable for heating the filament, and are extremely costly to renew compared with recharging accumulators, time will not be wasted in discussing them.

As the majority of readers are aware, the accumulator consists of a number of pairs of lead plates immersed in dilute sulphuric acid and usually mounted in celluloid or ebonite cases, with the positive and negative plates connected to two terminals on the top of the box. By passing a current of electricity through the accumulator a rearrangement of the chemical components of the plates takes place, and on disconnecting the accumulator from the mains and wiring up to an electric bulb, it will be found that the accumulator will give out a current, causing the lamp to glow, the lead plates in the meanwhile returning to their original form.

It will be obvious, that the current given out by the accumulator will be something less than the current put in when it was connected to the mains, and that it is necessary at certain intervals to recharge the plates by passing a current of electricity through them for several hours.

In the case of the filament battery the frequency with which this will have to be done will depend entirely on how much the set is used, the number of valves used and the capacity of the accumulator. When two or more valves are used the capacity should never be less than 20 actual ampere hours. Six-volt accumulators should be used, and the actual voltage across the valve filament varied by means of a variable filament resistance. This variable resistance is most useful, because by its use not only is the life of the valve prolonged by cutting down the voltage slightly, but the accumulator will last longer for one charge and the signals in the 'phones will be clearer in many instances and more distinct than if the valve filaments were glowing at full brilliancy.

It is advisable to keep two accumulators in use, one being on charge while the other

is in use on the set. The charging can be done either by the local garage or off the house lighting mains if direct current is in use. Accumulators should be charged frequently; nothing ruins an accumulator quicker than leaving it in a run-down condition.

On the side of most accumulators a list of directions will be found, also a warning never to let the voltage drop below 1.75 volts per cell. These instructions should be carefully carried out. If the set is not to be used, a freshening charge should be given every month until the acid gases, care being taken to wipe any froth from the outside of the case.

The terminals on most good-class makes of accumulators will be found to be painted with some acid-resisting paint; it is a good plan, however, to keep them always smeared with vaseline, which will considerably reduce the chance of corrosion.

"Broadcasting— A Rumour"

* Our article under the above heading in last week's issue has attracted wide attention. Much correspondence on the subject reaches us as we go to press.

* We print on pages 300 and 310 an article by Mr. L'Estrange Malone, M.P., whose emphatic dicta our readers generally will confirm.

* A letter from a member of the trade is printed on pages 310 and 311. It disposes of the "rumour" as being "a distortion of the facts." We sincerely hope it is.

THE EDITOR.

Acid should only be added to the electrolyte when the accumulator has been accidentally upset. The acid used for keeping the level of the solution constant should be mixed with distilled water in the proportion of one part acid to four parts water. It is most important to remember that in mixing the electrolyte the acid must always be poured on the water, not the water on the acid. The reason for this is that were the water poured on the acid in a thin stream the large body of acid acting on the comparatively small amount of water would cause a violent eruption, neither pleasant nor desirable.

The solution should be allowed to cool before being poured into the accumulator. The specific gravity of the acid should be tested by means of an hydrometer and the reading compared with the figures printed on the side of the case. The hydrometer in its most useful form consists of a glass phial fitted with a rubber teat similar to a fountain-pen filler, only larger. The glass body contains a small float marked with a scale, and a reading is taken by inserting the end of the hydrometer into the top of the accumulator and squeezing the rubber teat. When the cell is charged the acid will assume a milky appearance, and when tested with the hydrometer should give a reading of 1.225.

The greatest trouble of all with accumulators is their tendency to sulphate. This is caused either by overcharging, by charging too slowly, by discharging the cells at too rapid a rate, or by leaving them idle in a run-down condition. This sulphate, which consists of a hard white scale on the surface of the plates and is really sulphate of lead, is extremely detrimental to the battery, as in removing it from the plates a certain amount of active material is brought away at the same time, with a consequent loss of ampere-hour capacity.

Strong ammonia should be applied at once to any clothing on which acid has been spilled. Sulphuric acid will burn a hole right through ordinary cloth in less than twelve hours, whilst it will produce a red stain on blue serge, which will ultimately wear to a hole unless the place is immediately treated with ammonia.

A. W. HULBERT.

A New Mechanically-strong Valve

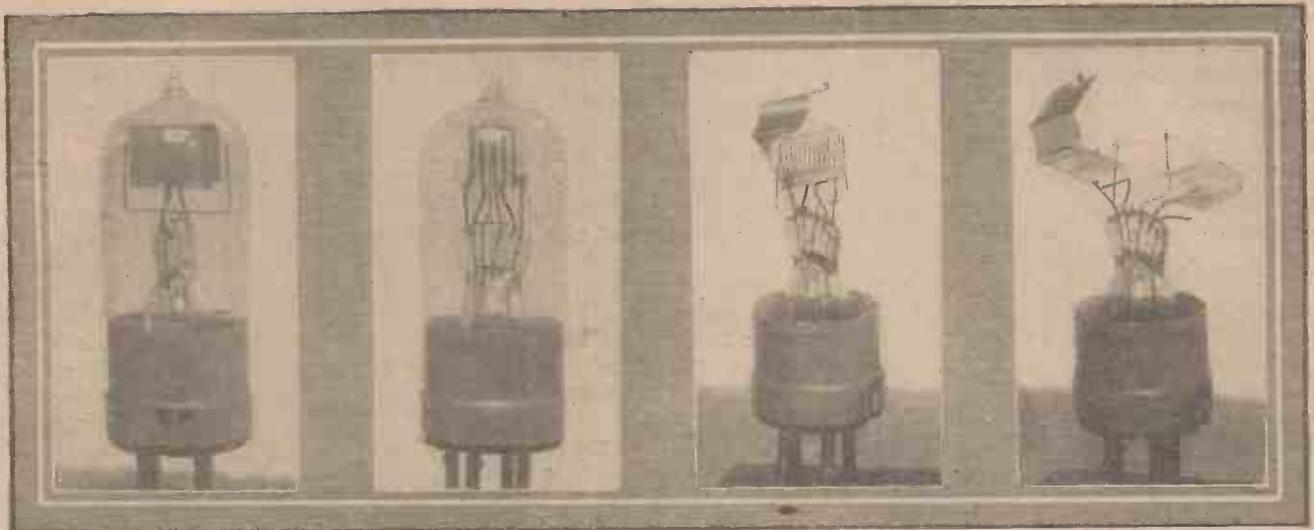
Particulars and Photographs of the Recently-invented Xtraudion Valve

SOME very interesting features in design are presented in the new Xtraudion valve which has just been placed on the market by the Economic Electric, Limited, 10, Fitzroy Square, London, W.1, features which, in the main, tend to economy in use owing to the strong

type of valve. It will be observed that the use of the spiral grid has been avoided, the form substituted, it is claimed, preventing the annoying ringing noises so generally experienced; also it accounts for the increased degree of amplification which is obtained. Hissing and frying

Vacuum test-anode, 150 volts; grid, 2 volts (less than 1 milliamp. is passed).

Another interesting point is that amber-coloured glass is used for the bulbs in order to reduce the troublesome glare experienced with plain glass. The valve is the invention of Mr. C. Holt, of the



A New, Mechanically-strong Valve, the Xtraudion.

mechanical construction of the valve. Its comparative strength is made possible, as will be seen from the photograph, by the peculiar form of the grid and plate. With this arrangement the filament may sag to any extent and yet cannot short-circuit with the grid, a matter which is a very usual cause of breakdown in the ordinary

noises are reduced to an extraordinary degree. The characteristics of the valve are as given below:

	Filament current at 4 volts	
Anode potential 50 volts	0.5 amps.	
Grid potential + 12 volts	2.4 milliamps.	
„ „ 0 „	0.5 „	
„ „ - 12 „	0 „	

Economic Electric, Limited, and costs less than very many valves now on the market. The photographs, specially taken by ourselves, show two views of the new valve complete, one view with the plate bent out of the way to display the grid, and a fourth view with the plate and grid displaced so as to reveal the filament.

“Broadcasting - - - A Rumour”

(1) A Special Article by
C. L'ESTRANGE MALONE, M.P.

(2) The Manufacturers' Side; A Letter
from a Member of the Trade

The Situation

By C. L'ESTRANGE MALONE, F.R.Ae.S., M.P.

THE rumour to which AMATEUR WIRELESS drew attention in the issue of September 9 is certainly very disturbing. No one would dream of suggesting that aeroplanes, motor-cycles, gramophones, musical-boxes, clocks, etc., should be purchased only as complete articles and that amateur mechanics and others, if they prefer to do so, should not be allowed to assemble them from their component parts.

The restriction would be so absurd in the special case of amateur wireless work that one is led to hope that it will never be more than a rumour. An official at the G.P.O. will not deny it, so I have written to the Postmaster-General, Mr. Kellaway. Wireless listeners-in will await his reply with considerable interest.

The fact, however, that such a rumour is possible shows up the

Hole and Corner Way

in which the broadcasting question is being

worked out, and with the complete absence of any useful results up to date.

Let us get on with it! I believe that the public will be much surprised when they learn all that has been going on during the past few months.

Whether the committee of manufacturers who are discussing the terms of the Broadcasting Company with the Postmaster-General is really representative of the wireless trade or not I will not enter into here, but I do say that I consider there

(Continued on page 310)

Freak Results

EMERGENCY is the mother of invention, and invention was perhaps never so much required as by army wireless operators in the field during the war.

Freak results were often obtained during such emergencies. Using a crystal set consisting of two currents, primary and secondary, and a farmer's wire fence (only insulated from earth by the wooden posts) as an aerial proved a successful experiment. On this occasion the aerial wire had been accidentally left at headquarters.

When co-operating with aeroplanes and assisting artillery firing, the aerial wire was often blown to fragments by return fire. Emergency steps were immediately necessary to continue reception. An operator sometimes acted as a human aerial by standing at the mouth of the wireless dug-out with the fingers of one hand pressed tightly on the aerial terminal. This was quite successful, although only carborundum or perikon (zincite and bornite) crystals were used.

Amateur friends who experience difficulties may be encouraged when I say that no difficulty is too great to be overcome by patience. For instance, when on aeroplane reception directing gun-fire, each battery had two operators and one tuner. All the aeroplanes were sending at the same time on wave-lengths so similar that constant interference was a certainty. When listening the noise of the many signals was like the buzz of bees. The operator had to pick out his aeroplane by its note (each note being slightly varied) and hang on to it. Operators so engaged soon came to ignore the heavy gun-firing and shell-bursting. Of course it is understood that coupling was used as far as possible, but interference was always very great.

A surprise was sprung upon us once by officers of the early experimental telephony detachment. Up to that period telephony was little used, and our surprise can be imagined on hearing "It's a long way to Tipperary" being whistled in the 'phones with gusto by a very human voice. Blank amazement appeared on the operators' faces.

Sometimes when signals were weak an operator would detach the aerial wire from the aerial pole and stroll round in a circle, keeping the aerial taut with his hands by means of the aerial insulator. As his direction changed so the signal strength varied, until he found the direction in which the signals were strongest. The aerial pole was re-erected on that spot.

Messages were often received on the aerial terminal, but this has generally been with short wave-lengths sent out by locally-stationed transmitters.

A ground aerial was effectively used on

occasions—that is, an aerial actually trailing on the ground. It consisted of a stranded copper wire thickly insulated by rubber tubing and attached to a moving motor-lorry containing wireless apparatus. It was generally a success, especially when trailing over long grass. Crystal detectors were the only means used for detect-

ing signals. Precautions were always taken to prevent the crystal being jolted and jarred by the motor-lorry running over uneven ground. The method adopted was to place under the crystal base a piece of rubber $\frac{1}{4}$ in. thick, and then screwing the base down only lightly on to the rubber. A. F. C.

A Kite Aerial

AT a recent field day of the Ipswich and District Wireless Club a very interesting experiment was carried out with a kite aerial, the results obtained being beyond



Fig. 1.—Portable Set Mounted on a Car.



Fig. 2.—The Kite that Carried the Aerial.

expectation. The arrangements were carried out by Mr. H. E. Barbrook, to whom we are indebted for the brief particulars here given. Fig. 1 shows the club's portable set at the back of a two-seater car; whilst Fig. 2 shows the kite which took the aerial aloft.

The kite was flown from a south-westerly direction by means of a cord attached, another operator standing in an opposite direction, holding the wire on a bobbin wound with No. 36 s.c.c., the length released being about 100 ft. This was connected to a three-valve high-and-low-frequency receiver with interchangeable transformers.

Lyme, Croydon and Hendon were clearly heard by the telephony. A great deal of work was done on 600-metre wave, of which G N F was found at his best.

Dirt and Damp

THE two main enemies of wireless reception which are most under the control of the amateur are dirt and damp. There are so many places where these two lurk, and consequently weaken received signals, that it will be advisable to point out where they frequently cause trouble.

In the smoky atmosphere of cities aerial insulators quickly become covered with a film of grime which can easily weaken signals by forming a path to earth for the minute received currents. If the insulators are glass or highly glazed porcelain heavy rain will help to keep them clean, but it is a good plan to rub them over every two or three months. If the leading-in tube is so placed that heavy rain can fall directly on to it there may be considerable leakage there in wet weather.

Inside the wireless "cabin" dampness can generally be obviated to a large extent, but the receiving set should be kept in a dry room, otherwise moisture will be sure to condense on ebonite panels, switches, terminals, etc., causing surface leakage, which is extremely troublesome. The aerial and earth connections require to be quite free from dirt, and all terminals should be kept scrupulously clean.

Dust has a habit of settling amongst wireless apparatus even when it is boxed up, and places to watch for it are between terminals, between contact studs, and on the plates of variable condensers. A new small soft paint-brush is useful for cleaning awkward corners.

High-tension batteries of the dry-cell type are quickly ruined by dampness, and care should be taken to keep them quite dry. A good plan is to stand them on some non-hygroscopic insulator with each cell well insulated from its neighbours.

L. W.

THE INTERVALVE TRANSFORMER

How the Amateur can, with a Little Thought, Design His Own

It appears to be usual practice when any special effect is required, to try every available article apparently suitable in the hope that one will do what is required. Much time would be saved were it possible to measure the currents being dealt with, and then pick apparatus which works best at that available power.

Take, as a first example, an intervalve transformer. Of all the different types with different resistances and voltage ratios, it would be expensive to try each in turn. For each individual amplifier there is but one really suitable transformer, and this should be predetermined by measurements.

If a milliammeter is placed in the plate circuit of a valve which is under working conditions a certain steady deflection will be observed due to the plate current of the valve. If the valve in question is a detector valve with a reaction coil in use two distinct values of plate current will be observed—one when the valve is not oscillating and a lower one when the valve is oscillating. For usual receiving valves, these values may be of the order of 2 and 1.5 milliamperes respectively, using a plate potential of 70 volts. The following table is based on measurements of a receiver in use, and shows that for varying H.T. voltages the difference between the current values drops off rapidly and obviously bears some relation to the plate voltage.

Voltage.	Not Osc.	Osc.	Res. not Osc.	Res. Osc.
70	2.0ma	1.25ma	35,000 ω	56,000 ω
55	1.5ma	1.0ma	33,000 ω	55,000 ω
40	1.0ma	.8ma	40,000 ω	50,000 ω
30	.75ma	.6ma	40,000 ω	53,000 ω

It may be noticed that the lowest resistance value, when the valve is not oscillating, is the value of the H.T. voltage most suitable for the valve in question. Taking these observations into consideration, it would appear best to have an intervalve transformer with a high impedance primary, so as more effectively to utilise the power at disposal.

There is one other factor which we have to consider, and that is the increased effective resistance of the primary due to load conditions on the secondary. This should make a noticeable difference, but careful observations do not show any alteration in plate current when the secondary of a transformer is open and close-circuited. This may be due to the amount of power being transformed bearing such a small proportion to the maximum power

which the transformer could carry. If the primary of the transformer were made of about 30,000 ω impedance, and since it is advisable to have a step up ratio of three or four to one, the secondary impedance should be approximately 120,000 ω . It is obvious that were these values adopted, even if the finest wire available could be used, such a transformer would assume quite large proportions.

The troubles then would be that the secondary would be so far from the primary, or rather the position of maximum magnetic flux, that a large proportion of turns would be idle resistance. Since the transformer would be large, the core also would have to be in proportion, and this again would tend to draw in the outer lines of magnetic force. It appears, then, that the transformer must be decreased in size and consequently in resistance until a balance is attained whereby maximum impedance is obtained consistent with transformer efficiency due to dimensions. Considering now the valves of the most usual types, we have, as a general rule, primary resistance valves near 2,000 ω and secondary valves between 8,000 ω and 16,000 ω . These are the usual values of British intervalve transformers, but the Germans, who at one time concentrated on valve amplifiers, developed efficient apparatus with secondaries up to 50,000 ω . The German transformers can hardly be compared with ours, since the valves used in that country were entirely different from the usual "R" type. There is one point, however, which might be mentioned regarding German amplifier valves, and that is, the plate current is comparatively high due to lower valve internal resistance, which brought the valve and transformer impedances nearer equality, and this fact, in some measure, accounts for the high amplification they were able to attain.

From these observations we might gather that intervalve transformers could to advantage be increased in size and resistance for use with the average valve. In this country there are only two or three different types of transformers which are used throughout all stages of note magnifiers, and it is significant that in America, where many patterns are available, transformers have been developed for each specific purpose to great advantage.

This is only a superficial study of the question, since there are so many other factors governing efficiency, such as the inductance of primary and secondary windings with regard to the signal strength being used in each. That is to say, a transformer used in the plate circuit of

a detecting valve might not be best for using on a third note magnifier, and vice versa. The size and relative proportions of the iron yoke is also of great importance, as is also the inclusion or omission of an air gap in some portion of the magnetic field, so as to decrease distortion of telephony. Another important factor not generally recognised is the spacing and type of insulation between the primary and secondary windings. This is very important in spark coils, and is just as important in the smaller power transformers used with valves, provided maximum efficiency is being aimed at.

The practical utility of these remarks may be observed by obtaining several different pattern transformers and trying them in a note magnifier and then transposing various pairs until the best arrangement is arrived at. This course is necessary with usual transformers because the windings are so far from what they should be that it is very difficult to predetermine their best positions. It is just these little items being properly investigated that mark the skill put into the construction of an amplifier; the collective results are certainly noticeable.

There is plenty of scope for experiment in winding transformers with higher resistances instead of trying to attain higher voltage ratios, as three or four to one are acknowledged to be the limit for efficient transformation of such small powers as are met in the usual pattern amplifiers as distinct from power amplifiers. These, dealing with much larger powers, demonstrate the necessity of careful transformer selection to a much greater degree.

W. J. JOUGHIN.

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strong rubber ring and tie in the middle as shown in the sketch. Bring the loop A to B and fasten to a rope which goes to the pole or mast.



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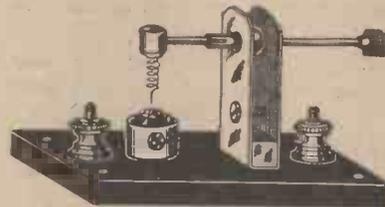
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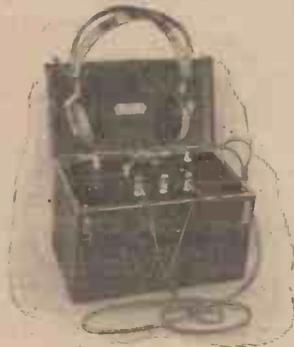
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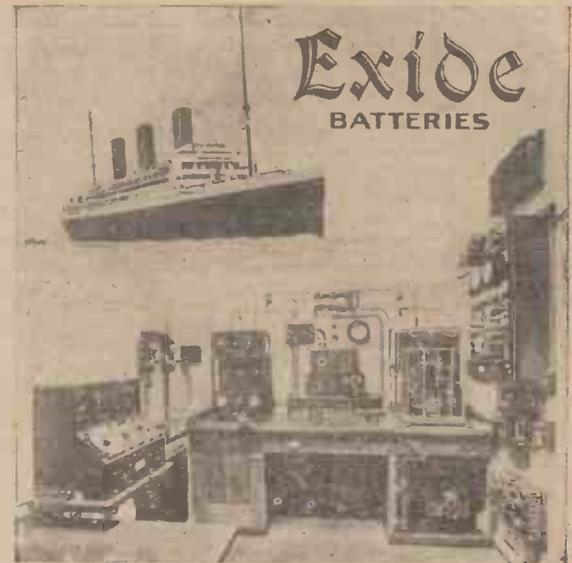
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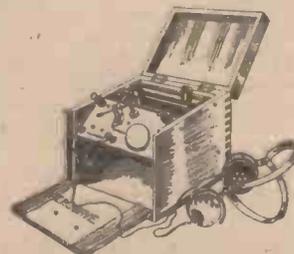
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ELECTRICAL BENCHWORK

POLISHING BRASS, Etc., WITH EMERY-CLOTH

A PROPERLY polished surface should exhibit a regular, even face, free from file marks, deep scratches or depressions which have not been eliminated by the previous filing operations. If flat, it should be a regular plane without any suspicion of rounding, which looks very bad when the light strikes in a particular manner; and if curved, the curve should be uniform throughout, with no flats or alternations in radius. Errors in working, which produce the above mentioned faults, are: (1) Beginning to polish before the work has been finally finished with the file on every part; (2) using fine paper or cloth at too early a stage in the polishing, with the result that a high superficial gloss is produced which shows up scratches and uneven places very badly; or (3) using the paper or cloth without a proper backing to support it.

A coarse grade of paper should be employed for the preliminary polishing until all the results of turning or filing are deleted, and then a fine grade is used. The diagram (Fig. 1) shows the principal methods of application. The method shown by A is similar to filing, and care is necessary to move the emery stick truly. Narrow faces are more readily worked by moving the emery stick in the same direction as for draw filing. Small areas, which are difficult for the beginner to get over, can be more easily accomplished by inverting the work on the emery-paper and rubbing to and fro over B. Another dodge for polishing a cylindrical or other object is to work the stick with a circular movement C, by which flatness is easily obtained. The quickest and neatest way of polishing round rods is by taking a long strip of cloth, lapping it round as at D, and pulling alternately on the ends. If the scratches are to be made in a longitudinal direction a short piece of cloth is lapped round as at E and grasped with the fingers while it is slid to and fro. Bosses and portions forming part of a circle cannot readily be polished by the strip device shown at D, and the stick F is more convenient. Operate it like a file, taking care not to let it move in a straight line which will result in flats or wrong curves. The draw-filing method G may be pursued more successfully, laying the stick transversely, a way which some workers find preferable for filing round a curve. A concave portion H may also be polished in this manner. It is quicker when using the rough cloth to employ the cross movement, reserving the draw movement for finishing.

Due precaution must be taken, just as in

filing, not to produce hollows, but to keep the stick moving up and down freely and so sweep round a continuous curve. The reason why it is nearly always preferable

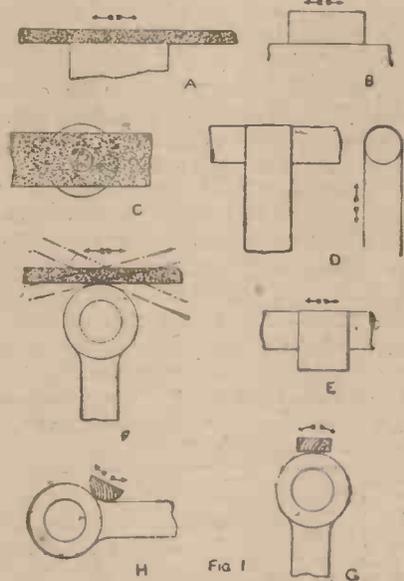


Fig. 1.—Various Methods of Using Emery-cloth, Emery-sticks, etc.

to use paper or cloth in conjunction with a backing stick is because, when held by the fingers alone, there is no guidance and the work tends to develop a convex face, and the sharp corners also become rubbed off. Using the fingers alone is, moreover, tiring and not so easy to exercise a good

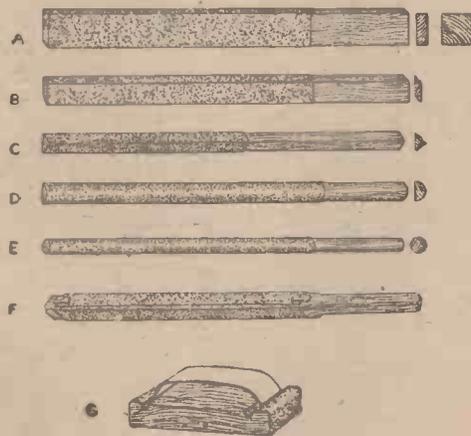


Fig. 2.—Various Emery Sticks, etc.

pressure. The only instance where the fingers are of decided advantage is in the finest polishing after roughing down. Employ old, worn cloth with or without oil; the application of the latter improving the high polish.

The practice of wrapping the paper or cloth round a file is not to be recommended on account of the rapid-tearing through induced by the file teeth. It is better to have a smooth piece of wood which prolongs the life of the cloth. Some of the chief shapes are shown in Fig. 2, the most useful being the rectangular or square section A, feather-edged type B (handy for getting into corners and other awkward parts), triangular C for similar functions, and the half-round and round rod D for round or hollows. The paper or cloth is either simply wrapped round the stick and retained with the fingers or is cemented, or a single strip is cemented down each side in the flat-sided sections. Sometimes rough and fine grades are attached to different sides of the same stick, or more usually two sticks are kept for this purpose. Clips as shown at F render the use of glue or cement unnecessary, the cloth being tightly lapped round and held by tightening up the screw. The application of a stiff steel spring G is another method of fastening emery-cloth to a block, and it is adopted for going over large areas.

An alternative way of preparing emery sticks is to coat them with hot glue and roll in emery powder. Precaution should always be taken to guard against the risk of the emery reaching any bearings or slides in a piece of mechanism, and no polishing should be done on an assembled piece of work without carefully wrapping up exposed bearings or slide ends or any moving portion which is likely to convey grains of the abrasive to the interior. Whenever possible the parts should be removed for polishing, and they should be thoroughly flooded with paraffin if there are any interior sections which cannot be wiped out.

One method of finishing large surfaces consists of wrapping a piece of emery-cloth round a cork, driving a steel spindle into the latter and securing this in the chuck of a drilling machine or a hand-brace. By rotating the cork and lightly pressing it on to the work the beautiful scintillating spot-face finish is secured. The spacing of these spot facings should, of course, be as regular as possible. This method is often effected by skilled workers by wrapping a piece of emery-cloth round the thumb and giving a circular movement to it.

INGOT.

“Wireless Telegraphy and Telephony”

The most Practical Handbook for the Amateur. The price is 1/6 net.

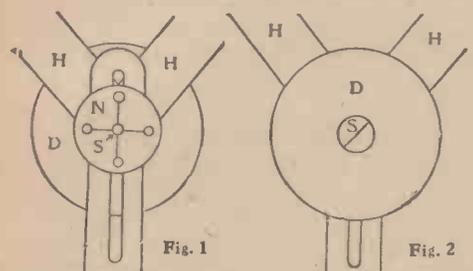
arranged that the switch arms are stopped with their ends exactly over their respective contacts when switched to either right or left.

The connections are shown in Fig. 1. Although shown on the upper surface for clearness it must be understood that they are to be made on the under side for neatness. A is connected to earth, B is connected to the aerial, C gives earth connection to the instruments, and D provides aerial connection to the instruments.

If the switch is to be mounted on a panel the latter should be cut away sufficiently to clear the terminal clamping nuts, although leaving sufficient at the corners for the fixing screws to get a good grip. If mounted individually it may be raised on four pieces of fibre tube 1/2 in. long, through which the fixing screws may be passed into the wood. J. MCG.

Improved 'Phone Headbands

FEW things are more annoying to the amateur than the trick some headbands have of nipping and tearing the



Figs. 1 and 2.—Outside and Inside View of Improved Headband.

hair every time the 'phones are used. With the aid of the attachment shown in

the illustrations the 'phones may be slipped on and off with comfort.

Cut out of pasteboard (or other suitable material) two discs 2 in. in diameter. Remove the screws at each side of the headbands. Pass a screw through the centre of each disc and replace on the headbands. Fig. 1 shows the outside view, and in this figure D is the disc, H the headbands, N the nut and S the screw.

Fig. 2 (inside view) shows how the attachment shields all moving parts that might catch the hair. R. M.

Underground Aerials

VERY few experimenters in this country have done any work with underground aerials, although in the United States they have been tried for some time. It is claimed that atmospheric interference is considerably decreased and, as these aerials are very directional, interference is reduced to a minimum. Underground aerials are of no use with crystal sets; they require amplifiers.

The aerial wire, which should be insulated, is generally laid in a trench two or three feet deep, but results can be obtained if it is supported from wooden posts a foot or two above the surface of the earth. The free end of the wire must be very well insulated.

Two Styles

Fig. 1 is a diagram of an underground aerial system showing two wires running in opposite directions with the receiver at the centre. One wire only may be used as shown in Fig. 2, but the results will not be as good. A disadvantage of this type of aerial is that signals can only be received from stations on or near the line of

the wire. Several wires could be laid out so as to radiate from the receiving gear to the eight principal points of the compass, in which case selective reception could be

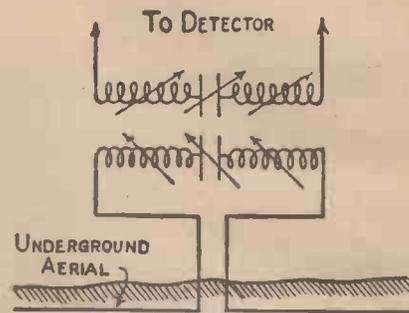


Fig. 1.—Two-wire Underground Aerial.

employed for signals from any direction by switching in the corresponding pair of aerials.

Wireless societies having field days on open stretches of land might give this

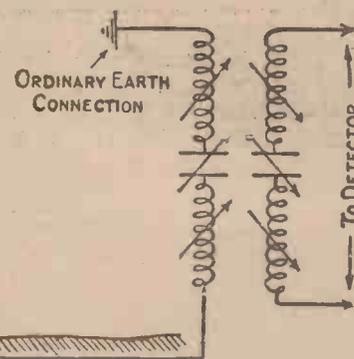


Fig. 2.—One-wire Underground Aerial.

type of aerial a trial and find out by how much the ratio of signals to atmospheric is increased. L. W.

WHAT WIRELESS TERMS MEAN.—IX

Some Technical Words Explained as Correctly as Popular Language Allows

BUZZER.—A small instrument which when connected up to a battery gives out a buzzing sound, and produces a tiny spark at the point of contact of the blade and the armature. This spark sends out tiny ether waves. If, therefore, a buzzer is used near a wireless set the waves will be picked up by the receiver. Used principally to test whether a set is working or not, and generally to test a crystal.

TRANSFORMER.—An instrument used in alternating or oscillating current circuits for the purpose of stepping up or reducing the voltage of the current. It is based upon the principle of mutual induction between two coils of wire. It usually consists of a bundle of soft iron wires upon which a number of turns of wire are wound, insulated from a second winding of a greater number of turns of finer wire. If a current is passed through the thicker wire first, a current of greater voltage is induced in the thinner wire. This is a

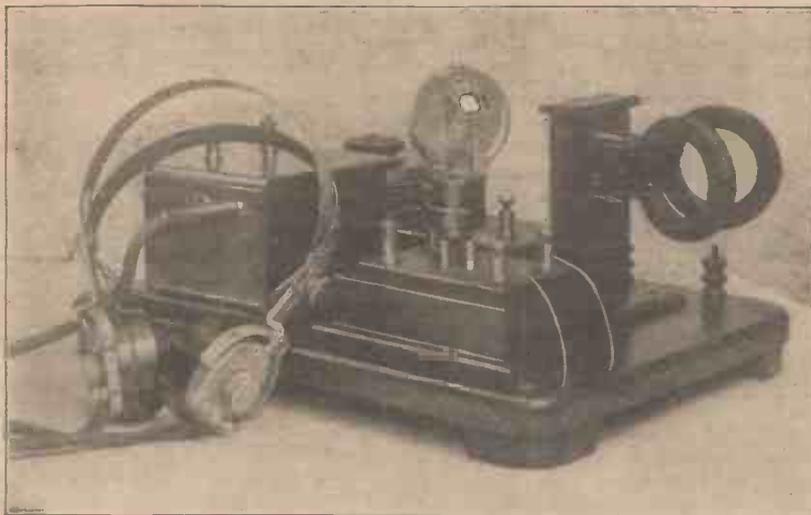
"step up" transformer as in the case of those used for low-frequency amplification. If the current is passed through the finer and longer wire first, a lower voltage is induced in the shorter and thicker wire. This is called a "step down" transformer as in the case of a telephone transformer.

WAVE, DAMPED and UNDAMPED.—Wireless signals are transmitted by means of waves in the ether which are produced and set in motion by an electrical discharge. They are of two kinds, damped and undamped. The former is the spark-produced wave and consists of a series or train of waves with gaps in between, represented by the period between the make and break of the circuit. Each train gradually dies away or is damped down, owing to the failure of the energy which started it.

Due to the existence of these gaps detection of them by a crystal is possible. Undamped waves are produced by a valve

or an arc, and are all equal in power. Other methods of producing these waves are by means of high-frequency alternators and timed sparks.

LEAK (GRID LEAK).—When a wireless wave strikes the grid of a valve it impresses upon it a certain potential or charge of current, either positive or negative. The following charge of the grid will be of opposite polarity. That is, if the first was positive the second will be negative. The charge is impressed on the grid by the grid condenser which is used to make the valve a rectifier. If the condenser is well insulated, the first charge will not be able to get off the grid before the next and opposite charge arrives. The leak is therefore provided to enable the former to leak away and make room for the latter. Some condensers are themselves leaky and do not, therefore, require an additional leak. The value of a grid leak is normally about 2 megohms.



The Single-valve Heterodyne Receiver Complete.

THE inductance coils described in the article in No. 5 of "A.W." were of the single-layer tubular type, which is just a plain helix of wire, and this is a very convenient type for most purposes. Of late years, however, the multi-layer coils have come into extensive use and have proved their great value. They are more especially useful in reactance circuits, as will be shown later.

In the previous article it was stated that inductance necessitated a length of wire preferably in the form of turns, and that two turns had four times the inductance of one turn, provided they were close together. In the tubular inductance, for the sake of convenience in tapping off, these turns are in the form of a helix, but there is no reason why they should not be piled up spirally on top of one another if they are properly insulated.

The terms helix and spiral are often interchanged, and to avoid any confusion it may be advisable here to define the two words as they are used in this article. This is done in the sketch, Fig. 1. It is possible to obtain any amount of inductance by winding the wire in spiral fashion.

There are numerous varieties of multi-layer coils, each having its own uses and advantages. In general, spiral coils take up much less room than helical coils of the same wave-length, and are thus useful for long-wave reception. It will be noted, however, that they cannot be tapped off to vary the inductance with the ease that tubular coils can be, but there are other ways of obtaining the same effect.

When it is desired to tune in widely different wave-lengths with the same set the usual practice is to make a number of coils in progressive sizes and then arrange

a simple form of attachment to the apparatus so that they are all interchangeable. To get fine tuning a variable condenser is shunted across the coil. To tune a receiving circuit to a definite wave-length either its inductance or its capacity may be varied, or both, but to get the best results from receiving circuits the capacity should be kept as low as possible. Thus in the tubular coils, for low wave-lengths it is not necessary to shunt the inductance by a condenser, as the self-capacity of the coil itself is sufficient, but for long wave-lengths and for spiral coils (except when they are coupled inductively) it is always necessary to have a variable condenser, although it need only be a small one. There are many types of spiral coil, but only those best suited for the amateur will be described here. The first is the basket coil.

The Basket Coil

This is only suitable for fairly low wave-lengths, as a large number of turns would make an unwieldy affair of it. The coils can be wound on a circular former with radial spokes like a cart wheel (see Fig. 2). A suitable size is $1\frac{1}{2}$ in. inside diameter with seven or nine spokes. French nails are quite suitable for the purpose, and they must be removable. The wire is wound basket fashion, going alternately to one side of one spoke and then to the other side of the next until the coil is of sufficient size. The whole is then dipped in hot paraffin wax, and when it is cool the spokes can be pulled out and the coil slipped off the former. These coils are best mounted between pieces of fibre, as they are rather fragile and therefore need some support.

A SINGLE

Our esteemed contributor, J. FRS.
No. 5 of "A.W." "A Single-valve

The Slab Coil

For longer wave-lengths slab coils may be used. In these the wire is wound on a bobbin, layer upon layer until sufficient turns have been obtained. The former (see Fig. 3) and coil can then be soaked in paraffin wax, and when hard the coil taken off. Although this is a simple type of coil it has several disadvantages, and is not very strong mechanically.

The Honeycomb Coil

This has been described in an earlier article (see No. 2 AMATEUR WIRELESS). It is wound on a former somewhat similar to the basket former, but with two sets of spokes, each set being about 1 in. apart. The chief disadvantage of this coil is that it takes a long time to wind and is rather clumsy to use on account of its thickness. These coils are also sold ready mounted in holders with plug and socket for fixing in a set.

Lokap Coils

These are sine-wave lattice coils somewhat similar to the honeycomb, but thinner and more compact. They are machine-wound and consequently can be made very quickly, as the wire has only to be fed on to the former, and is guided into its correct position by a device on the machine. Coils of any reasonable wave-length can be wound without difficulty.

Mounting

There are many ways of mounting multi-layer coils. Perhaps the simplest way is to connect flexible leads to the ends of the coils and slide them over the former as shown in Fig. 4. This has the objection that accurate adjustment cannot be obtained. A better way is shown in Figs. 5 and 6, and is used in the heterodyne receiver shown in the photograph. A piece of hard-wood $\frac{1}{2}$ in. thick is cut to the size shown in Fig. 5, and the coil when finished (coils $\frac{1}{2}$ in. thick are best for these holders) is tied in position with a piece of thread. The ends of the coil are brought out and screwed under washers, the heads of the screws serving as contacts to go in the clips. The coil and holder can then be dipped in molten resin; this will make a solid job of it and fix the coil firmly to the holder. When set the coil may be given a coat of shellac varnish and allowed thoroughly to dry. This will

VALVE HETERODYNE RECEIVER

described in "Receiving Set" and "How to Make It." The following article, by the same author, takes the amateur a stage further and will serve as an easy introduction to the use of multi-layer induciance coils.

Amateurs intending to make this receiver should see the Special Note on p. 310.

prevent the stickiness that resin leaves on the fingers.

Range

For a range of coils to tune 150 to 3,000 metres the following number of turns will be found suitable: One coil each of 25, 30, 35, 40, 48, 58, 70, 85, 105, and 130 turns.

Connections

The diagram of connections (Fig. 7) will now be dealt with. Supposing the reactance coil to be removed and the leads short circuited, the diagram would be exactly the same as that for the single-valve set, using the valve as rectifier and high-frequency amplifier combined. The minute currents in the aerial circuit are magnified into stronger and uni-directional currents in the plate circuit. By using the reactance coil as shown these currents will increase the current in the aerial circuit, which will again increase the current in the plate circuit and so on until the valve becomes what is termed saturated, hence the term regenerative circuit. The ele-

mentary theory of this process has been dealt with in other articles.

It must be remembered that by carelessly adjusting the coils the valve will howl, and the aerial will emit oscillations which may interfere with other stations. It is for this reason that no one should use such a circuit until he is thoroughly acquainted with its principles, so that he will not be causing annoyance to his neighbours.

Construction

The set shown in the photograph was made up according to this diagram of connections and gives very good results on a short indoor aerial. The coil mounting for holding the coils in place are made of springy brass or copper strip. They are held in the upright piece by four 1 in. by No. 4 B.A. brass screws. The nuts and the connecting wires are clamped under washers. Care should be taken that all the coil holders have the same distance between the heads of the screws, so that they will just spring into position nicely when placed between the clips.

No dimensions have been given for the woodwork, as these will vary according to the position occupied in the set and the quantity of wood available. The variable condenser can easily be built up from parts or purchased whole. Complete sets of parts are now advertised for sale, and it is worth while getting one of a capacity up to .001 mfd., if possible, as this will always be useful. When the apparatus is connected up the amateur should try the small coils first. The reactance coil may be a little smaller or the same size as the tuning coil. If all the connections are correct and the reactance is the right way round it should be possible to hear continuous-wave stations by turning the knob of the variable condenser and altering the distance between the coils. These stations will come in on a very high note, gradually going down to a low one and then back to a high one again as the knob is turned. If they are not heard the connections to the reactance coils should be reversed. It is no use turning the coil round in the clips, as that will make no differ-

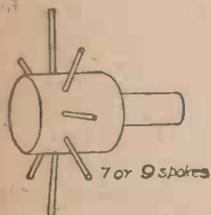


Fig. 2.—Former for Winding Basket Coils.

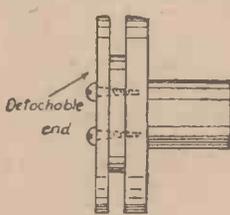


Fig. 3.—Former for Winding Slab Coils.

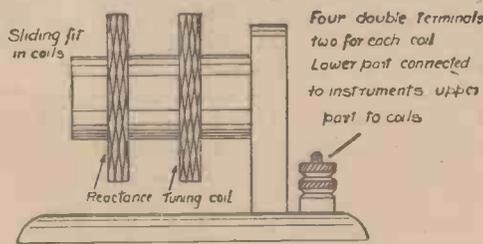


Fig. 4.—Simple Coil Mounting.

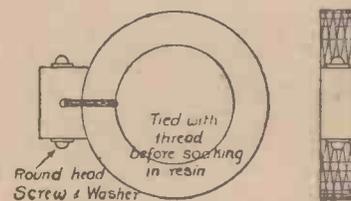


Fig. 5.—Better Method of Mounting Coils.

THE WORKING DIAGRAMS



Fig. 1.—Spiral and Helix.

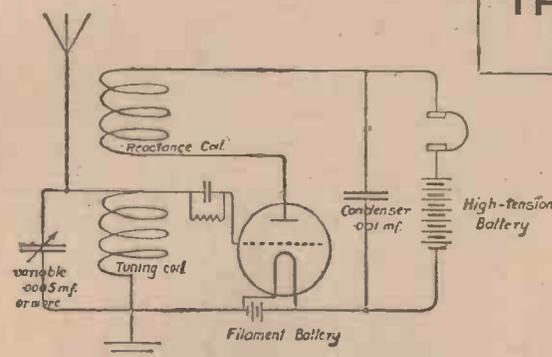


Fig. 7.—Diagram of Connections.

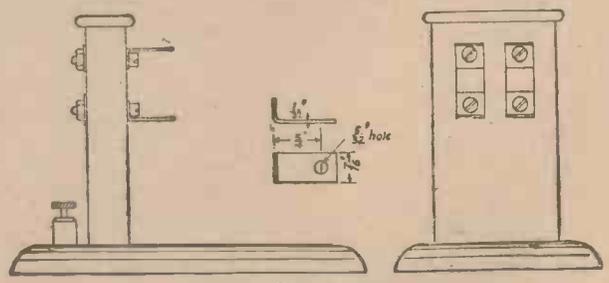


Fig. 6.—Coil Stand, etc.

ence. If, however, the coil mounting shown in Fig. 4 is used it will be sufficient to turn the coil round.

When the coils are far apart spark stations will be heard in their usual singing note, but when the coils are brought closer together they will sound more like a hoarse croak and the individual note will be lost.

If a loud rushing noise or a whistle is heard the coils must be pushed apart immediately, as the set is then radiating.

Special Note

The set described in detail in this article was designed for use on a small indoor aerial. Any readers wishing to make a set to connect up with a standard post-office aerial must adopt certain modifications. It will be observed that the reactance coil in Fig. 7 is coupled with the aerial tuning coil, an arrangement forbidden by the P.M.G. on a standard aerial.

Fig. 8 shows the modified diagram which must be used in this case. Three coils are used: the aerial tuning coil, the

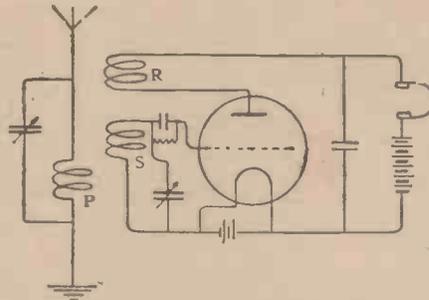


Fig. 8.—Circuit to Prevent Re-radiation.

secondary, and the reaction coil. The secondary is between the two others. With this modified arrangement there is no danger of radiation except by gross carelessness on the part of the operator.

J. F. S.

Advertising

by wireless telephony, Five minutes might be allocated between every three or four items on the programme, or once every hour as found most convenient, and one hour a day might be set aside; this latter, would, of course, be at a lower rate to the advertiser.

It has been said that advertising would make wireless telephony objectionable, but if so, does it not apply to the curtains of theatres, to the backs of programmes, to the tickets themselves, to our artistic weeklies and monthlies with a few pages of reading matter wedged in between reams of advertisements? The blue sky itself has been blotted out at £100 a letter. Do we complain or can't we?

Advertisements would bring in a big revenue. I would not object to a certain amount of advertisements myself, but this brings me back to my original point that the public must be consulted.

The Users Must Pay

whether or not they would mind a low licence fee, plus a few minutes devoted to "Pears' Soap" or "Lipton's Tea," or whether they would prefer a higher licence fee and no advertisements.

I am convinced of the need for a licence holders' protection society, but this name is already monopolised by the beer trade. I suggest Radio Association as a possible name. I should be very glad to hear from those of your readers who would care to co-operate in forming such a society (which has already been assured of powerful support) and assist in putting broadcasting and radio-telephony on a sound footing.

The Manufacturers' Side

To The Editor, "Amateur Wireless"

SIR,—So many prejudiced and pannicky statements have been made with reference to broadcasting that we think it necessary that a statement of our side—that is the manufacturers' side—of the question should be given for the enlightenment of the public.

In the first place let it be said that had it not been for the help and assistance given and promised by the Postmaster-General to wireless manufacturers, broadcasting, so far as England was concerned, would be still a thing for the phantom future. Many difficulties have confronted the wireless manufacturers on the broadcasting question, but, thanks to the small committee appointed to deal with them, these obstacles have been surmounted. It is already known that the manufacturers are going to run the broadcasting stations, and, of course, to do a thing of such national magnitude it needs money.

Manufacturers, therefore, are investing the sum of £100,000 in this undertaking, and naturally, when such a huge sum is going to be expended, some little assur-

"Broadcasting - - A Rumour"

Mr. L'Estrange Malone's Article, continued from page 300.

Should be Less Secrecy

and that the interests of the public in general, and the prospective broadcast receivers in particular, ought to receive more consideration even to the extent of representation on the board of the Broadcasting Company.

Wireless telephony can have an enormous future before it, but it requires men of wide vision if it is to be established on sound foundations.

Let us try to take the long view of the problem. The two main questions which require much hard thinking are:

1. What are the uses and benefits of wireless telephony?
2. How can it be placed on a sound commercial footing?

(1) One cannot believe that concerts, etc., will really attract a very wide public by themselves; if music, singing and perhaps some academic news is all one is to hear, broadcasting will be hardly more popular than the gramophone. The intellectual appeal to "amateur scientists" will help a temporary boom, but the top of the curve will soon be reached, and before many years the receiving instruments will be unused and covered with as much dust as the electrophone.

If wireless telephony is to have the effect on civilisation one hopes it will in bringing the peoples together, sporting news, general news, politics, and the headline summaries of newspapers must be given out; further, loud-speakers must be permitted in cinemas or other public buildings that desire it.

One can picture the smoking-room of a house, say, in the corner of which an un-

obtrusive mouthpiece ejects the news at intervals during the day, and round which people gather as they would to a tape machine, but at considerably less cost and less inconvenience.

It is therefore quite obvious that

The Public Must be Consulted

as to what they want; otherwise the Broadcasting Company will be presented to us as a *fait accompli*. If it is to be a success it must work in the closest touch with the press and the press agencies. So far from injuring the press, if properly organised it will be of wonderful assistance. For instance, the brief headline announcements of a railway disaster or of a mysterious murder might at once make people buy a paper. In many respects broadcasting will be a journalistic enterprise.

(2) Nobody denies the difficulty of paying for the broadcasting stations, but we have seen no definite figures. Amounts varying from £20,000 to £30,000 a year have been mentioned. The Postmaster-General ought to tell the public (who will have to pay the licence fees) how the Broadcasting Company is arriving at its figures.

What is to be the revenue? From preliminary inquiries I find that something not far short of 1,000,000 receiving instruments are on order and under construction to-day; at 10s. a head this would mean £500,000 a year. Even assuming that this is an over-estimation, far smaller figures would cover the costs without taking into consideration the profits which will be received by these particular firms by the sale of instruments.

I see no serious objection to

ance or safeguard is desirable. The P.M.G. has given a number of guarantees which are essential both in our interests and those of the public. For instance, if British manufacturers are going to spend £100,000 on broadcasting it would be unfair to allow the foreigner to dump his cheap sets into this country at their expense. If British manufacturers are going to popularise wireless in this country they should derive the benefit.

It is declared with alarm, solely by people who want to make the question a political one, that if such a ban as is proposed is placed on foreign sets the country is in danger of being monopolised by the Broadcasting Company. Let it be explained the Broadcasting Company is the British manufacturer. All of them will be shareholders of the company. It will not be in their interests to set up exorbitant prices, because there will just be the same competition among the British manufacturers as regards cheapest prices for the public.

The Broadcasting Company will in no way rule the policy of any British wireless firm on the matter of the sale of wireless sets. The company's work solely deals with broadcasting for the public.

It has been declared erroneously that amateurs in wireless are going to have their rights seriously curtailed. This is only a distortion of the facts, because, on the contrary, every encouragement and help will be given to bona-fide amateurs.

Whilst we do not in any way desire to enter into a controversy on this question, we would point out to those who cavil at the wireless manufacturers running the broadcasting either on political or selfish grounds, that the British wireless manufacturers are about to build an entirely new industry in this country and will employ thousands of hands. Such a venture we consider needs every encouragement.—GORDON SHAW & SON, 35, Whitefriars, Hull.



A Letter to the P.M.G.

THE following letter has been addressed to the P.M.G. :

DEAR SIR,—I am instructed by my committee to state that we view with considerable alarm the apparently inspired notices appearing in the Press to the effect that it is in the contemplation of the authorities to forbid the use of amateur constructed wireless receiving apparatus.

Other reports state that it is not intended that bona-fide experimenters will be hampered in any way, and it is this confusion of thought which is alarming us most, as we do not know where the official line will be drawn.

We are aware of the difficult position in which the Post Office Department has been placed by the insistent public demand for broadcasting services, and we are of opinion that the best interests of the science would not be served by allowing all broadcasting facilities to fall into the hands of a monopoly, unless it were a departmental one, which would be under the rule of the responsible Government.

We beg deferentially to offer the suggestion that all members of a properly organised and affiliated wireless society may be deemed for all purposes to be bona-fide experimenters, and I am authorised to state that my committee will do all in their power to assist in keeping order in the ether.—GEO. SUTTON, A.M.I.E.E., Hon. Sec., Wireless and Experimental Association.



The "Novel and Useful" Items Competition

The Result

READERS will remember that in our September 2 issue we printed four competition items and asked readers to vote as to which of the four was the best. We have pleasure in announcing that No. 3 was voted the best—by a majority of one vote only, No. 2 coming next—and we shall have pleasure, therefore, in sending a wireless set to Mr. L. Burgoyne, 93, Granby Road, Eltham, London, S.E.9. Between the three other competitors whose efforts we published we are dividing the sum of five guineas, more or less in proportion to the length of the items.

CORRESPONDENCE

A Practical Experiment—The Case for the Rubber-covered Aerial

SIR,—We are surprised to find in last week's issue of AMATEUR WIRELESS, under the title of "A Practical Experiment," certain statements regarding the suitability of rubber-covered cables as receiving aerials.

As patentees of the "Esi-Fix" one-piece

continuously insulated aerial, we take exception to these statements on the ground that they may lead to infringements of our patent rights, and also that they quite wrongly condemn the use of rubber-covered aerials.

Your contributor's one freak experiment is contradicted by our own experience and that of hundreds of satisfied users of our "Esi-Fix" aerials throughout the country (including many readers of "Amateur Wireless"). We have at this office a single 75-ft. "Esi-Fix" insulated aerial which was erected in a few minutes in circumstances which would be extraordinarily difficult for the ordinary bare-wire aerial, but which, contrary to the statement of your contributor, gives excellent reception under any weather conditions. Perhaps he would care to inspect this aerial and then make known his considered opinion?

In view of the misapprehension caused by your contributor's remarks, we should feel obliged if you will give suitable prominence to the real facts relating to insulated aerials, properly made, and to the proprietary rights of the undersigned in the use of these aerials as exemplified in our well-known "Esi-Fix" aerial.—CHAMBERS AND ELLIS (Craven House, Kingsway, London, W.C.2.).

Radiograms

THE rule which precluded the Germans from possessing a wireless installation has now been rescinded; as from this month the German can hire a wireless telephone from his nearest post office. Wireless subscribers over a large area are supplied with business news by wireless telephone.



Our frequent contributor, Mr. George Sutton, A.M.I.E.E., who is a member of the staff of the Engineer-in-Chief to the Post Office, has been awarded a special award of merit for the shell loud speaker illustrated in the last number of AMATEUR WIRELESS.



The United States Bureau of Standards has recently conducted some valuable experiments in connection with position finding as applied to wireless.

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Write distinctly, give all necessary details and keep to the point. Ask one Question at a time—never more than two. Send a Stamped and Addressed Envelope. Send the Coupon cut from this page.

One of the attractions of the wireless exhibition which has just closed was a competition for crime detection known as the Bleak Down Murder Mystery. By means of wireless telephone the competitor was enabled to interrogate the grange where a "murder" was committed, the police, ships at sea, or wherever the detective capabilities of the competitor led him to suppose that a clue might be obtained.

The Amalgamated Wireless Company of Australasia has entered into guarantees with the Commonwealth Government to erect a high-power station and to establish direct wireless communication with the British Isles; it is to be completed before March, 1924.

The Popham panel, used for the system of communication between the land and air forces, is to be replaced by wireless communication.

The latest information from Germany states that a Central Wireless Broadcasting Office has been inaugurated in Berlin in connection with the Post Office Wireless Station. Its object is, it is stated, to broadcast financial news to subscribers.

According to a statement of the Postmaster-General, a partial interruption of the cable service to the United States was satisfactorily bridged by diverting the work to the Post Office wireless station at Leafield.

According to an official report Leafield station, near Oxford, is distinctly heard at Perth, Melbourne, Sydney and several other places in Australia. Provided that there is an absence of atmospheric disturbances the reports sent out by Leafield are sufficiently clear to make them useful as news items for publication in the Australian press.

Upon the death of a fireman on a Canadian Government steamer it was discovered that there was no Prayer Book on board from which the service for the burial at sea could be read. A wireless message asking for assistance resulted in the required service being dispatched by wireless from the *Carmania*.

ANNOUNCEMENTS

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

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

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

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager or The Publisher, "Amateur Wireless," 1, Belle Sauvage, London, E.C.4.

CLUB DOINGS

Southwark Wireless Telephony Association

Hon. Sec.—MR. W. HELPS, King's Hall, London Road, S.E.1.

SOUTHWARK Wireless Telephony Association held their first meeting of the month at Headquarters on Sept. 3rd. The evening was devoted to wireless queries, answers to which were supplied by Mr. Winston. The secretary announced that he desired more entries for the Crystal Set Competition, which was open to all members of kindred societies. It is to be held on Sept. 17th.

Birmingham Experimental Wireless

(Affiliated with the Wireless Society of London). Hon. Sec.—MR. F. S. ADAMS, 110, Ivor Road, Sparkhill, Birmingham.

This club meets at Digbeth Institute, Birmingham, on alternate Fridays, at 7.30 p.m.

Wembley Wireless Society

Hon. Sec.—MR. W. R. MICKELWRIGHT, A.M.I.E.E., 10, Westbury Avenue, Wembley, Middlesex.

AN interesting series of lectures and demonstrations has been arranged for the session, and amateurs interested should send their names to the hon. secretary.

Hull and District Wireless Society

Hon. Sec.—MR. H. NIGHTSCALRS, 16, Portobello Street, Hull.

AN open meeting was held on Aug. 25th, when Mr. G. H. Stroug presided.

Discussion resulted in the decision to commence a series of instructional lectures for the benefit of new members.

Burton Wireless Club

(Affiliated with the Wireless Society of London). Hon. Sec.—MR. A. J. SELBY, 66, Edward Street, Burton-on-Trent.

THE above club paid a visit to the Burton electricity works recently, being conducted round the establishment by Mr. T Hall.

Wakefield and District Wireless Society

(Affiliated with the Wireless Society of London). Hon. Sec.—MR. ED. SWALE, 11, Thornes Road, Wakefield.

A MEETING of the above society was held at the Y.M.C.A., Grove Road, on Sept. 1st. Mr. Burbury, jr., delivered his lecture on "The Two Valve High Frequency Amplifier."

A discussion took place between Messrs. Burbury, jr., Wrigley and Bateman, regarding various circuits and valve oscillation.

Halifax Wireless Club and Radio Scientific Society

Hon. Sec.—MR. L. J. WOOD, Clare Hall, Halifax.

THE club room is now open three nights per week. The syllabus for the winter session, includes, apart from lectures for members, a "Popular Lecture," and a "Sale and Exchange, with Demonstrations."

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Saturday, Sept. 23, 1922

Fulham and Chelsea Amateur Radio and Social Society

Hon. Sec.—MR. R. S. V. WOOD, 48, Hamble Street, Fulham, S.W.6.

A MEETING was held on Sept. 30th at the Social Centre, Townmead Road, Fulham, this being the headquarters for a period of three weeks, where a meeting will be held each Wednesday at 8 p.m.

A discussion was invited from the members relating to aerials, insulation being dealt with by the secretary. Numerous interesting items were discussed, and the secretary gave his experience on one and two valves and answered a number of questions. Total membership is now 57.

East London Radio Society

Hon. Sec.—MR. L. E. LUBBOCK, King George's Hall, East India Dock Road, Poplar.

A MEETING was held on Aug. 29th in the lecture hall in Woodstock Road. A fair number was present. After the usual buzzer practice the evening was devoted to open discussion for the benefit of the newer members. The society's apparatus was laid on the table together with a crystal set and various matters explained.

All interested amateurs in East London are invited to communicate with the secretary.

FORTHCOMING EVENTS

Tuxford and District Amateur Wireless Society. Sept. 21. Morse practice. Valves and a one-valve receiving set.

TELEPHONY TRANSMISSIONS

Eiffel Tower (F L), 2,600 metres. Each afternoon, 6.10-6.30 p.m. (Saturdays and Sundays excepted).

The Hague, Holland (P C G G), B.S.T., on 1,085 metres. Sept. 14, 8-9 p.m.

Writtle (2 M T), 400 metres. Sept. 19, 8 p.m.

Marconi House (2 L O), 360 metres. Saturday, Sept. 16, 5, 6 and 7 p.m.

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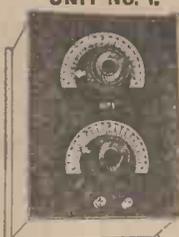
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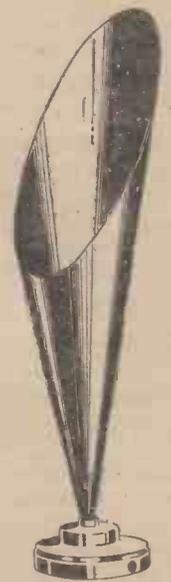
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32/6
 Packing & Postage, 1/3 extra



As no metal is used in its construction, the objectionable metallic "ring" so common to most Loud Speakers is entirely obviated, the result being a rich mellow note without the slightest distortion.

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French-polished selected walnut Cabinet, 10" x 8" engraved finest quality Ebonite panel, fitted with valve holders, H.F. transformer holders, filament resistance, gridleak and condenser, blocking condenser and terminals.

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Sloping front cabinet of selected polished walnut, with 14" x 12" finest quality Ebonite panel, engraved and fitted with valve holders, H.F. transformer holders, variable condenser, vernier condenser, rheostats, gridleak and condenser, blocking condensers, calibrated highly polished dials, and terminals.

Full instructions and wiring diagram with each Panel. If you are not completely satisfied, your money will be refunded in full on return of set in good condition.

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will give you perfect reception by connecting to your electric light mains by means of an adapter in a lamp-holder only, and **consumes no current.**

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With this little fitting telephony has been clearly received on the

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which has a crystal detector.

This latter instrument is a complete receiver with sensitive double head 'phones enclosed in a walnut cabinet and aerial, and earth wires, also insulators, are supplied. The detector, which is of the "Perekon" type with crystals in a dust-proof glass tube, is capable of extremely sensitive adjustment and is constant.

The tuner is designed for the most efficient reception of Broadcasting.

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Large or small Condenser Plates (Aluminium) ...	1/- doz.
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Ivory Scales ...	9d. each.
Condenser Box, in Polished Oak or Mahogany, 3 1/2 in. by 3 1/2 in. by 2 in. ...	4/6 each.
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All necessary parts for above Condensers, no drilling or fitting required, but unassembled ...	12/6 each.
Ditto, but without box ...	9/6 each.
Ditto, but without box and Ebonite top, suitable for panel mounting ...	8/6 each.
Crystal Detector, mounted on Ebonite, complete with Crystal	4/6 each.
Large or Small Contact Studs ...	9d. doz.
Valve Legs, complete with nuts and washers ...	2d. each.
Government Surplus Accumulators, 16 volt 15 amp. hrs., in case complete (f.o.r.) ...	20/- each.
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Packing and postage for last item, 1/3 each.	

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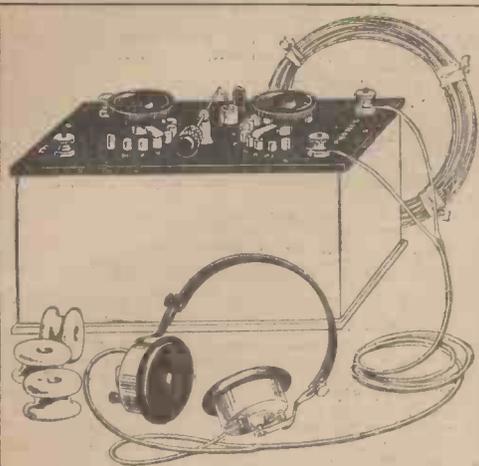
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Complete, as shown **37/6**
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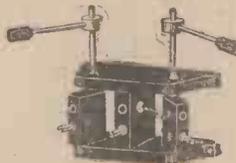


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Approx. Capacity in Micro-farads	No. of Plates	Price
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.0005	29	5/6
.0003	19	3/6
.0002	13	2/6
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These sets are complete ready for assembling and consist of following parts: Necessary Aluminium Vanes (fixed and moving), all standard size, large and small Spacer Washers, Centre Square Spindle with Knob screwed 2 BA, 3 round screwed Rods for sides, necessary Nuts and Washers, Brass Pointer, Engraved Scale, 2 Terminals, Lock Nuts, bush and 2 bronze, coil Spring Washers. Every part guaranteed best workmanship and quality.

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Aluminium Condenser Vanes, accurate to gauge. Fixed and moving, 1d. each; 1 doz. 9d.; 4 doz. 2/8; 6 doz. 4/3; 12 doz. 8/-; per gross, pairs, 14/- Larger quantities cheaper. (Reduction to callers.)

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Knobs. Very good quality with 2 BA nut in centre, 6d. each.

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Ebonite Valve Holders, complete, best quality, 1/9.
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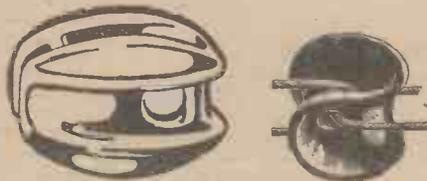
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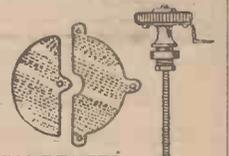


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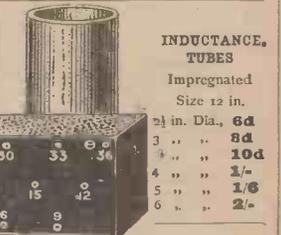
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100 to 1000 with clips
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Fixed and Movable Vanes, 3/16 in. diameter, 2/6 dozen.
Centre Rod, complete, 4 in., 4/6



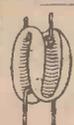
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Efficient & Reliable
15 Volts .. 3/6
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60 Volts .. 15/-



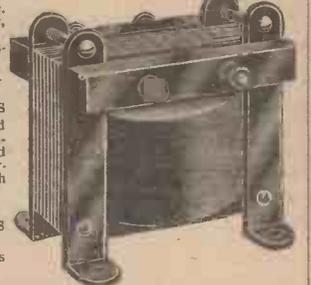
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2 in. 4/6; 2 1/2 in. 10d.
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per 100 ft.
3/20, 4/-; 7/20, 5/-; 3/18;
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Reliable Quality,
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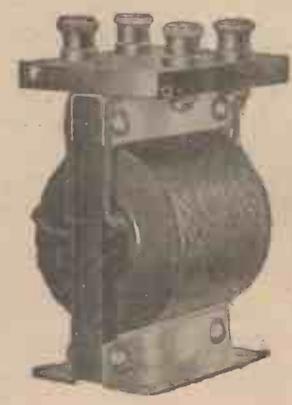
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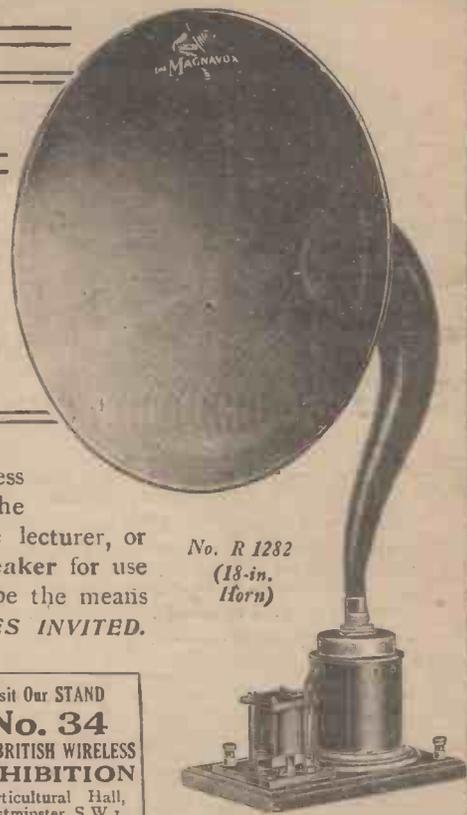
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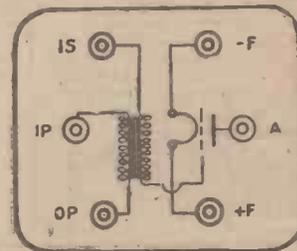
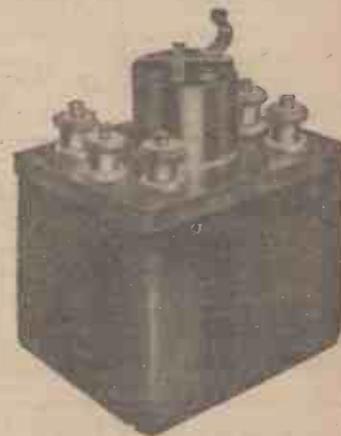
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Amateur Wireless And Electrics

No. 16

SATURDAY, SEPTEMBER 23, 1922

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TELEPHONY RECEPTION ON A SINGLE-
VALVE RECEIVER

BROADCASTING: THE SITUATION

HOW TO MAKE A MOVABLE FRAME
AERIAL

WIRELESS FURNITURE

A NEW VARIABLE CON-
DENSER

WIRELESS, "WIRED"
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A COMMERCIAL STATION WITH A
PHENOMENAL RECEIVING RANGE

A FIVE-VALVE RECEIVING SET

SOME INTERNATIONAL WIRELESS
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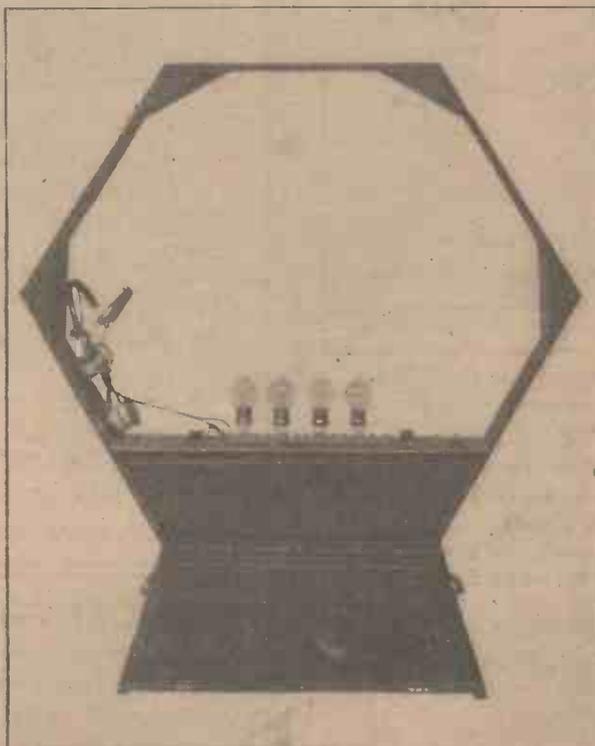
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Amateur Wireless

and Electrics

No. 16

September 23, 1922

A FIVE-VALVE RECEIVING SET

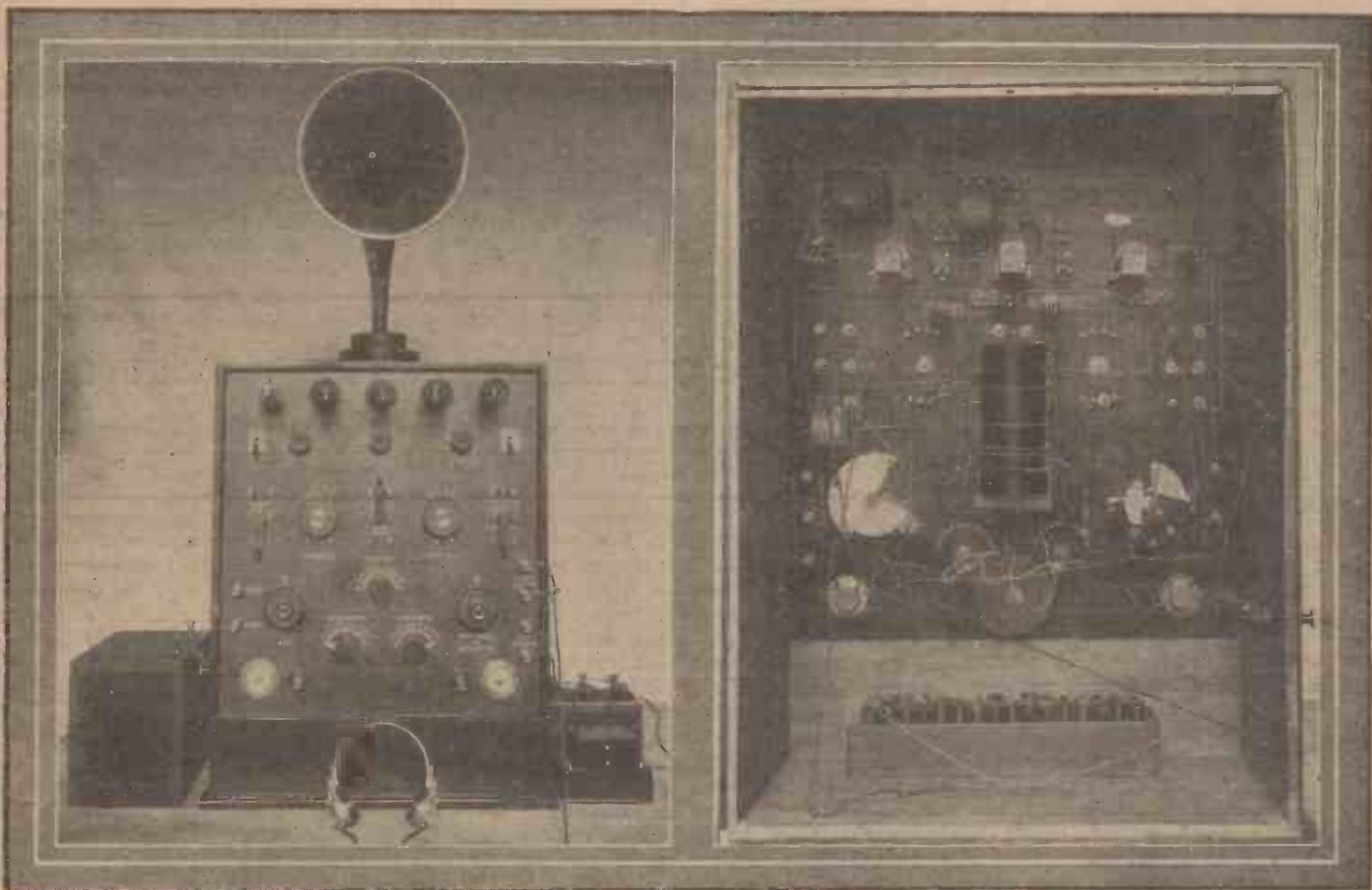
A Fine, Amateur-made Set with Loud-speaker

THE five-valve set shown here consists of two high-frequency valves, a detector valve, and two low-frequency valves, this combination, in the opinion of its maker, Mr. R. Horrocks, a member of the staff of Messrs. Vickers, Limited, being the most satisfactory for all general

The method of coupling on the high-frequency side is resistance-capacity, and is found to be remarkably efficient for amateur telephony. The low-frequency transformers and also the telephone transformer conform to the standard hedgehog pattern.

The A.T.C. is of .001 M.F. capacity, and the fine-tuning condenser .0005 M.F. The voltmeter on the left of the panel is for showing the accumulator voltage and the ammeter on the right for registering the amount of current taken by the valves.

When the Marconi concerts are being



A Five-valve Receiving Set Made by Mr. R. Horrocks, of Thornton Heath, Surrey.

purposes. The set has been made at home by Mr. Horrocks and covers all wavelengths from 300 to 25,000 metres.

For short-wave working (300 to 2,600 metres) a tuning coil with ball reaction is used, twelve taps being taken off the coil. For long waves a series of basket coils are banked together and twelve taps in all are taken from these.

For the H.F. valves V.24's are usually employed, the remainder being Marconi Osram "R" type. The filament resistances are of the Marconi pattern, being absolutely silent in working and allowing of a very fine adjustment. One L.F. valve may be cut out when desired by means of the switch shown in the top right-hand corner.

transmitted the telephony can be heard plainly, if the loud-speaker and microphone are in use, at a distance of more than 200 feet. Telephony within a radius of 350 miles can be heard, and Morse within approximately 3,500 miles.

We congratulate Mr. Horrocks on such a fine piece of amateur craftsmanship and on the excellent results he has obtained.

Telephony Reception on Single-valve Set—I

Mr. H. H. Dyer, the first-prize winner in our first competition, here carries his competition essay a stage further. Amateurs will benefit from the author's plain and practical instruction on the fuller use of his one-valve set.

HAVING had experience of the reception of spark signals with the single-valve set described in the article on page 170 of No. 9, you will be in a position to try telephony. You should have been able to receive spark signals from Nauen (3,100 metres) and Karlsborg (2,500 metres), which stations transmit at specified times. If you have not yet heard them satisfactorily as clear musical notes you should try to do so, otherwise it will be quite useless to attempt long-distance telephony. Try varying the voltage of your 60-volt H.T. battery, which should be provided with "tappings," until you find the best value for the particular valve you are using.

The Oscillating Point

The reception of telephony resembles that of weak "spark" in so far as it is necessary to get near to the oscillating point without actually reaching it. If you are close to a high-power station it should be easy to get good speech without approaching dangerously near this point, even with one valve. On the other hand, if you wish to receive over long distances you will have to get almost on the oscillating point, but on no account must your valve be oscillating. If this occurs, not only will you be unable to receive, but others round about will be unable to do so. There is nothing so annoying when receiving telephony as when someone starts radiating; in fact, on some occasions I have had to shut down altogether owing to this. I believe that some people have no idea that they are interfering, but the knowledge of this should be quite sufficient to ensure that it does not occur.

A Warning

Those who are selfish enough not to watch this point should remember that they are liable to lose their licence. There are ways and means of tracking down the culprits, and if people persist in this kind of thing I think the different wireless societies will have to take drastic measures. I have said rather a lot about this, for it is one of the things that will determine whether the reception of telephony is going to be a success or not.

Before you can put a value on advice about the reception of "wireless" you must know something of the circumstances under which such advice is given. For instance, if I lived, say, in the northern suburbs of London and, without informing you of that fact, simply told you that I received very good telephony from Writtle without any critical adjustment,

you might be led to expect similar results although you are a hundred miles away. Therefore, before going any further, I will tell you that I am roughly 100 miles from Writtle, 150 miles from Croydon, and 300 miles from Paris and The Hague.

Start with Paris

I consider that the best station to start with is Paris, which transmits on 2,600 metres between 6.10 and 6.40 p.m. (B.S.T.) each day except Saturdays and Sundays. From your previous experience you know the adjustment for 2,600 metres and the exact position of the reactance to be just short of the oscillating point. Having made these adjustments very carefully, switch on shortly before the time for Paris to commence. If, when they come on, you should get a note in your 'phones, without any hesitation loosen your reactance coupling, for your valve is oscillating. You may now tighten your reactance coupling very, very gradually as you approach the critical point. All being well, you should just be able to hear

speech. If you do so, do not take your reactance adjustment too far, but try moving your aerial condenser ever so slightly to see if you can improve the speech that way, always being ready to loosen your reactance coupling should your valve start to oscillate. Having got the best adjustment of the condenser, tighten the coupling the least little bit at a time, making a note of the exact position. You will eventually arrive at the point where you get oscillation and must instantly loosen the coupling. You may then tighten the coupling again, stopping just short of this point. You should now be receiving about as well as is reasonably possible with the rough adjustments at hand. With one valve you have to get so near the oscillating point that you do occasionally start radiating, but as you only radiate for a fraction of a second, I think so much is permissible until you have had practice, when you should be able to get to the critical point without causing any interference.

HERBERT H. DYER.

(To be concluded in our next number)

A Commercial Station with a Phenomenal Receiving Range

IN the extreme south of the South Island of New Zealand is the 30 kw. Telefunken wireless station of Awarua (call sign V L B), which was erected in 1913 to ensure day and night communication between that place and Sydney, New South Wales, a distance of approximately 1,225 miles. The aerial—of the umbrella type, consisting of 24 wires—is supported by a triangular-section steel lattice mast 400 ft. high. At this station remarkable receiving results are obtained, using only a single-valve circuit. The powerful stations around Honolulu can be heard easily in the daytime. In the evening Carnarvon, Bordeaux, Lyons and Nauen come in quite strong enough to give complete reception, and at night Annapolis, Tuckerton, New Brunswick, Darien and other high-power American stations are received very clearly.

The circuit used for these results is

shown in the diagram. In this A is a variometer consisting of two long coils wound in opposition and so constructed that one may slide completely within the

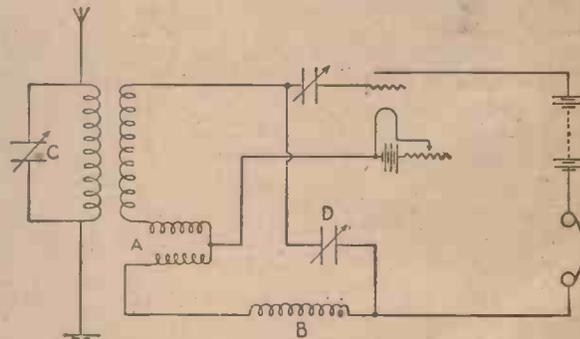


Diagram of Connections

other; B is the plate circuit loading inductance; C and D are condensers, each having a capacity of .004 mfd. The grid condenser is made variable for critical adjustments and no grid leak is used, the valve being of the "soft" variety requiring 24 volts in the plate circuit.

WIRELESS FURNITURE

A coming feature of the home is wireless furniture. The furniture of music—the instrument case, the music stool, easels and cabinets for printed sheets, etc.—has been added to within living memory by the gramophone cabinet, which frequently is an elaborate, costly piece.

Now comes the wireless cabinet, and it will soon prove a necessity. A collection of wireless apparatus on a side table can look very unsightly. The article on this page is illustrated by photographs specially taken at the Central Hall Exhibition, Westminster.



EXAMPLES OF WIRELESS FURNITURE

AMATEURS might well follow the example of some of the leading wireless manufacturers in enclosing receiving apparatus in suitable pieces of furniture.

For the people who install a receiver for the sole purpose of listening to broadcast concerts and speech (and eventually such people will probably form the majority of those interested in wireless), the nightly act of bringing out from various drawers

would be a built-in loud speaker in the upper part. A frame aerial could be constructed either on the back of a door or on a special framework inside the cabinet, in which case the whole receiver would be really self-contained; but this is not recommended unless at least a three-valve amplifier is used. Otherwise two terminals for the aerial and earth must project in some inconspicuous position.

Although a boxed-up set does not as



Top—Wireless Receiving Cabinet in Jacobean Style. (Maker: R. Scruby)

Left—Cupboard Doors open, showing Batteries.

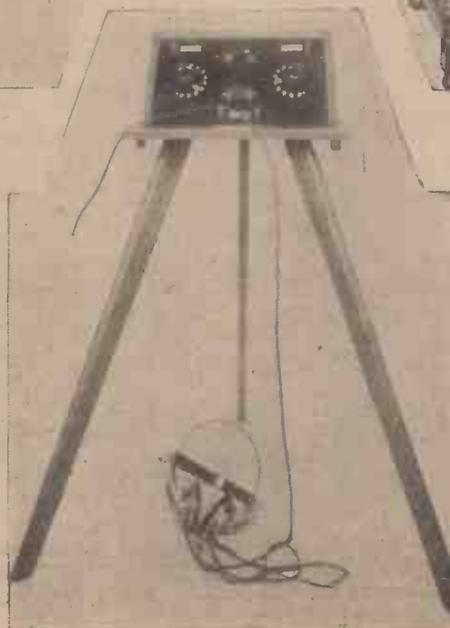
Right—Panel Reversed, showing Apparatus.

Bottom—Wireless Receiving Easel. (Makers: Union Wireless Co.)



and cupboards pieces of apparatus and connecting them together will speedily cause loss of interest except to enthusiasts. The average person will want a self-contained receiver always ready for use and enclosed to keep dust off and to prevent damage to the instruments.

Quite a number of pieces of furniture are suitable for the purpose, including roll-top desks, bureaux, china cabinets, gramophone cabinets, etc. For rooms which have furniture of a decided period—as Queen Anne, Jacobean, Chippendale, Sheraton—a cabinet to match the surroundings can be easily adapted. It should contain the adjustable parts of the apparatus in a convenient position, the high- and low-tension batteries underneath or at the back, and a special refinement



a rule appeal to the experimenter, he will probably appreciate a cabinet set especially when tired of temporary connections. L. W.

It is now officially announced that the supposed messages from Mars which were received by Senatore Marconi when cruising in the Mediterranean were from Schenectady, the home of the General Electric Company.

A wireless telephone exchange now in existence at the Croydon aerodrome (Waddon) enables the officer in charge of air traffic to keep in touch with machines on the Channel.

Movable Frame Aerial for Direction Finding

An Article to be Read in Conjunction with the Series Appearing in Nos. 10, 12 and 15

There is a considerable amount of excitement to be obtained in operating with a movable-frame aerial. The advantages of a frame aerial for the amateur are: (1) It is specially sensitive to one particular wave-length; (2) owing to this

ing the size (area) of your frame, you must decrease the number of turns. In practice, of course, it is not convenient to alter the size of a frame each time it is desired to receive on a different wave-length; so one must adopt means of

Provided the necessary conditions of insulation and symmetry (preferably a rectangle) are fulfilled, the actual design of the frame is immaterial and will vary with the material resources and ingenuity at the disposal of each experimenter. For the guidance of those who have not yet essayed this task, however, two simple and useful forms of frame aerial will be described.

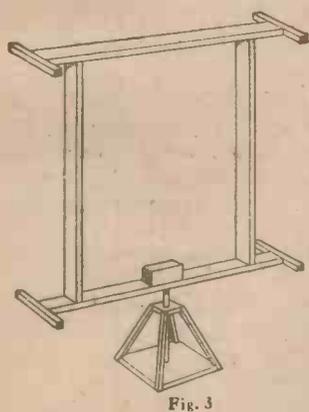
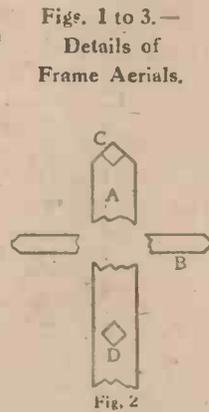


Fig. 3



Figs. 1 to 3.—
Details of
Frame Aerials.

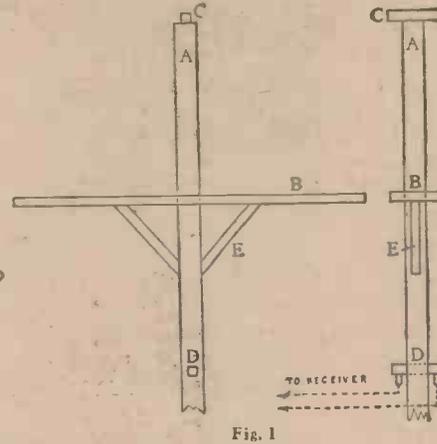


Fig. 1

fact, combined with the marked directional effect associated with it, it affords great "selectivity," that is, it possesses the quality of eliminating jamming; (3) it can be moved with ease to any part of the house or garden; and (4) there is no danger of it being carried away in high winds or tempestuous weather. As against these advantages there is the fact that it is much less "receptive" than an open aerial. This means that in order to get the same strength of signals as with the latter, a greater degree of amplification is required. A crystal receiver, for instance, would be quite useless with a frame aerial. At least two, preferably three, amplifying valves should be used in order to get good results.

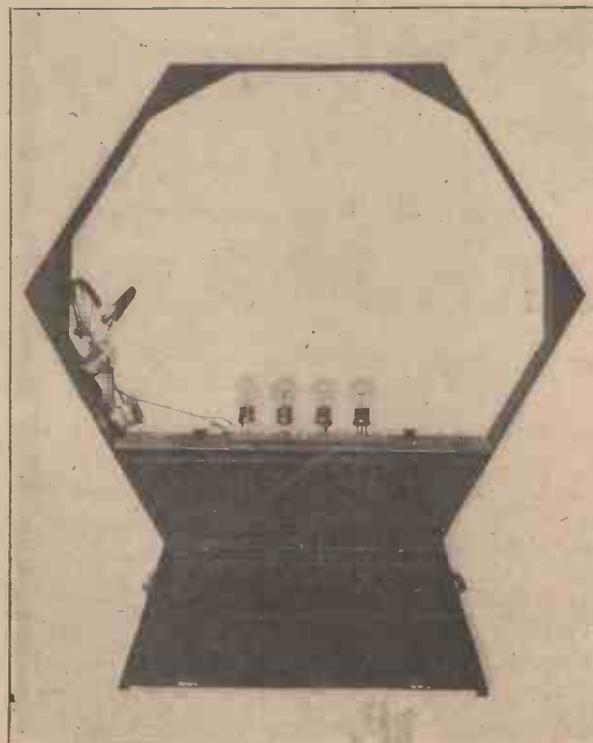
In making a frame aerial one very important point should be borne in mind. The sensitivity of a frame aerial varies as the product of the area of the frame and the number of turns of wire wound upon it. That is to say, by increasing the size of the frame or the number of turns you increase its sensitivity. But it must not be forgotten that by increasing the number of turns (the length of your aerial wire) you also increase the wave-length of your aerial. This means that the longer the wave-length you aim at receiving the more suitable will a frame aerial be. Another corollary from the same principle is that if you want to increase the sensitivity for a particular wave-length by increas-

increasing or decreasing the number of turns of wire. However, even this method is not very satisfactory. It is advisable, therefore, to make the biggest frame you can easily accommodate, and then ascertain by experiment the precise number of turns suitable for reception on whatever wave-length you wish to receive.

Fig. 1 shows a frame made out of two long and four short pieces of wood. The centre-piece A is a 6-ft. pole of about 2½ in. in diameter. It is pushed through a tight-fitting hole in the centre of a 5-ft. length of board B 6 in. wide and 1 in. thick. On the top of the vertical pole a cross-piece of wood C, 6 in. by 1 in. by 1 in., is screwed at right angles to the horizontal board. The distance from the top of the small cross-piece to the centre of the horizontal board is 2 ft. 6 in. At the same distance on the other side of the horizontal board another cross-piece D of the same size is inserted through a tight-fitting hole in the pole. This lower cross-piece is also at right angles to the horizontal board (parallel to the top cross-piece), and is fitted with two terminals from which leads are taken to the aerial and earth terminals of the receiver.

A variable condenser is connected across these leads for the purpose of allowing fine tuning. Two extra pieces of wood E are used to support the weight of the horizontal board. It will be noticed that at D some bunching of the wires will be inevitable owing to the obstruction of the pole. This can be eased by cutting shallow slots in the pole with a fine saw, care being taken not to weaken the pole too much. For the purpose of keeping the wires in place as they pass over the cross-pieces and the extremities of the horizontal board, it is advisable to cut small notches in each of the latter at equal distances apart.

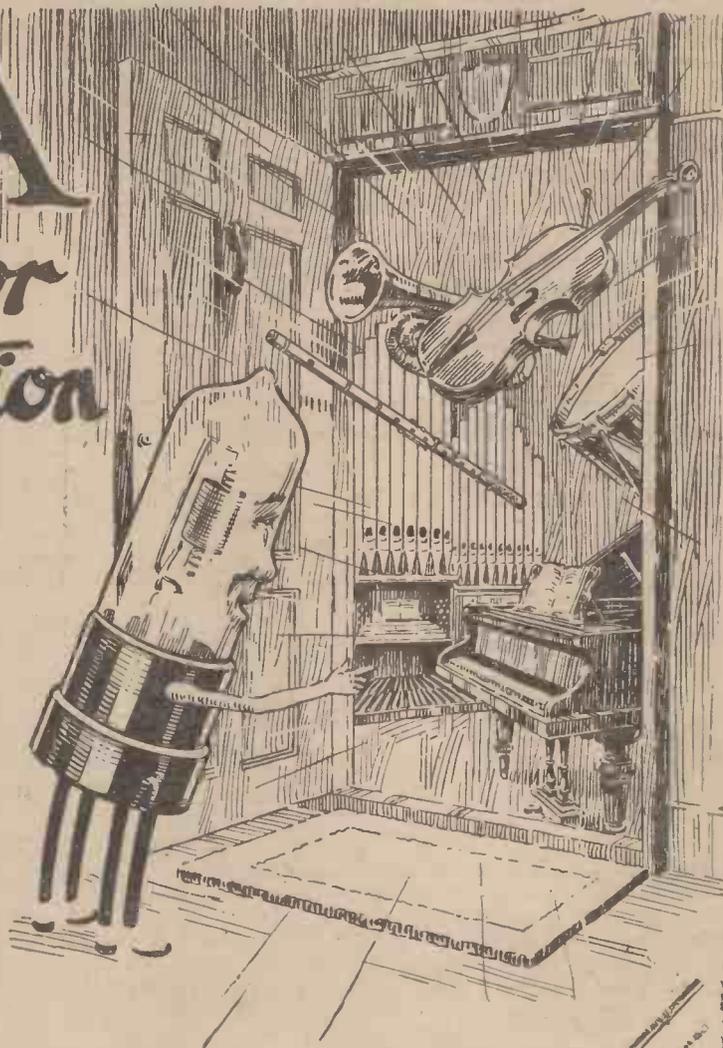
Great care must also be taken to preserve perfect insulation at these points. For this reason insulated (copper) wire should be used: either enamelled or cotton-covered, preferably the latter. Whichever kind of wire be used, however, its insulation is liable to be impaired at the corner bends. To avoid this the cross-pieces and the ends of the horizontal board should be covered with some insulating substance (ordinary adhesive "insulating tape" will do) before the wire is laid on them. An improvement in this form of aerial



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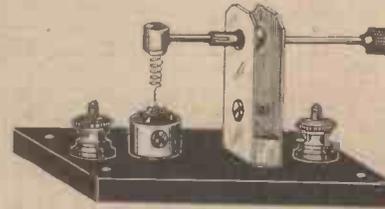
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would be effected by cutting the tips of the horizontal board and altering the angle of the cross-pieces in the manner shown in Fig. 2. The object of this is to secure greater efficiency by obtaining all right-angled bends in the wire.

A strong design for a frame aerial is illustrated in Fig. 3. Owing to its increased strength and rigidity much larger frames can be made on this pattern. Four pieces of wood (4 ft. by 3 in. by 1 in.) are fixed at right angles to one another as shown. At each of the four ends of the horizontal pieces a cross-piece (8 in. by 1 in. by 1 in.) is screwed on. (Good insulation can be ensured by using ebonite cross-pieces.) The frame thus constitutes a square each side measuring 4 ft. 2 in. The lower horizontal piece is screwed on to a rod about 1 ft. long. With either of the frames described above, rotation can be effected by pivoting the lower end of the rod as shown in Fig. 3. By fixing a compass card (the function of which has already been explained) to this base block and fitting a suitable pointer to the pole, directional readings of transmitting stations can be taken. On a frame of the dimensions shown in Fig. 3, about seven turns of wire, spaced $\frac{1}{2}$ in. apart, should give good tuning for the reception of broadcasting stations. With longer aerials the spacing distance should be increased. It is with the view to providing means for increasing the number of turns that 8-in. cross-pieces are suggested; they can, of course, be longer. If the frame were made of 8-in. wood throughout it would be both costly and clumsy.

There will be some, however, whose interest in a frame aerial does not emanate from any desire to find the direction of transmitting stations, but simply because of the unfavourable conditions which prevent the erection of an outdoor aerial. The ambition of such may be merely to hear broadcasting stations. In such cases a fixed frame aerial can be made to answer the purpose excellently, especially as, since it is not desired to rotate the aerial, more space will be available and, consequently, it can be made on a large scale. In certain cases the rafters in a loft offer a good opportunity for winding a good-sized frame aerial. Or, again, if you find that one of the walls of your room runs in a line with a broadcasting station, you have an ideal chance for winding a frame aerial on four good wall-plugs!

As a last word of advice, keep your frame aerial and receiving gear as far removed as possible from telephone wires and electric mains, etc. Also keep them at least a couple of feet above the ground. The question of making an outdoor directional ("balanced") aerial system has not been gone into because the practical difficulties involved render it outside the scope of the experiments of the wireless amateur at present.

M. E.

Ask "Amateur Wireless" to send you a list of practical books. Sent gratis and post free.

A New Variable Condenser

A Device to Eliminate Re-radiation

THE photograph illustrates a new design of variable condenser which is claimed to eliminate the possibility of re-radiation. The condenser is connected be-

tween them. By a suitable adjustment the variations in plate-circuit current are made to maintain a self-oscillation in the aerial tuning circuit when this is required for



A New Variable Condenser.

tween the plate circuit of the detecting valve and the aerial tuning circuit and provides adjustable capacity coupling be-

continuous-wave reception. The condenser here shown was recently exhibited by Autoveyors, Limited.

A Gramophone as an Interrupter

AT the conclusion of a recent article on a home-made clockwork interrupter it was mentioned that a gramophone could be used as a tikker by allowing one wire to rub lightly against the turntable. The writer having tried this method, which did not prove very satisfactory owing to the difficulty of obtaining a steady make-and-break, has fitted up the following improvement:

An old single-spring motor gramophone was available, having a turntable of about 8 in. in diameter, the circumference therefore being about 25 in.

A length of thin copper-milled strip, such as is used for ornamenting photo frames, etc., was obtained, the milling being about 40 to the inch. This was secured to the edge of the turntable by means of solder every few inches. It will be seen that this gives about 1,000 millings to the entire circumference.

The felt was removed from the turntable stop and a thin piece of springy

copper attached, the stop spring being so adjusted that the copper spring pressed lightly against the milling when the turntable revolved.

In order to make a good connection a piece of strip was attached to the milled copper and carried across the turntable, the other end being soldered to a copper washer which fitted tightly over the centre spindle. A piece of flexible wire was attached to the gramophone motor frame and another to the turntable stop, one of these wires being connected to one of the 'phone leads and the other to one of the detector terminals.

The speed can be regulated to a nicety by means of the motor speed regulator. Set at 30 to the minute, the necessary 500 interruptions per second can be obtained. The motor gives about 300 revolutions, a run of about ten minutes to one winding.

The tension of the copper tongue can also be nicely adjusted by means of the turntable stop.

F. B. R.

The Smallest Wireless Generator

The Atom and Its Radiations :: Visualising Hertzian Waves

THE atom is really the smallest wireless generator. Of course, it would be impossible for the eye to detect the radiation from one atom, but in the case of monochromatic light, that is, light of one colour only, all the atoms are sending, or preparing to send, "signals" of the same wave-frequency.

In a star, for example, there are millions and millions of atoms; they are not all tuned to the same signal-frequency, so instead of monochromatic light we get light of many wave-lengths. A prism may be used to separate the mixed-up rays into component colours.

Messages from the Stars

And what about the "signals"? What information does the star send across the billions of miles of space? As you might expect, being millions of miles away from its neighbour, all it can talk about is itself. You may reflect that many people are just as bad with far less excuse.

A star tells how old it is, how hot it is, and how big. Also what it is made of. It will also often give a little information about a near neighbour which we cannot always see. Of course, one must be able to decode these messages correctly. That is another matter.

How the Atom Sends out a Wave

The atom itself is very much like a small solar system. But the "sun," the nucleus, is not large. It is negligibly small compared with the size of the atom. Nevertheless, in it is concentrated practically all the mass of the atom. Another important difference is that whereas the electrons move round the nucleus in orbits, they are different from planetary orbits in that they do not gradually diminish. An electron moves from an outer orbit to an inner one in a jump. No one knows just how. But it is during this jump that the electro-magnetic wave is sent out. Only certain orbits are possible, and the electron falls from one to another of these, perhaps passing a few possible orbits on the way. This occurs when the atom is stimulated by heat or electricity.

It is fortunate that our earth behaves differently! Of course, both the electron and nucleus are charged with electricity, whereas the earth and sun are not, at least not to such an extent.

All electro-magnetic waves then are produced by persuading groups of electrons to change their velocities very rapidly in some orderly manner. Hertzian waves are produced by rapid oscillations of electrons in the wires forming the aerial and in the earth below the aerial.

The formation of these waves can be visualised by considering the action of the well-known "tubes of force."

If you can imagine the inner pneumatic tube of a bicycle wheel cut across and then re-sealed so as to form a straight tube instead of a ring, with both ends fastened to two objects some distance apart and at such distance as to keep the tube in tension, and finally with the tube inflated so that there is a lateral pressure, you will have a fairly good idea what a tube of force is like.

The tube of force is attached to a charge at each end—charges of opposite sign. Hence the attraction of opposite charges. But the tube of force shrinks until the charges neutralise, and never sags like the tube of india-rubber. Further, there is not one, but many tubes, and on account of the tension they are crushed together, this crushing force being neutralised—when the tubes have settled quietly in some position—by the lateral pressure.

Detaching a Closed Loop

Now see what happens when the aerial is charged up, first with electricity of one sign then with that of the other.

Consider one tube of force starting from a charge on the aerial and with the opposite end on earth. A signal is being sent, so that next instant the position of the tube is reversed.

What has happened? The two ends of the tube have approached along the conductor and at such speed that the tube has become looped at the mid-point. (It must be remembered that the tubes have inertia.)

The tube immediately breaks off at the crossed part, and the shortened tube rapidly growing pushes the closed loop or ring away. This having now no charge to hang on to, moves away into space with the velocity of light. It is an electro-magnetic wave. At the receiving end it is absorbed by a suitable circuit, in which process it produces a small current.

These tubes of force, which are conceived as made up of "lines" of force, have been the subject of much speculation. J. J. Thomson suggests that a line of electric force may consist of a central axis around which spin with the velocity of light small electron-like bodies, much smaller even than electrons. If the line of force, and of course the tube of force, is a manifestation of the action of material particles, then the ether theory is not required.

Now little is known of the actual process of radiation from atoms; the clue will be given by consideration of the large wireless oscillator.

Working the other way, facts known about atomic vibration may lead to important discoveries in wireless. One important fact in connection with the atom is that it cannot receive or emit energy (radiation) except in certain definite amounts or bundles. If the atom radiates energy, it gives out a definite minimum quantity depending on the frequency of the radiation, or nothing at all; and in receiving, the energy must exceed a certain definite amount (of course very small) before the atom can absorb it.

It is interesting to speculate on the parallel phenomenon in wireless.

When one recollects that on a dark night the light from a small lamp, representing a very small outlay of energy, can be seen many miles away, while the radiant heat can also be detected by sensitive apparatus, it seems natural to conclude that our present wireless apparatus is really very inefficient, and that time will evolve more delicate and less cumbersome devices.

J. H.

International Wireless Publications

MOST amateurs reading Morse signals are curious as to the names of the stations they hear. When listening in it is decidedly tantalising to read O P K or B V Y or P Q T and not to know the name of the station or whether it is ashore or afloat.

The International Office of the Telegraph Union at Berne publishes an alphabetical list of all call signs ("Liste Alphabetique des Indicateurs d'Appel," 6 francs (Swiss), post free). The last edition—No. 6—was published in April, 1921, and the price includes all supplements to that edition, nine of them having been issued already. This list merely gives the call sign, the name, and whether the station is on board ship or ashore.

A more complete list published by the same office contains an alphabetical list of all stations, the geographical position of land stations, normal range, system, wave-lengths used for transmission and hours of service. This is the "Nomenclature Officielle des Stations Radiotelegraphiques, Edition Anglaise," 18 francs (Swiss), post free. The last edition—No. 7—was published in June, 1921, and the price includes all supplements to that edition, eight having been issued already.

L. W.

RADIOGRAMS

SEVERAL of the schools about the country are now including instruction in wireless as part of their curriculum.

A British Wireless Relay League has been formed in Manchester to organise and safeguard the interests of wireless amateurs.

Weather forecasting by means of wireless was the subject of an experiment during the meeting of the British Association at Hull.

A wireless telephony station at Madras will probably be converted into a high-speed automatic plant for operation inland and also to Rangoon.

A correspondent to a contemporary raises the question of whether the transmission of wireless impoverishes the air of its life-sustaining qualities!

The transmission of handwriting, pictures and photographs, it is stated, are made possible by the latest invention in connection with telephotography.

A contemporary is waxing furious over the use of the term "wireless" instead of "radio." "The rose by any other name—" Or "What's in a name?"

The Government has entered into an agreement with the Marconi Company for the erection of a wireless station in South Africa capable of direct communication with this country.

Parents who lost their children at the recent exhibition were quickly enabled to locate them by means of wireless telephonic communication between one part of the building and another.

The latest additions to the pseudo-scientific arguments relating to nomenclature in connection with wireless are "far speaker" and "far writer" as substitutes for wireless telephone and wireless telegraph. Next, please.

It is reported that the Postmaster-General has not yet approved of the articles of association of the Broadcasting Company. This delay has partly been caused by the difficulty of safeguarding the interests of the public and the small manufacturer.

The progress of the air race for the King's Cup was broadcast by wireless telephony.

The Postmaster-General has been asked to receive a deputation representing the wireless trade outside the broadcasting combines.

Senatore Marconi prognosticates that in future a Mrs. Beeton will appear to broadcast culinary notions to housewives. Aren't things bad enough as they are?

The Glasgow and District Radio Club are shortly holding an exhibition in that city. The secretary's request to the French authorities asking that a short message might be sent specially to the exhibition from Eiffel Tower has been acceded to.

In Glasgow an enterprising business firm has installed a wireless time service. An electric lamp is fixed in a prominent position in one of the front windows, and is connected to the firm's receiving apparatus in such a way that the lamp flashes as the signals are received.

In France regulations are in preparation under which the public may be allowed to use transmitting as well as receiving installations. At present it will be remembered there is no restriction on the use of receiving apparatus in that country.

A meeting of exhibitors at the first Radio Exhibition and Wireless Convention was held during exhibition week at the Central Hall, Westminster, S.W.1. Mr. Alex. Stewart, of the Wireless Exploitation Corporation, was in the chair. The meeting was unanimous in approving this association as being fitted to serve the requirements of the industry, and appointed a provisional committee to consider and settle in draft what should be the aims and objects of the association and the steps to be taken best calculated to achieve them. Practically all those attending pledged their support. A provisional committee has also been appointed for the northern area, which is being operated from 70, Central Buildings, 41, North John Street, Liverpool, the southern area being operated from Dundee House, 15, Eastcheap, London, E.C.3. Any inquiries and membership applications may be addressed to either of the above offices. A general meeting of members will be called at an early date to receive a full report from the provisional committees.

According to the latest reports Captain Amundsen, at present *en route* to survey the Arctic region, will broadcast Eskimo music to the world.

It is reported that the Meteorological Office has prepared a scheme to broadcast weather reports to come into operation directly the broadcasting comes into being.

Much irrelevant flapdoodle is being published by the daily press on the question of thought-reading by wireless. The credulity of the daily press leaves us cold.

The new Wireless Telegraphy and Signalling Act has now been passed and widens the powers conferred on the Postmaster-General by the Wireless Telegraphy Act of 1904.

The Postmaster-General, it is reported, has severely criticised not only the tentative agreement between his department and the broadcasting company, but also that made between the broadcasting company and the members of it.

A youthful reader, no doubt with his eye to business, made considerable pocket money by selling posters containing the latest information regarding the air race. His set, it is said, was made from instructions in the "Work" Handbook.

America promises us a new method of waging war in her promised production of a giant airship capable of carrying large numbers of pilotless gliders laden with bombs. These gliders would be guided to the spot at which it was desired to drop bombs by means of a wireless ray.

Apropos of a recent concert broadcast from The Hague, the *Musical News and Herald* comments as follows: "What a programme to broadcast! If only the *Daily Mail* would send its own critic and allow him truthfully to criticise we should have even more caustic remarks than come from his pen after he has been forced to attend a *débutante's* concert, and if the *Daily Mail* would take the said gentleman's advice on the arranging of a programme items could be given which would be good even though well known." We should like to know from these musical critics when a spade is a spade. The majority enjoy these concerts. It doesn't matter about the highbrow few,

Will Amateur Wireless Clubs please keep us informed of their activities.

A RECENT invention in wireless, by which the usual aerial system may be dispensed with, is now the subject of much interest in this country. The scheme consists in using the electric-lighting supply mains as an aerial, the usual earth connection being retained. This invention is the outcome of experiments made some ten years ago, but whereas the original scheme made use of telephone wires running directly from the transmitter to the receiver, the latest invention makes it possible to use electric light mains as an aerial in conjunction with ordinary wireless receiving circuits, irrespective of the position of the transmitting station. That is, it is not necessary to have lighting mains running all the way between the transmitter and receiver.

Before discussing the methods of so using the mains and the results obtained by experiment compared with the more usual aerial system, it will perhaps be as well to say something about the earlier experiments with wired wireless, which in its time has had the attention of most of the well-known workers in the field of wireless.

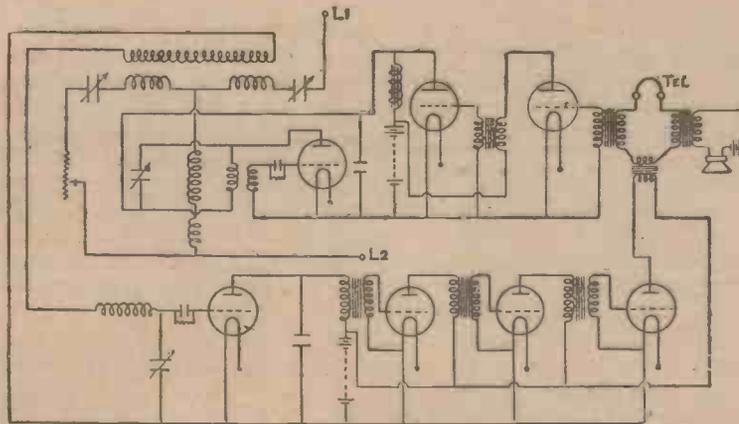


Fig. 1.—“Wired” Wireless Transmitter and Receiver: London-Bristol Circuit.

The Inventor and Original Patentee

The inventor of the system appears to be Mr. George Owen Squier (now General Sir G. O. Squier), who, in 1911 or earlier, conducted experiments over a telephone line which at the time was carrying its normal telephone traffic. He employed a high-frequency alternator for setting up the waves, and worked over the line in one direction only. The success achieved in this initial experiment showed the ultimate importance of the invention which, with certain modifications, could be employed for duplex or even multiplex working, and Mr. Squier therefore took out master patents.

It was not until the thermionic valve came into use as a generator of high-frequency oscillations that any practical progress with the scheme was made, but with the advent of valves, such well-known scientists as J. J. Thomson, Flem-

ing, Wagner and Lee de Forest began to take an interest in wired wireless. The problem of devising suitable multiplex telephone circuits was carefully considered in this country, and also in America and Germany, and much good work was done towards overcoming the many difficulties in the way of making the system a practical proposition.

The Simple Idea

With regard to the object in view, the original idea as put forward by Squier was very simple. Waves set up by a telephone transmitter were to be guided by wires to a distant receiver, and both transmitter and receiver were to be tuned to the same wave-length. It was therefore thought that several pairs of transmitters and receivers could be used on the same line without interference, provided each

pair employed a separate wave-length. Unfortunately it transpired later that the number of pairs which could be used on one line was very limited, as will be seen shortly.

A curious flaw in the theory of the circuit manifested itself when the first experiment was carried out, using valves to generate the required high-frequency oscillations. Theoretically the transmitted waves should not flow along the telephone lines, but should simply be guided by them to the distant receiver. Accordingly, it was thought that the usual losses in the telephone line would be non-existent or, in any case, very much reduced, and therefore the greater part of the transmitted current should reach the receiver. This turned out to be quite wrong, and it was soon made clear to the experimenters that high-frequency waves in wires, follow exactly the same laws as telephone waves,

WIRELESS, “WIRE

ELECTRIC-LIGHT MAINS AND

EDITOR'S NOTE

OF the subject of that the British The inventor of scientist who is well training in England) could be used as a m article (to appear in wireless is, describes ceeds to reveal to the amateur the lines on which Mr. P. T. Beard, gives the results of many first-hand even when lighting mains do not exist but where

the only difference being that the wired-wireless waves sustained much greater losses by reason of their higher frequency.

A Test

The first test in this country dispelled the “no losses” theory. This test was carried out with a wireless-telephony transmitter (tuned to a frequency of 500,000, equivalent to a wave-length of 600 metres) loosely coupled to an overhead telephone line. The receiver was installed about five miles away, and good speech was heard. The distance between the transmitter and receiver was increased until twenty miles was found to be the working limit. It appears, therefore, that the telephone line did not aid the transmission to any extent; in fact, it is highly probable that a greater range would have been possible without the use of the wires. The results of this test showed that wired wireless had commercial possibilities and would be very useful in cases where strict secrecy is needed, but it is very doubtful if any advantage is obtained over the usual telephone system.

Experiments in multiplex telephony followed this development, but it was found that only a definite band of wave-lengths was suitable for working with wired wireless. This limitation in itself placed a limit on the number of pairs of transmitters and receivers which could be worked over the same line, but in addition there was the difficulty that the modulated carrier wave covered frequencies of 2,000 on each side of the carrier-wave frequency, and consequently sharp tuning was an impossibility. The number of pairs of stations which could be efficiently worked over the same line was thus still further reduced.

Two ways were found of overcoming the latter difficulty to a certain extent. The first method was to suppress the carrier wave and employ a separate heterodyne at the receiver end. The second way was to employ a “filter” to pass a band of

ED" AND "PIPED"—I

AND GAS-PIPES AS AERIALS

In this specially-written article it is truthful to say that an amateur knows less than his American cousin. "Wired wireless" is a distinguished American known in Great Britain (he acquired part of his name and who, in 1904, discovered that living trees are means of receiving wireless signals. The complete article (about three instalments) explains what wired wireless is, a commercial example of the system and how you may experiment for himself. The author, and his experiments, some of which can be performed on gas mains do! "Piped Wireless," eh?—ED.

frequencies of about 2,000 which would offer considerable "resistance" to frequencies outside this range.

Bristol-London Circuit over Telephone System

Fig. 1 shows a wired wireless circuit which has been in use for nearly three years between Bristol and London over the telephone system. There is nothing unusual about the circuit, which a little study will show to be a three-valve wireless telephone transmitter at the top, with a four-valve receiver at the bottom. The line wires are connected to the terminals marked L1 and L2, and the receiver portion is energised through the coupling coils, at the top left hand of the diagram. The two transmitters working this system employ carrier waves of different frequencies, and although in theory no filter arrangement was deemed necessary, it was found that some arrangement of this kind had to be used in order to obtain good results, and accordingly a bridge was employed. A number of repeaters, or relays, are inserted in various parts of the circuit between Bristol and London.

It is interesting to note that this circuit was designed and put into use by the Post Office engineers some considerable time before descriptions of anything similar to it were given by the technical publications of America or Germany.

Figs. 2 and 3 show two kinds of filters which are designed to pass low and high frequencies respectively. By means of suitable values in the condensers and inductances the filters may be made to pass bands of frequencies of any width within certain limits.

Wired-wireless Circuit over Lighting Mains

The wired-wireless system could very well be adapted to the electric lighting mains, using apparatus similar to that just described, but in the writer's opinion very inferior results would be obtained as far as range is concerned. It must be remem-

bered that the various lighting systems do not extend for more than a few miles from the generating station, except in special cases where electricity at very high voltage is transferred from a source of electrical energy to a town many miles away. In such cases it is usual to transform the generator voltage to one of a much higher value, and to lower the voltage again by means of a step-down transformer when the distributing station is reached. Although it cannot be stated with certainty, it is highly probable that these transformers by reason of their impedance would effectively damp out any wired-wireless waves transmitted along the system. On the other hand, it is possible that the capacity effect between the primary and secondary windings would allow the radio-frequency waves to flow in the circuit. Another difficulty in the way of employing the mains as a medium between transmitter and receiver for long distances is the practical impossibility of introducing any kind of repeater or relay into the circuit. It would appear, therefore, that any system making use of the mains for long-range working has very little to recommend it, although there would be two obvious advantages, namely, the system would be secret and directional, and there would be plenty of power available at both ends of the circuit.

Broadcasting Might Use Wired Wireless

Another possible use for wired wireless, employing the lighting mains as a carrying medium, immediately suggests itself. It should be quite a practical proposition to use the system for broadcasting purposes in the larger towns. The wireless telephony transmitter could be located at the generating station and a receiving set could be connected to any lamp socket by means of the apparatus to be described later.

The idea certainly seems good, but there are several difficulties in the way of its successful operation, some of which may be discussed here.

Taking London as an example, numerous electric-lighting companies possess their own separate and distinct systems, and in most cases there is no connection between any two systems. Therefore, for any broadcasting scheme to be a success, each company would have to install its own transmitter. Then, again, some companies supply direct current and others alternating; some run one wire to earth and others do not, and there is often difficulty in discovering which wire is earthed.

It is not unusual for the generating station to reverse its connections and thus earth the opposite pole, and this of course would add considerably to the risks run by the operator of the receiver, as will be shown later.

Combined Light and "Wireless" Service?

It is doubtful whether any broadcasting scheme by means of wired wireless *via* the lighting mains will materialise yet awhile, and it is rather difficult to decide whether such a scheme would come under the jurisdiction of the Postmaster-General. In any case it would be an excellent means of popularising electric light; and enterprising companies would probably incorporate a small receiver in the meter, with suitable rectifiers, resistances and transformers for supplying the filament and

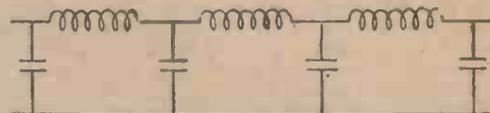


Fig. 2.—Filter for Lower Frequencies.

plate of the valves straight from the mains.

The Amateur's Adaptation.

It now remains to be seen how wired wireless can be adapted to the needs of the amateur who is unable, through lack of space, to erect an outdoor aerial, and who at the same time is fortunate enough to have electric-lighting mains available for use. In cases where no mains are available, an indoor aerial in conjunction with a costly multi-valve receiver may be used; but yet another method of getting fair signals with a single-valve receiver and

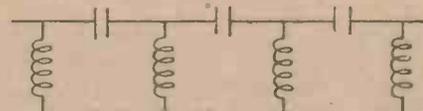


Fig. 3.—Filter for Higher Frequencies.

no outdoor aerial would be to use the gas pipes.

Many American firms, and at least one English firm, are now advertising a piece of apparatus which is inserted between the aerial terminal of any wireless receiver and any electric lamp socket, the usual earth connection to the set being retained. The same General Squier is responsible for the invention, which is probably covered by patents. Somewhere in the circuit between the lamp socket and the receiver there must obviously be a device that allows radio-frequency oscillations to pass, but which prevents the flow of direct or alternating current from the mains. This suggests a condenser, very high resistances, or probably a combination of the two similar to the usual grid leak and condenser.

P. T. B.

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5-Valve Amplifier Not Working

Q.—I enclose particulars of my 5-valve amplifier set which, despite repeated attempts to rearrange connections, etc., does not function well. Will you please advise?—H.B. (1596)

A.—Querist's set comprises five valves arranged as follows: Two H.F. amplifying valves, which together with the detecting valve form a complete and separate unit; and two L.F. amplifying valves, these latter also forming a separate unit. The H.F. valves are "resistance-capacity" coupled, whilst the L.F. valves have the usual type of iron-core, intervalve transformers. Querist states that the three-valve portion works all right, but if so, surely he has heard something of the Dutch Concert with the three valves only. If not, it would appear that this portion can be made to work in a more satisfactory manner than at present. When using the resistance-capacity coupling between valves, it is necessary to provide leaks (grid to filament) for each of the valves except the first. The usual valve of these leaks is in the neighbourhood of one or one-and-a-half megohms, and the provision of the same will no doubt lead to improved results. Presumably when connecting the 2-valve L.F. amplifier set to the terminals marked A and B in querist's diagram (not

reproduced) the primary of the telephone transformer is disconnected. The howling effect complained of will be greatly reduced if not entirely eliminated on all adjustments by the provision of small mica-foil condensers (capacity, say, .0002 mfd.) across the primary windings of the L.F. iron-core transformers. Another important point in connection with querist's diagram (unless merely an oversight in drawing), is that although inductive coupling is employed the secondary coil of the tuner is not shunted by a variable condenser, that is, it is not a tuned circuit. Either provide the necessary variable condenser, or dispense with the coupled circuit (temporarily at all events) and connect grid and filament of the first valve direct to aerial and earth ends of the A.T.I. respectively. The condenser may be removed from the reactance coil and used as above mentioned. On the whole the writer does not much care for the resistance-capacity coupled arrangement, and accordingly would recommend querist to change over to transformer coupling between the H.F. valves, using air core transformers as sold by advertisers in this journal, which will prove very effective over a wide range of wave-lengths, though not the best possible for the Dutch Concert.—CAPACITY.

Forthcoming Exhibition

THE All-British Wireless Exhibition and Convention, to be held under the auspices of the Wireless Society of London and affiliated societies, will be open from Saturday, September 30, to Saturday, October 7, at the Horticultural Hall, Westminster. There will be a series of daily lectures, and a demonstration stand has been erected close to the lounge where the public can "listen-in." It is stated that the exhibits will be confined exclusively to wireless apparatus. Our next issue will contain many further particulars of this exhibition.

CORRESPONDENCE

Improving a Short-wave Set

SIR,—Those readers of "Amateur Wireless" who have constructed, or intend to construct, the short-wave receiving set described in the Handbook "Wireless Telegraphy and Telephony" will no doubt be interested to know that it can be adapted for picking up the Paris time signals by making a few temporary alterations to the wiring. I have wound my set to receive up to about 1,000 metres, as recommended in AMATEUR WIRELESS No. 10, page 193. Paris, however, transmits on 2,600 metres. One obvious method of getting the set to tune to this wave-length is to load both the primary and secondary circuits with external inductances. This method is not efficient, and means a further outlay.

A much better way, in my opinion, is to loosen the coupling and join the two coils in series after disconnecting the detector, 'phones and variable condenser from the closed circuit. The aerial is then connected to one free end and the earth wire to the other end of what is equivalent to one long inductance. The detector and 'phones are now joined in series and the two connected across from the aerial to the earth. The variable condenser is also connected across these two points. If the wiring has been arranged exactly as in the book, the fresh wiring should be done as follows: The aerial and one lead of both the variable condenser and the detector should be connected to the original aerial terminal. The earth lead, the second lead from the variable condenser, and one lead from the 'phones should be connected to

Broadcasting: The Situation

SINCE our last issue went to press there has been a resumption of the conference between the Postmaster-General, with his officials, and the representatives of the British Broadcasting Company. Previously the Postmaster-General had sent to the company his criticisms of the proposed articles of association, and the conference was called with a view of discussing the criticisms and arriving at a basis of agreement. There is no doubt that the conference was fruitful of discussion, but it was given out that it had failed to reach an agreement and that the Postmaster-General would issue a statement on the subject. Up to the time of our going to press this statement has not appeared.

The "Big Six"

It is understood that the "big six" of the Broadcasting Company are the British Thomson-Houston Co., the General Electric Co., Marconi's Wireless Telegraph Co., Metropolitan Vickers Electrical Co., Radio Communication Co., and the Western Electric Co., and that all *bona fide* manufacturers of wireless apparatus in Great Britain may qualify

for membership by taking up one or more shares. It is stated that Marconi's Wireless Telegraph Co. and Metropolitan Vickers Co. have stations ready for broadcasting immediately an agreement is reached.

"The Rumour"

Nothing in confirmation or in denial of the "rumour" which we published a fortnight ago has been issued. The matter stands exactly where it did. The daily newspapers have been giving attention to the subject, however, and in no uncertain way have voiced the very strong feeling to which the "rumour" has given occasion. We ourselves firmly believe that any such restriction is not likely to be made, or would have no chance of being effective even if it were made.

Every reader of "A.W."

should have at hand for reference a copy of the "Work" Handbook, "Wireless Telegraphy and Telephony: and How to Make the Apparatus," 1s. 6d. net.

the right-hand telephone terminal. The second leads from the 'phones and the detector should be connected to the left-hand telephone terminal. The original earth terminal must now be connected to the moving arm of the secondary tuning switch by a short piece of wire. Provided that the original wiring for the detector, 'phones, and variable condenser runs outside the box, this change can be effected in less than five minutes. Eleven p.m. B.S.T. is about the best time to test this arrangement. The primary switches should both be set to their highest value and the secondary switch slowly moved from left to right, during which time the experimenter should listen in carefully. In my case I hear the Paris clock ticking before this switch has reached its maximum, but if this does not occur with any particular set, the condenser should be slowly turned full on. If there is still no result, and the crystal is properly adjusted, the coupling should be slowly tightened, as this will act as a variometer and further increase the wave-length. If there is no result by 11.5 p.m., when the ticks generally cease, the experimenter must wait until 11.35 p.m., when Paris transmits Morse until 11.44 p.m., when the regular time signal commences. Briefly this consists of dashes for one minute with a dot on the stroke of 11.45 p.m. After an interval of one minute one hears d's for another minute with a dot on the stroke of 11.47 p.m. A further minute interval occurs, then a minute of sixes (dash and four dots), with a final dot on the stroke of 11.49 p.m. Sometimes a little more Morse follows this. The same sort of thing occurs just before noon, but there is more chance of hearing it at night. If the experimenter intends getting Paris frequently, it is a very easy matter to arrange three change-over switches to effect the transformation. The set should then have a wave-length range of about 200—3,000 metres.—H. G. E. (London, N.).

FORTHCOMING EVENTS

- The Leeds and District Amateur Wireless Society.** Sept. 22, 7.30 p.m. Annual general meeting.
- Ipswich and District Wireless Society.** Sept. 24. At 55, Fonnereau Road, Ipswich. Sale and exchange of apparatus.
- Redhill and District Y.M.C.A. Wireless Society.** Sept. 27. At 111, Station Road, Redhill. Lecture by Mr. White on "Phones and Loud Speakers."
- Nottingham and District Radio Experimental Association.** Sept. 28. At Room 74, Mechanics' Institute. Discussion on Mr. Ford's lecture on "Radio Measurement." Subscriptions due.
- The Tuxford and District Amateur Wireless Society.** Sept. 28. Morse practice. Coils of various shapes, their advantages, etc. Discussion.

TELEPHONY TRANSMISSIONS

- Eiffel Tower (F L),** 2,600 metres. Each afternoon (Saturdays excepted).
- The Hague, Holland (P C G G),** 1,085 metres, B.S.T. Sept. 21, 24, 28, 8-9 p.m.
- Writtle (2 M T),** 400 metres. Sept. 26, 8 p.m.
- Marconi House (2 L O),** 360 metres. Probably Friday, Sept. 22, and Saturday, Sept. 23, respectively, at 5-5.30, 6-6.30 and 7-7.30 p.m.

CLUB DOINGS

Wakefield and District Wireless Society

Hon. Sec.—MR. ED. SWALE, 11, Thornes Road, Wakefield.

A MEETING of the above society was held in the Physics Laboratory of the Grammar School at 8 p.m. on Sept. 8th., last. G. E. Welch delivered his lecture on "Simple Facts and Experiments in Electricity."

For upwards of an hour Mr. Welch described the composition of batteries of various kinds, building of an ammeter, voltmeter and galvanometer, measurement of voltage, resistance electro-magnetism, etc., with apparatus and blackboard illustrations.

All are looking forward to Mr. Burbury's (jnr.) visit on the 22nd, probably at the Y.M.C.A., Grove Road.

Ilkley and District Wireless Society

Hon. Sec.—MR. E. S. DOBSON, "Lorne House," Richmond Place, Ilkley.

THE fourth general meeting of the above was held at the Tower Buildings, Ilkley, on Sept. 11th. The chair was taken by Dr. J. B. Whitfield.

Mr. Law gave his lecture on "The Theory, Use and Maintenance of Accumulators."

Programme for the month of September, 1922: Monday, Sept. 25th, at 8 p.m., at the Regent Cafe, Morse Practice. Monday, Oct. 2nd, at 8 p.m., at the Regent Cafe, Morse Practice. Monday, Oct. 9th, at 7.30 p.m., at the Regent Cafe, general meeting, followed by a lecture on "Capacity and Condensers," by E. Stanley Dobson.

North Middlesex Wireless Club

Hon. Sec.—MR. E. M. SAVAGE, "Nithsdale," Eversley Park Road, Winchmore Hill, N.21. THE 98th meeting of the club was held on Sept. 6th.

The lecturer for the evening was Mr. W. A. Saville, and his subject was "Instrument Construction for Beginners."

Mr. Saville described the construction of a valve panel. In wiring up the completed panel, Mr. Saville pointed out the necessity for making the connections as short as possible, so as to avoid the danger of extra unwanted capacity and inductance of long leads.

The lecturer then dealt with the different types of valves on the market, and passed round for inspection examples of these types.

Mr. Evans, the chairman, spoke in support of the crystal detector.

Particulars of the club may be had from the hon. secretary.

West London Wireless and Experimental Association

Hon. Sec.—MR. H. W. COTTON, 19, Bushey Road, Harlington, Middlesex.

"LISTENING-IN" on club's apparatus and an informal chat took place on Aug. 31st. Many questions as to the restriction in connection with the use of reaction circuits were asked, and a question in the form of a resolution was sent to the Wireless Society of London in connection therewith.

Meeting held Sept. 7th. Morse practice class well attended. Mr. J. F. Bruce related his experiences in connection with the Armstrong circuit and loop aerial.

It is hoped to have many lecturers from the Wireless Society of London down during the winter session. The secretary will have much pleasure in replying to any inquiries as to membership, etc.

South Shields Y.M.C.A. and District Amateur Wireless Society

Hon. Sec.—MR. T. TEASDALE, 38, Readhead Avenue, South Shields.

A MEETING of the above society was held on September 12th in the Y.M.C.A. Rooms, the chair being taken by Mr. G. Busbridge.

A neatly arranged and compact German single-valve set was exhibited by Mr. M. Tuohy, which aroused great interest, excellent signals being received with the club's aerial, which had been recently extended.

The objects of this society are to assist and bring together local amateurs, the furtherance of all matters and studies connected with wireless telegraphy and telephony, and allied subjects, and the promotion of intercourse and exchange of ideas between experimenters in wireless telegraphy and telephony.

A series of lectures which has been arranged by Mr. G. Busbridge on elementary theory of wireless telegraphy commenced on Friday, Sept. 19th.

The hon. sec. will be pleased to hear from any gentleman desirous of becoming a member; the subscription is 7s. 6d., per annum.

Meetings are held every Tuesday and Friday at 7.30 p.m.

Peckham Wireless and Experimental Association

Hon. Sec.—MR. GEO. SUTTON, 18, Melford Road, S.E.22.

ON August 23rd the above association had the pleasure of listening to a very interesting and instructive lecture by Mr. Haynes on the Johnson-Rabek loud-speaker. The lecturer went through every point of the construction of the apparatus, giving enough of the theory to enable his listeners to appreciate the various parts and their uses. Full instructions were given to enable one to cut and polish agate cylinders.

The association's wireless receiving set was not available for purposes of demonstrating the capabilities of the loud speaker. The lecturer afterwards demonstrated the use of the Neon tube as a generator of oscillations, and more than one present had an idea that it might be very useful in the Armstrong receiving circuit.

Walthamstow Amateur Radio Club

Hon. Sec.—R. Cook, 49, Ulverston Road, Walthamstow, E.17.

ON August 23rd Mr. Tyler gave a lecture on the advanced members on the "Ionisation of Valves," and Mr. Webb lectured to the more elementary members on the approximate cost of constructing a valve panel and the necessary apparatus used. The secretary will be pleased to welcome prospective members.

Hornsey and District Wireless Society

Hon. Sec.—MR. H. DAVY, 134, Inderwick Road, Hornsey, N.8.

At a meeting of the above society held on September 1st, members brought up their sets which were photographed; afterwards a demonstration was held, affording an opportunity for comparing various methods of valve and crystal circuits, etc.

A further programme was arranged concerning listening-in, lectures, Morse practise, etc. It is hoped that the club set which is almost completed will be in use by September 11th.

Applications for membership are cordially invited; meetings every Tuesday and Friday.

Swinton and District Amateur Radio Society

Hon. Sec.—MR. GEO. T. BULTITUDE, The Slade, Swinton, nr. Rotherham.

THE inaugural meeting was held on Aug. 25th. Mr. A. Hammerton presided. The committee elected were Messrs. Greenfield, Oxby, Woods, Twigg, Trowbridge, Hammerton, Henson and

Finn. Mr. A. Hammerton was elected treasurer, and Mr. Geo. T. Bultitude, secretary and librarian. The question of fees and subscriptions was put back for subsequent discussion. The Co-operative Guild-room has been secured for weekly meetings.

Wireless Society of Liverpool

Hon. Sec.—MR. C. L. LYONS, 76, Old Hall Street, Liverpool.

A MEETING of the above society was held on Aug. 25th at the Royal Institution, Colquitt Street, Liverpool.

Special arrangements had been made with The Ashley Wireless Telegraph Co., Ltd., of Renshaw Street, Liverpool, whereby they would transmit telephony and musical items from their experimental station, 2 KH, the same being received on a five-valve receiving set of their own manufacture (W. 2 H.F. : 1 Rect. : 2 L.F. valves).

There were six-minute transmissions with intervals of five minutes between each. The receiving set was operated by Mr. C. G. Williams, of Messrs. Ashleys (who is also a member of the society). The whole of the items were received extremely satisfactorily, and were made clearly audible to all present through a loud speaker. The programme was varied.

The five-minute intervals were occupied in answering questions deposited previously in the question box.

The next general meeting of the society will be held on Sept. 14th, at the same address, and all interested persons are invited.

Barnoldswick Wireless and Technical Society

Hon. Sec.—MR. A. BALDERSTON, 6, Clough Terrace, Barnoldswick, via Colne.

A MEETING of the above society was held on August 30th at the Gladstone Liberal Club.

At the termination of the usual thirty minutes buzzer practice, a lecture was given by the hon. sec., entitled "Electro-magnetism."

The secretary solicits applications for membership from any gentlemen in the locality.

Durham City and District Wireless Club

Hon. Sec.—MR. G. BARNARD, 3, Sowerby Street, Sacriston, Durham.

A MEETING of the above society was held on Aug. 25th. After Morse practise the hon. Sec. gave a short lecture on diagram interpretation, using twenty-two diagrams upon the blackboard to represent various apparatus. These diagrams were copied by the members.

After the announcements, the chairman commenced the question period.

Several new members were enrolled.

The sixth meeting of the society was held on Sept. 1st at headquarters. The lecturer for the evening, Mr. Ainsley, of the Henley Cable Co., was unable to be present, and his place was filled by the secretary, who gave a lecture on simple circuits.

Potential, Ohm's Law, closed circuits, earth-return circuits, series and parallel circuits and simple wireless receiving circuits were explained in a simple fashion.

There was a debate, during which the Rev. Bottomley enlarged upon the lecturer's description of Ampere's rule. He drew several sketches on the board and also explained Maxwell's corkscrew rule.

It was announced that Capt. Donnisthorpe, of the Marconi Co., is to give a lecture on the 22nd of this month. This meeting will be open to all interested, and members are invited to bring their friends. It will be held at 7 p.m. in the gymnasium of the Y.M.C.A. Lantern slides will be used.

The next meeting, on Oct. 1st, will chiefly consist of buzzer practice.

The seventh meeting of the above took place at headquarters on Sept. 8th.

It is hoped that the three chief northern societies (Durham, Newcastle, and Sunderland) may co-operate in the exchange of lecturers, demonstrations, visits to works, etc.

A letter sent by Mr. G. Barnard made an appeal to the members to advertise the forthcoming event on the 22nd, when Capt. Donnisthorpe will deliver his lantern lecture. Arrangements are being made for two special concerts to be transmitted from Newcastle and Ashington during the evening so that those present may have the benefit of a first class "Listen-in."

Stoke-on-Trent Wireless and Experimental Society

Hon. Sec.—MR. F. T. JONES, 360, Cobridge Road, Hanley.

AT A MEETING of the above club on Sept. 7th, a library of wireless literature was suggested. If any members have any books on wireless or electrical subjects, the secretary will be pleased to receive them.

A demonstration on how to wind coils for wireless receiving sets was given by Mr. F. T. Jones.

A pleasant diversion was provided by Mr. R. W. Steel in the form of a lecture on "Reminiscences of the Wireless Service."

Fulham and Putney Radio Society

Hon. Sec.—MR. W. DEWHURST, 52, North End Road, West Kensington, London, W.14.

A MEETING was held at the new headquarters on Sept. 8th.

Mr. Barker switched on his set and the members heard the result of the air race through a Brown loud speaker. A new committee was formed to deal with the rules, etc. Friday was found to be the most suitable for meetings. It was decided that the first Friday in each month be devoted to lectures, and we hope to start the October meeting with one.

Mr. E. Vernon Barker, who is a member of this and the Willesden Society, explained his apparatus to the members, and with five valves and a loud speaker produced music and singing that was rendered clear and free from the usual disturbances.

All amateurs in the district are invited to join.

Barnes, Mortlake and Richmond Wireless Society

Hon. Sec.—MR. E. L. ROGERS, 17, Leinster Avenue, East Sheen, S.W.

THE first meeting of the above was held at "Inglenook," Sheen Gate Gardens, East Sheen, on Sept. 20th.

Mr. Blake of Richmond has consented to be our President.

Fulham and Chelsea Amateur Radio Society

Hon. Sec.—MR. R. S. V. WOOD, 48, Hamble Street, Fulham, S.W.6.

A MEETING of the above was held at the temporary headquarters on Sept. 6th. The crystal set was discussed by the members and numerous question papers were handed in.

Proposed Watford and District Radio Club

It is proposed to form a radio club for Watford and district.

Will all those interested please communicate with Mr. F. A. Moore, 175, Leanesden Road, Watford, Herts.

Leeds and District Amateur Wireless Society

Hon. Sec.—MR. D. E. PETTIGREW, 37, Mexborough Avenue, Chapeltown Road, Leeds.

A MEETING was held at the Leeds University on Sept. 8th, Mr. A. M. Bage taking the chair at 8 p.m. The chairman called upon Mr. H. Mortimer, of the P.O. Telephones (Leeds), to deliver a paper on "Automatic Telephony."

The Leeds exchange is the largest automatic exchange in the British Isles, and Mr. Mortimer successfully conveyed to the meeting the principle upon which the complicated mechanism installed therein, functioned. The principles upon which old hand-operated exchanges worked were considered, in order that one could appreciate fully the great advantages attached to automatic operation. The methods of automatic operation were explained. The circuits were traced from a subscriber to the exchange by open and underground wires.

The second annual general meeting (for members only) will be held on Sept. 22nd. Meetings next session will probably be held weekly, formal (general) and informal (instructional) meetings being held alternately.

Portsmouth and District Wireless Association

Hon. Sec.—MR. R. G. H. COLE, 34, Bradford Road, Southsea.

ON Sept. 6th the monthly meeting was held at the Pile Memorial Rooms.

In future it has been decided to hold two meetings each month, the first and third Wednesdays suiting the majority of the members.

The members paid a visit recently to the local electric light and power station. This visit was arranged by Mr. Lawrence.

Wireless Society of Hull and District

Hon. Sec.—MR. H. NIGHTSCALES, 16, Portobello Street, Hull.

A MEETING of the above was held on Sept. 11th.

Mr. J. Nicholson proceeded to give his lecture on "Aerials," detailing the preparation of a mast and the fittings required. He gave demonstrations on the making of guys, splicing of same, etc., and finally the method of erection and fixing of the mast and aerial.

Future meetings, Friday, Sept 22nd and Monday, Oct. 9th.

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ANNOUNCEMENTS

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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.

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.3.

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ALL-BRITISH
WIRELESS EXHIBITION
AND CONFERENCE

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Admission

SPECIAL TRADE DAY, October 2nd
Admission **1/3**, including tax.

Sept. 30th (1922) Oct. 7th
(Saturday) (Saturday)

1/3

SPECIAL PUBLIC DAY, October 3rd
Admission **5/-**, including tax.
(Public admitted both days after 6 p.m. at the usual price.)

Including Tax

The CONVENTION will be held under the auspices of THE WIRELESS SOCIETY OF LONDON.

SPECIAL ATTRACTIONS

THE WIRELESS SOCIETY OF LONDON

Have arranged for officers of the Society to be available each day, at the room put at their disposal, to meet officials and members of Affiliated Societies from London and Provinces. A staff of experts will be in attendance to conduct visitors round the Exhibition. The following are among the gentleman who have kindly promised to give lectures, which will take place every afternoon and evening as announced during the Exhibition:

- | | | |
|---|--|---|
| Admiral of the Fleet Sir HENRY JACKSON, G.C.B.,
K.C.V.O., etc. | G. P. MAIR, A.M.I.C.E., etc. | R. CLINKER |
| F. HOPE JONES, M.I.E.E. | G. G. BLAKE, M.I.E.E., A. Inst. P. | JOHN SCOTT-TAGGART, M.C., A.Am.I.E.E., F. Ins. P. |
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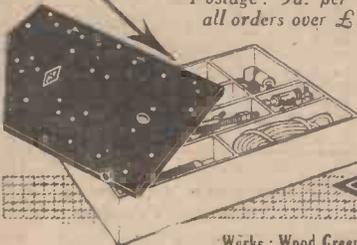
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.0002	13	2/6
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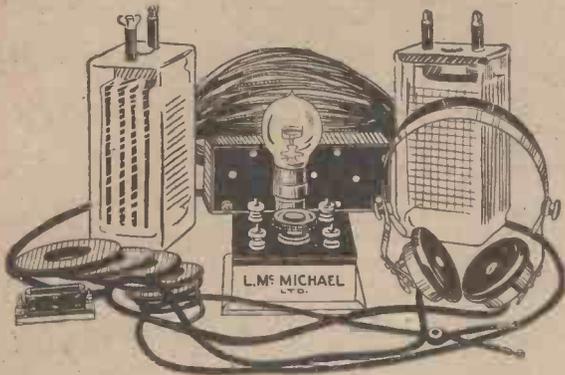
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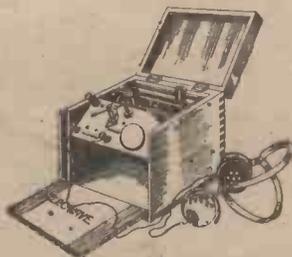
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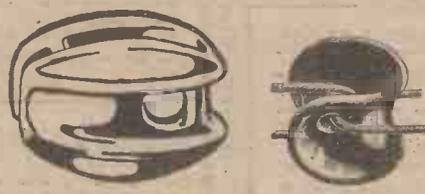
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Wireless Requisites. Crystal and valve sets. Send us your inquiries and write for prices.—Attracta Electrical Co., 11, Hanway Place, Oxford Street, W.1. [14 s]

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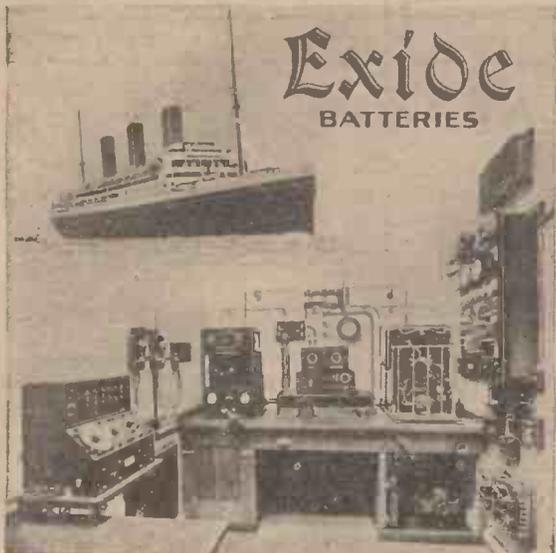
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26	3. 4.	3. 8.	4. 5.	5. 6.	3. 0.
28	3. 10.	4. 2.	5. 0.	6. 6.	3. 3.
30	4. 6.	5. 0.	6. 3.	7. 0.	3. 6.
32	—	—	7. 3.	8. 0.	3. 11.
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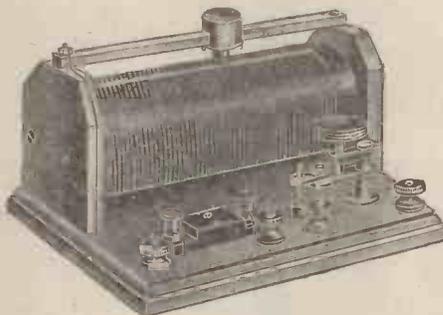
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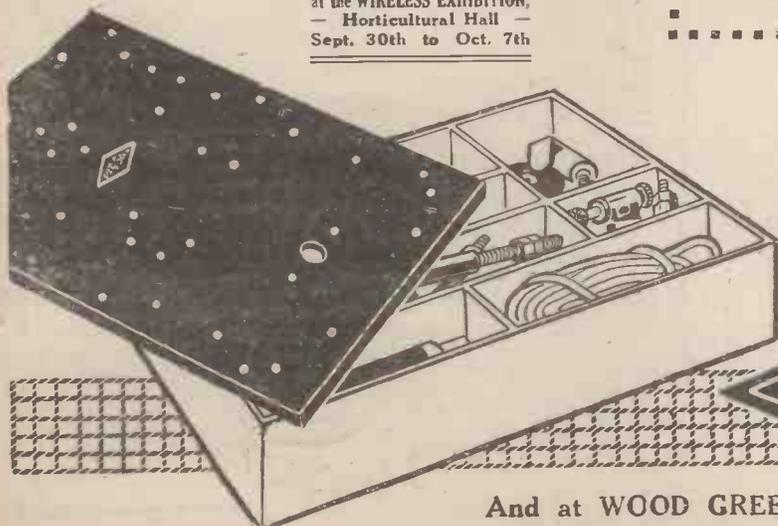
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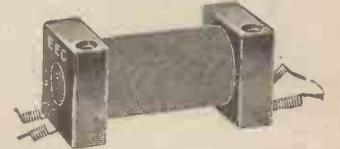
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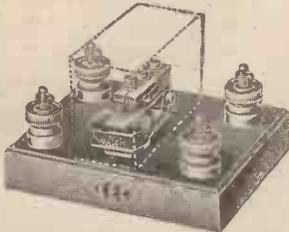
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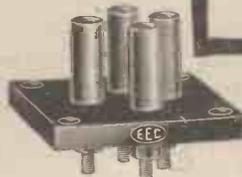
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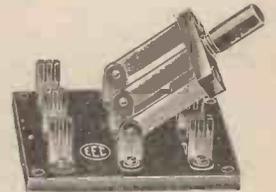
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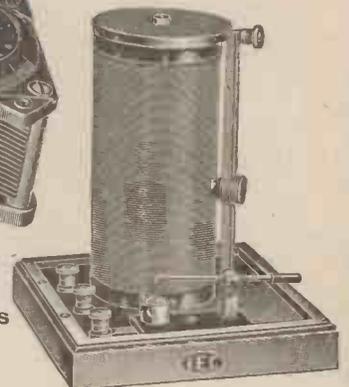
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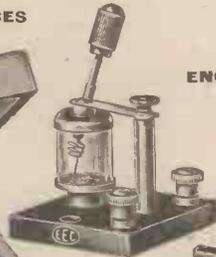
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WIRELESS ECONOMIC CATALOGUE

Amateur Wireless

and Electric

No. 17

September 30, 1922

What We Can Learn From America

Specially Written for "Amateur Wireless" by an American Visitor

AS remarkable as the growth of wireless has so far been in the States it is still in its infancy. The word "radio" has come into general use in the United States as applied to the newer branch of the science, namely, wireless telephony. The word wireless is still always used when referring to the first development, that is, telegraphy.

Commercial Value

Because of its direct commercial value to farmers in providing them with daily quotations and market prices of their farm products, more farmers in proportion to their numbers have installed sets than any other class. As one rides through the country an aerial is to be seen on the majority of farmhouses. City dwellers are rapidly following suit, however. Modern apartments and dwellings are being equipped with wireless sets and featured as renting attractions.

Although the wildfire spread of radio did not really begin until November and December, 1921, it is estimated by the gramophone dealers that now there are over three times as many shops selling wireless supplies as there are selling gramophones, the latter having had a lead of over fifteen years. There is scarcely a school or college boy throughout the length and breadth of the land who has not either built his own set or assisted in building one. When one contemplates the vast scientific possibilities of this new generation growing up from boyhood with years of experimental experience, the suggestion of the Governmental authorities in Great Britain to curb and stunt the most wonderful scientific stimulus that has ever come to civilisation is beyond understanding. America is pre-eminent in the telephone, wireless and some other industries, and my belief is that if any short-sighted interests were yielded to in

Great Britain, America would continue to be pre-eminent.

Wireless Schools

In the States many wireless schools have sprung up to instruct salesmen, demonstrators and, of course, novices. Nearly every daily paper in the United States has now a wireless page, and many issue in addition a special wireless Saturday supplement of twelve to sixteen pages devoted exclusively to the subject. Included in the wireless news is the daily programme from the broadcasting stations within a radius of, say, 500 miles. Many newspapers also provide testing laboratories where novices who have trouble with their sets (mainly home-made) can bring them to be tested and corrected.

Interference

It seems to be a general impression here that telephonic radio in the United States

A DAY'S WIRELESS PROGRAMME

IN ONE RADIO DISTRICT OF THE UNITED STATES

Thursday, August 24

WJZ, Newark (360 metres)

- 9 a.m., noon and 5.30 p.m.—Agricultural reports.
 9 a.m., noon, 12.55, 4 and 7 p.m.—Musical programmes.
 Noon and 4 p.m.—Market quotations.
 Noon, 5.30 and 11 p.m.—Weather forecast.
 12.55, 4, 7 and 9 p.m.—Baseball schedules.
 12.55, 4 and 9 p.m.—Stock quotations.
 5.30 and 9 p.m.—Shipping news.
 7 p.m.—Final baseball scores of the American, National and International League games.
 7.10 to 7.30 p.m.—"Jack Rabbit Stories," by David Cory.
 8.30 to 10.30 p.m.—The 459th Mayor Hylan-Peoples' concert, by the Street Cleaning Band, will be broadcast from the Lewisohn Stadium, at the City College. Programme: "Tannhauser," "William Tell," "Bohemian Girl," "Song of Love," "La Fourterelle," "The Bridal Rose," "Carmen," "Lucia di Lammermoor"; solos by John J. McMahon, tenor; "Washington Greys," "America." Acting Mayor Murray Hulbert will deliver a short non-political address.

WVP, Bedloe's Island (1,460 metres)

Signal Corps, U.S. Army

- 8.50 p.m.—Instruction in radio; piano numbers.
 9 p.m.—Concert under the direction of

Charles D. Isaacson. Artists' names and selections will be announced by radio.

WWZ, New York (360 metres)

- 1.15 p.m.—Piano selections.
 1.25 p.m.—Leota E. Fischer, soprano; Elsie Thompson, piano; "The Little Thief," "A Little Pink Rose," "Dawn."
 1.40 p.m.—"Vogue's" Paris Cable on Fashion. Subject: "Paris Openings."
 1.50 p.m.—Leota E. Fischer, soprano; Elsie Thompson, piano; "A Rose and a Dream," "Roses," "The Lilac Tree."
 2.5 to 2.15 p.m.—Piano selections.

WOR, Newark, N.J. (360 metres)

- 6.15 p.m.—Zither solos, by Edward Wieland.
 6.30 p.m.—"Women's Fashions," "Household Suggestions" and other topics, by Maude Hall.

WGY, Schenectady (360 metres)

- 6 p.m.—Produce and stock market quotations; baseball results; news bulletins; results of races at Saratoga Springs.
 7.45 p.m.—Concert programme: "By the Sapphire Sea"; "California" — intro. "Soothing"; Sunset Inn Orchestra, "She is Far From that Land," Elsie Duffield, soprano; "Nobody Lied"; "Moon River"; orchestra, "Il est doux, Il est bon"; Elsie Duffield; "All Over Nothing at All"; "Spread Yo' Stuff"; orchestra. "Midsummer Lullaby," Elsie Duffield; "Vir-

ginia Blues"; "Gypsy Love Song"; "Lucky Dog Blues"; orchestra, "Don't Feel Sorry for Me," Oswald Morache, tenor; "Do It Again"; orchestra.

WBZ, Springfield, Mass. (360 metres)

- 7.30 p.m.—Baseball scores; Uncle Wiggly bedtime story.
 7.45 p.m.—U.S. government and state market reports.
 8 p.m.—Baseball scores; piano solos by Nellie Bleakly.

WGI, Medford Hillside, Mass. (360 metres)

- 7.30 p.m.—Baseball scores. Police reports.
 8 p.m.—Evening programme: "Regarding Fuel," Prof. Chas. Horns Chase, Professor of Steam Engineering, Tufts College Engineering School. Recital by Miss Marguerite de Liberti, soprano; Miss Hortense Cornier, accompanist.

KDKA, Pittsburgh (360 metres)

- 6 p.m.—Zoney's St. Clair Country Club Orchestra.
 7 p.m.—"Home Furnishings, Modern and Practical," by Miss Harriett Webster. United States Public Health Service Semi-weekly Bulletin broadcast.
 8 p.m.—Miss Frances Magee, pianist; Andrew Callhoon, violinist; L. Marie Day Moore, soprano; Miss Grace Kramer, reader

(Eastern standard time.)

is almost nothing but a continuous etheric disturbance due to interferences and reactances from other receiving sets. This is not so. In an interview published in the *Times* of London on July 28 last Mr. Marconi, when he had just returned from the United States, was quoted as follows: "I found that the alleged chaos in wireless telephonic communications is not really apparent in America."

Development

In the development of wireless telegraphy involving wave-lengths from 300 to 20,000 metres Britain undoubtedly leads, but in the development of wireless telephony or "radio" involving wave-lengths from 300 to 1,000 metres America is to-day far in advance of Britain. In the interview referred to Mr. Marconi also stated: "I think in wireless telephony and broadcasting the Americans are undoubtedly ahead of us. The clearness of speech, and

the ease with which messages are received are remarkable. The Americans have reached a greater perfection of detail than we have."

State Regulation

It is a fair assumption that the phenomenal development of telephonic wireless in America would and could not have assumed such amazing proportions if atmospheric and interferences were nearly as bad as they are reported here to be. Months ago the American Government took the matter in hand and allotted various wave-lengths to different classes of users. The enforcement of an additional important regulation was deferred till the end of the year, at which time all transmission will have to be done by oscillating valves and not spark. The last basic patent on valves expires, in the United States this November, and the Government, not desiring to compel the use of a

patented monopoly, deferred the enforcement of this regulation. There is less atmospheric interference in America to-day than in Britain, and when all the "damped" waves are ruled out a great stride forward in the advancement of the art will have been achieved.

Apparatus

In passing it might be well to mention that one reason there is less interference in the United States than here is because of the almost universal use of variometers and variocouplers in valve sets. In broadcasting with short wave-lengths, say from 300 to 600 metres, by means of variometers and variocouplers very much closer and sharper tuning is possible, thus tuning out much interference. When variometers and variocouplers come into more general use in Great Britain a marked improvement in freedom from atmospheric undoubtedly will result.

M. A.

Caring for Your Valves

Avoiding Excessive Filament Currents and Plate Voltages

IN compiling these notes for the guidance of amateurs possessing valve receivers, the writer takes for granted that readers have a knowledge of the electronic theory and some slight knowledge of the functioning of the three-electrode valve.

To secure the maximum efficiency and length of life from a valve there are two conditions that must be avoided—(1) the formation of a "space charge" in the valve and (2) "ionisation." How these conditions are caused and how best to avoid them are explained below.

Space Charge

In the first place, the reader should remember that an electric current is due to the passage of a stream of electrons from negative to positive, and not—as he might be inclined to assume—from positive to negative.

When the filament of the valve is heated to incandescence, electrons (negative charges) are released from the filament and are attracted to the plate, which is kept at positive potential by the H.T. battery. The electronic emission from the filament is increased up to the safe carrying-capacity of the valve. Should the electronic stream become too dense, due to an overheated filament or too low a plate voltage for a particular filament temperature, the negative charges (or electrons) in repelling each other tend to drive those electrons which are near to the filament back to the filament, and a crowd of electrons—or what is termed a "space charge"—is formed round the filament, resulting in the choking back of the electronic flow. If this space charge is not dispersed the signals will become weaker

and the valve will shortly cease to operate. The remedy is to increase the plate voltage, thereby increasing the electronic attraction to the plate.

For correct working the plate potential should be of such a value that it is capable of attracting from the filament all the electrons which are given off at the existing filament temperature. Further increase of plate potential serves no useful purpose and only tends to cause deterioration of the valve by heating up the plate and the rapid disintegration of the filament due to increased ionisation. It is therefore a matter of importance to use as low a plate voltage as is consistent with the reception of clear signals.

Ionisation

The electrons travel with an ever-increasing velocity from filament to plate, and, should they collide with atoms of residual vapour, electrons will be liberated or, as it were, "knocked off" the atom. These free electrons join the stream and rush on towards the positive plate. Now, on the other hand, the atom in losing these electrons (or negative charges) has itself derived a positive charge. This positive atom (or "positive ion," as it is more often called) is attracted to the negative filament and rushes towards it with increasing velocity, finally striking it. Heavy bombardment of the filament by these positive ions frees various gases from the metal of which the filament is composed, and these gases tend to cause increased "ionisation" (that is, formation of positive ions) in the valve. This bombardment, if allowed to become continuous, would cause rapid disintegration of the filament and would very

materially shorten the life of the valve. When ionisation has been taking place for any appreciable time the valve becomes "soft," that is, of low vacuum, due to the gases liberated from the filament. A "soft" valve can be recognised by "blue glow"—a violet-blue haze to be seen in the valve while it is in operation.

Flow

It will be seen that with a comparatively low current passing through the valve the electronic stream will not be very dense, and the risk of collision between the electrons and atoms of residual vapour will not be great; the electrons can, as it were, pick their way among the atoms of vapour without colliding. Now, should a high filament current be used, consequently freeing a large number of electrons, a correspondingly high (positive) plate voltage will have to be used to attract these freed electrons. A dense flow of electrons from the filament, urged at great velocity by the high potential of the plate, will therefore result. These electrons, travelling in dense formation and at a great velocity, will have less chance of avoiding collision with any atoms of vapour in their path, and ionisation will take place.

It will thus be seen that by avoiding excessive filament currents and plate voltages the risk of ionisation can be reduced to a minimum. Readers should be guided by the valve manufacturers as to the values of the filament currents and plate voltages that may safely be used, and they will be rewarded with longer life from their valves, and will also obtain maximum working efficiency, both of which are matters to strive for.

G. R. M.

A Home-made Two-valve Receiver

Bicycle-pump
Condenser

Long- and Short-
wave Tuners

THE set shown in the photograph has been designed and constructed by Mr. H. W. Crook, of Swansea. It has two valves, which are mounted on polished cigar-boxes, with a L.F. transformer. Of the five switches on the top, one controls the H.T. battery, another the L.T. battery, one connects to the aerial and another the aerial to earth, whilst an additional earth switch is provided for experimental purposes. There are three variable condensers, two of which are of the vane type and the other tubular. The tubes of the latter were originally two bicycle-pump barrels of different diameters, the smaller barrel being packed with sufficient mica to make it a sliding fit. The values of the two loose couplers are 3,000 and 12,000 metres respectively, and either may be used by plugging in. Splendid results are obtained, and most signals can be heard



Two-valve Receiver made by Mr. H. W. Crook, of Swansea.

all over the room without the aid of a loud speaker. Signals can also be heard quite distinctly with the aerial cut off. The H.T. battery and filament accumulators are housed beneath the instrument table. If the leads from these batteries are unnecessarily long, such as from a distant part of the room, the voltage at the instrument terminals will be less than at the battery terminals due to the voltage drop in the leads. The valves and other instruments being mounted on wood provide assurance that quite good results may be obtained without the use of ebonite or other expensive material. The sliding bars on the loose couplers are brass. As will be seen, each instrument is easily accessible and the complete station is very compact. The twin aerial ordinarily in use is 35 ft. high and of the regulation length. The earth wire is connected to a water pipe.

VARIABLE CAPACITY ||| A Cheap and Efficient Method of Obtaining it

WHILST a variable condenser is not an absolute necessity for crystal receiving sets, yet one of small size is a distinct advantage when such a set is used

of the moving vane type are expensive, and it is the purpose of this article to describe how one can construct a set of condensers, very small and compact, on the basis of the "unit" system, coupled with a small variable condenser for final

pieces of good ruby mica, usually sold in pieces 3 in. by 2½ in. by 0.002 in. thick;

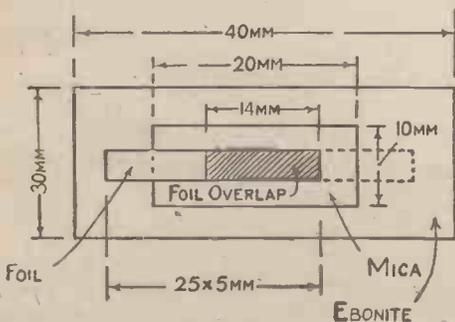


Fig. 1.—Plan of Condenser showing Method of Construction.

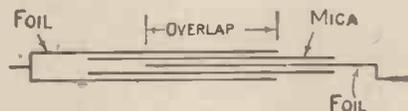


Fig. 2.—Side View of Condenser.

tuning. In this manner the set can be added to as desired.

The construction can be divided into three different parts: (1) The small fixed condensers; (2) the rotary stud switch for same; (3) the small variable condenser.

The Small Fixed Condenser

The necessary materials are three or four

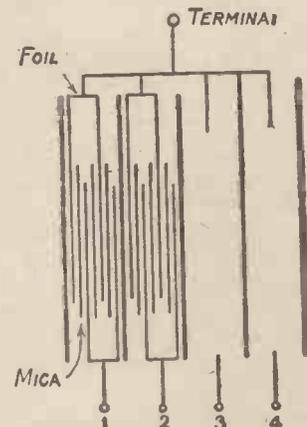


Fig. 3.—Method of Connecting Fixed Condenser.

for telephony, and in the case of a valve receiver it is absolutely an essential part of the apparatus. Variable air condensers

a 4-in. length of copper-foil 6 in. wide or thereabouts (tin-foil will do if free from

pin-holes); some thick cardboard (about $\frac{1}{8}$ in. thick), or better still $\frac{1}{8}$ -in. ebonite sheet, size about 8 in. by 4 in.

The pieces of mica should be cut into strips 20 mm. by 10 mm., thus obtaining 21 strips from each sheet, 55 being required altogether.

The foil must be cut into pieces 25 mm. by 5 mm., 65 pieces being required in all.

The cardboard or ebonite is to be cut into 13 pieces, the size being 40 mm. by 30 mm.

The usual method of assembling the condensers is followed as shown in Figs. 1 and 2. Take one piece of ebonite or card (if card is used it should be soaked in paraffin wax and shellacked), and on it place one piece of mica, leaving about 8 mm. of foil sticking out over the end when a piece of foil is placed on the top of the mica. Each piece of material can be attached to the lower one by a spot of

soldered together (the connection from condenser 1 is fastened to connection from 2 and 3, etc., on one side as shown in Fig. 3), the wire from the other side of each condenser being left free and separated.

In column 1 is given a table showing how many pieces of foil, mica, and the approximate capacity for each condenser.

The Rotary-stud Switch

This consists of a piece of $\frac{1}{4}$ in. ebonite (or hard wood) about 7 cm. square, having ten holes drilled or tapped in the arc of a circle about 5 cm. radius. A hole is then drilled at the bottom, corresponding to the centre of the arc's circle, to take the pivot for the switch arm, which is made out of stiff brass $\frac{1}{8}$ in. thick. Ten contact screws are then fastened in the holes either by a nut at the back or by being screwed in

Thickness of glass is about 1 mm. Cover the outside with copper-foil for a length of about 10 cm. Fasten the copper to the glass by thick shellac varnish. The inner or sliding member is made of either stiff metal (copper) or thinner metal wound round a rod of wood of the correct diameter. Another glass tube can be used in place of the roller if one can be obtained to fit nicely. The outer surfaces of the members are then shellacked. A wooden bung with an ebonite handle is fitted at one end of slider as shown in Fig. 5. The approximate capacity of this tubular condenser is of the order of 0.0002 mfd.

General Arrangement

The method of using this set is to connect the ten separate free leads on one side of the condenser to the ten stud contacts on the switch; the pivot of the switch to outer coat of tubular condenser; the inner coat to the receiver set; the other side of the condensers (all joined) to the other terminal of the receiver (see Fig. 6).

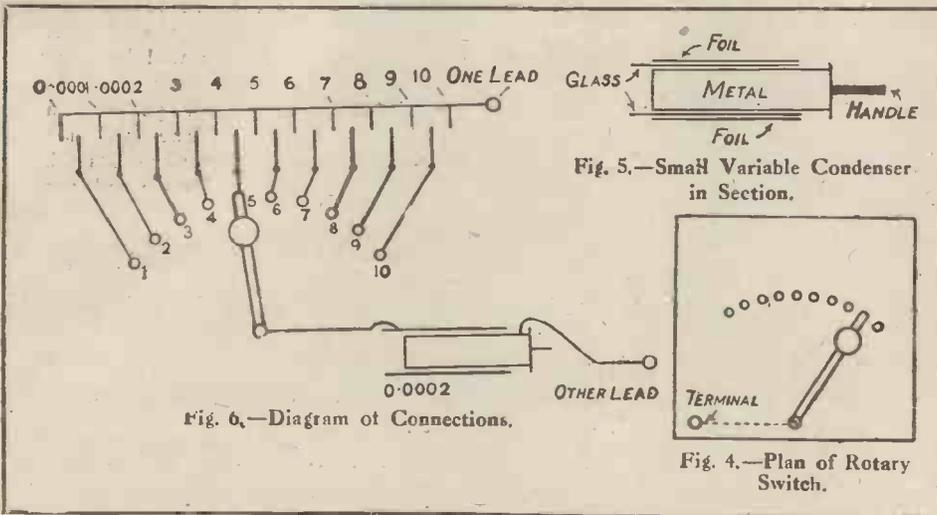
Thus by putting the variable condenser at full capacity, that is, the inner tube right in, and putting the switch arm on stud 1, then a capacity of 0.00008 mfd. is obtained. By moving the variable slider, this value is gradually brought to 0.0001 mfd., when the slider is pushed in and the switch put on stud No. 2. In this way any capacity can be obtained from 0.0008 mfd. to 0.001 mfd. in infinitely small steps.

Operation

In use leave the variable slide in any position, tune roughly with the switch, and then work the slider, which will completely cover the amount jumped over by moving the switch from one stud to another.

Finish

The block of condensers can be mounted in a box together with the variable condenser, the switch being outside. The fixed condensers can be taped, screwed, or clamped together. W. E. WILMAN.



shellac varnish. On top of this foil place a sheet of mica again and then a sheet of foil until the requisite number of foils has been placed, finally putting a piece of card or ebonite on the top of all. A piece of wire is soldered to each connecting piece of foil. Each alternate layer, that is, numbers 1, 3, 5, etc., and 2, 4, 6, etc., are soldered together and to one wire each as mentioned.

The next condenser will be made directly on top of the last one, the final result being a small compact block. The end connections, on one side only, are

if the hole is tapped. The pivot is connected to the terminal, the whole assembly being as shown in Fig. 4.

The Small Variable Condenser

For this all that is required is a glass chimney, as used for upright gas burners, about 6 in. long by about $\frac{1}{8}$ in. diameter.

Condenser No.	Capacity mfd.	Dielectric	No. of Foils		Total No. Foils
			One Side	Other Side	
1	0.0001	Mica 0.002 in. thick.	1	1	2
2	0.0002		2	1	3
3	0.0003		2	2	4
4	0.0003		3	2	5
5	0.0005		3	3	6
6	0.0006		4	3	7
7	0.0007		4	4	8
8	0.0008		5	4	9
9	0.0009		5	5	10
0	0.0010		6	5	11
Total			35	30	65

AN ELEMENTARY CRYSTAL SET

MADE BY A CHILD SEVEN YEARS OF AGE

THE photograph shows the handiwork of Master Orling, a boy of seven years of age. With the aid of a few empty cotton reels, wood screws, washers, a wooden roller, brass tube and some enamelled copper wire, this enterprising amateur has built for himself quite a novel and useful wireless receiver. Tuning for the various wavelengths is obtained by sliding the brass tube over the coil. This set was exhibited at the recent wireless Exhibition at the Central Hall.

Wireless: "Wired" and "Piped"—II

The Second Article on the Use of Electric-light Mains and Pipes as Aerials

Great Care Necessary in Experimenting

ALL condensers used, whether fixed or variable, must have high insulation, and before starting operations a test should be made, as shown in Fig. 4. The condensers can be taken as correct if the lamp fails to light up when they are short-circuited one at a time. If variable condensers are used, they should be examined internally, as in some cases a strip of metal is fixed to the stationary plates against which the moving vanes make contact when the con-

wide. The side pieces G and H are of hard wood 4 in. long by 1½ in. wide. K and L are two small fixed condensers, and may be of about .002 micro-farads. These are screwed to the side pieces as shown, and their connections taken to their corresponding pairs of terminals. Condenser K will therefore be connected to terminals A and C, and condenser L to B and D. Two or three yards of lighting flex, terminating in a lamp plug adapter, will be required for connection to A and B, and a similar length of flex without an adapter for connection between C and D and the receiver. The condensers K and L may be of other capacities, or they may be variable; but as the size and type was proved by preliminary tests to make no difference to results, the writer has thought it best to recommend fixed condensers, having good insulation, and of about .002 micro-farads capacity.

was taken to the aerial terminal of the receiver, the usual earth connections being retained. Generator hum was noticeable, but was not loud enough to interfere with signals. Both continuous-wave and spark stations came in quite well on all wave-lengths, the strength being about one-third as compared with signals obtained on a standard outdoor aerial. The set was very easily controlled, and no difficulty was experienced in producing self-oscillation when the series condenser was set at about its minimum value. A slight increase in the value of this condenser was found to stop oscillations, make a sharp difference in the wave-length, and greatly increase generator noises. With regard to differences in wave-length, it was found that an inductance coil and condenser which would normally tune to 700 metres on an outdoor aerial, now gave only about 500 metres; and a coil which normally

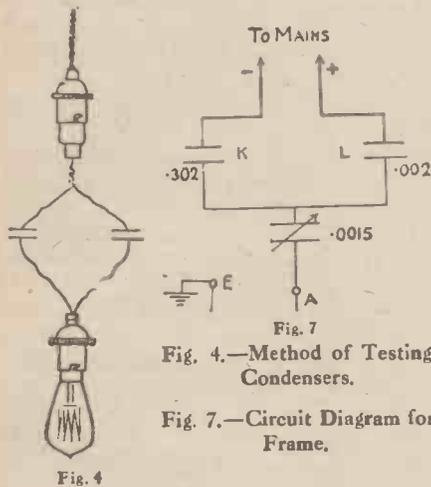


Fig. 4.—Method of Testing Condensers.

Fig. 7.—Circuit Diagram for Frame.

denser is set at its minimum and maximum values. This strip of metal must be removed, and may be replaced by a piece of ebonite or other good insulating material.

When connecting variable condensers to the mains, see that the moving plates are connected to the receiver and the fixed plates to the mains. This will reduce the risk of shock, as in some cases a small screw is used to fasten the knob to the centre spindle of the condenser. Examine the fuses and see that the current is switched off before any connections are made. Use your oldest receiver for the first test. The same remark applies to the telephones and valve.

When everything is ready for the test, remove the telephones from the head, switch on the valve, stand well clear, and then switch on the current from the mains. Any leak will soon be detected, and if the fuse blows it will be obvious that the condensers are defective.

Amateur's Apparatus

A useful piece of apparatus which will be of great assistance in carrying out experiments such as are about to be described is shown by Fig. 5. A B C and D are four terminals; E and F are two pieces of ¼-in. ebonite, 5 in. long by 1½ in.

Fig. 6 shows the single-valve circuit of

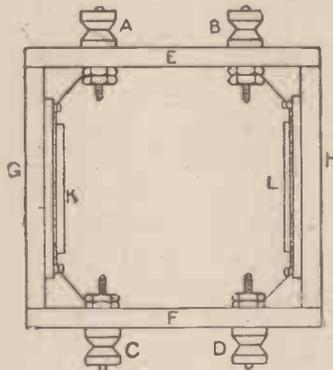


Fig. 5.—Frame for Experimental "Wired" Wireless.

standard type which was used in the tests, but for the benefit of readers who possess multi-valve sets, the comparative amplification is the same on the mains as with an outdoor aerial. Fig. 7 shows a diagram of the frame illustrated in Fig. 5 as connected for the first test.

On Three-wire Systems

In all the cases which follow the electric-light mains were of the three-wire system, with negative side earthed, carrying current at 230 volts D.C. The two fixed condensers K and L were first tested for good insulation as previously described, and were then connected one to each lead from the lamp socket as shown, the opposite sides of the condensers being joined together and taken to one side of a variable condenser of .0015 micro-farads, and from the opposite side of which a connection

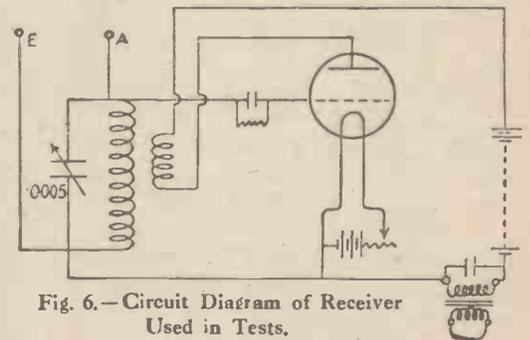


Fig. 6.—Circuit Diagram of Receiver Used in Tests.

gave 5,000 metres now tuned to only 4,100 metres; and other wave-lengths showed similar differences.

P. T. B.

(To be concluded)

"An Electric Alarm Gong" is the title of an article in this week's "Work," the journal for amateur mechanics. Other useful articles are: A Home-made Weather-glass; Model-making Lathe; Economic Furniture; Removing Valve-stem Guides.



The Super-Antenna
(Wireless Exploitation Corporation)

Simple Lead-in Tube

ONE of the commonest faults, yet at the same time one most easily remedied, that the wireless amateur is prone to is the incomplete insulation of his aerial lead-in. He generally gives much time and thought to the insulation of the aerial itself, and then at the point where leakage is most apt to occur, and most disastrous to the clarity of his signals, he is content with a cardboard tube or an extra thickness of rubber on the lead-in wire.

Incomplete insulation at this point means trouble; it means, too, that the effectiveness of the insulation in the aerial itself is practically destroyed. To prevent much of the energy that should go to the receiving set from leaking off to the ground, and to ensure an effective waterproof insulation that will give best results, the simple lead insulation here described will meet all the amateur's requirements.

A porcelain, hard rubber, or ebonite tube of stout construction about 2 in. in diameter and, say, 2½ in. long, with two end pieces ground to make a tight fit are required. Porcelain makes an admirable insulator, but ebonite will be found easier to work. The end pieces should be drilled in the centre to take ¼-in. or ½-in. brass rod about 6 in. long and threaded at each end for nuts. This rod is used to tighten up the two end pieces and as a conductor; the threaded ends act as terminals for the wires.

One end piece should be made fast in the tube, the brass rod placed in position, and the remaining space in the tube filled with molten sulphur. When this has

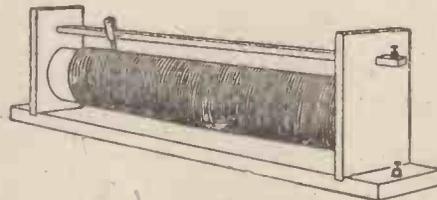
solidified it will prove a splendid insulating material, as well as render the interior moisture-proof. The other end piece is now fixed into position and both ends screwed up tightly, and the insulator is ready for use.

A hole should be bored in the window frame just sufficiently wide to take the insulator with a little forcing; if made too wide it must be well packed. The lead-in wires are now connected up on the outside, and the inside lead, which goes to the instruments, fastened on the inside.

Both connections should be soldered, and to make assurance doubly sure covered with two or three thicknesses of adhesive insulating tape. A. J. B.

A Potentiometer

A POTENTIOMETER is simply a variable resistance coil, any length of which may be included in a circuit by moving a sliding contact. In a crystal set the potentiometer is used for varying



Simple Potentiometer.

the small current which some crystals require, and in a valve receiver it is used for regulating the filament current. It can also be used as a variable tuning inductance.

The materials which must be bought for the construction of a potentiometer such as is shown in the diagram are as follows:

- ½ lb. of No. 32 S.W.G. enamel-covered wire.
- 2 ft. of ¼-in. square brass rod.
- One inductance slider.
- Four brass terminals.

First construct a wooden base 20 in. long, 4 in. broad and 1 in. thick, with two grooves to hold the upright supports for the coil, as shown in the drawing.

Next make the uprights. The dimensions of these are 4 in. by 5 in. by ½ in. In selecting the wood for these, get a piece in which the grain will run up the upright, not across it. Also the harder the wood used the better. Ebonite could be used if desired, but it would be neither so easy to work nor so cheap as wood.

The cylinder on which the wire is wound is 18 in. long and has a diameter of 2 in. It fits into the two uprights and can be either a wooden cylinder or a cardboard tube.

The ½ lb. of No. 32 S.W.G. wire will have a length of about 955 yards, and if the wire is wound double, that is, one turn on top of the preceding turn, then the next turn on the cylinder, and so on, it will take up about 14.7 in. of the tube, giving a maximum resistance of 123.5 ohms. This is quite large enough for all ordinary purposes.

With a gimlet bore a hole through the cylinder about 2 in. from one end, pass the wire through this, and commence to wind the coil. Wind every other turn over the one before it, so that a double thickness of wire is put on the coil. The slider will, of course, touch every other turn. When you have wound on all the wire with the exception of a few inches at each end, fasten the two ends to terminals on the baseboard.

Next assemble the instrument, putting a brass terminal on each end of the brass rod. The whole, with the exception of the rod and slider and terminals, should be coated with paraffin wax or shellac varnish to ensure perfect insulation.

W. R. H.

ILLUSTRATIONS OF THE CRYSTAL HOLDER

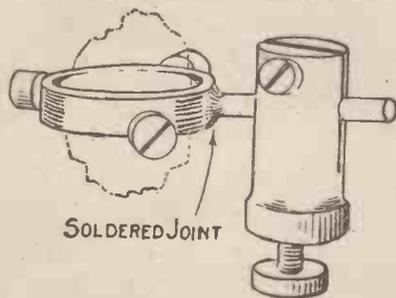


Fig. 1.—Crystal Ring and Support.



Fig. 2.—Crystal Wrapped with Tinfoil.

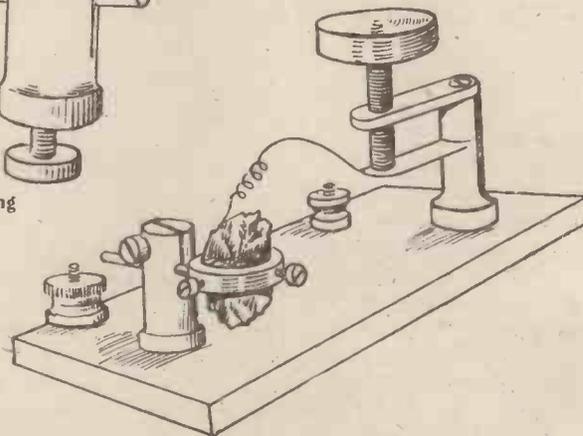
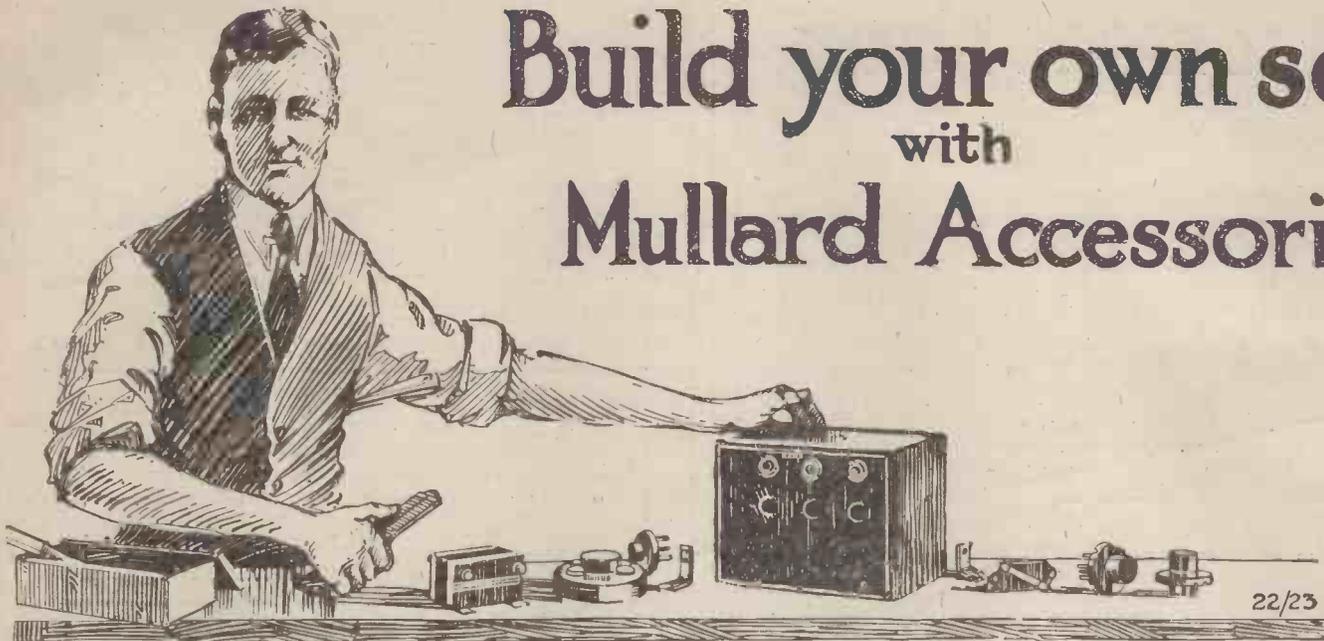


Fig. 3.—The Complete Detector.

Novel Crystal Holder

MANY amateurs with crystal sets will find that a crystal, which may have been carefully tested beforehand, has gone severely "off colour" after being fixed in the cup with hot metal. Even when this operation has been successful one often has the uncomfortable feeling that, after all, the most sensitive spot of the crystal may be at the bottom of the cup, and more likely than not it is. The following device can be adapted to your existing detector. All you require is a crystal cup with three set screws and the contact post from an electric bell, the contact

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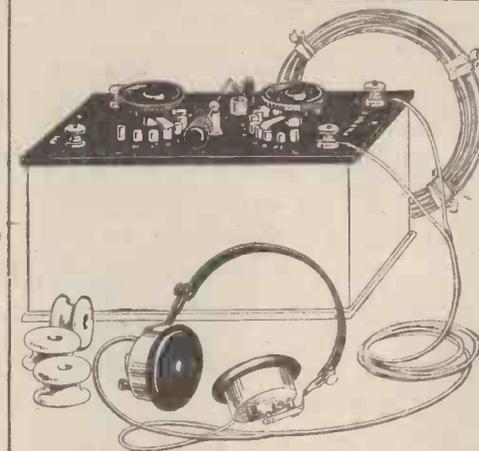
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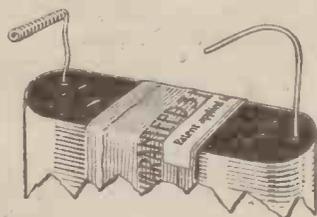
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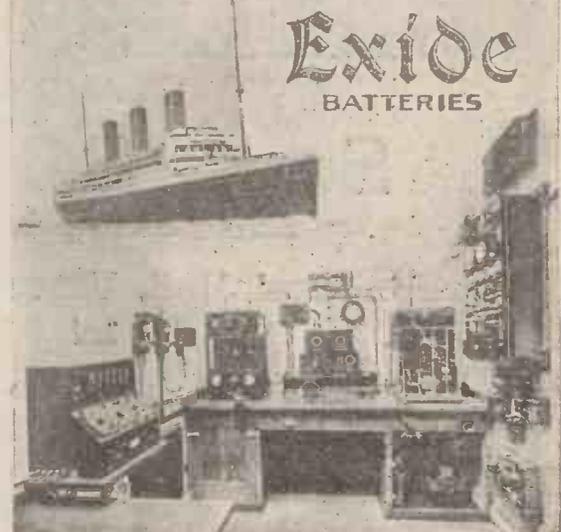


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AT THIS EXHIBITION there are 52 wireless manufacturers and suppliers, who in every case will show nothing but wireless goods.

AT THIS EXHIBITION many exhibitors will be showing for the first time wireless apparatus and accessories of new and novel design.

AT THIS EXHIBITION two prominent wireless publishing companies are placing before the public the finest collection of technical books on wireless ever offered.

AT THIS EXHIBITION there is one stand occupied by the Organisers, who have made every preparation to assure the pleasure and comfort of thousands of visitors.

AT THIS EXHIBITION there will be an orchestra to entertain you during the periods when wireless demonstrations are not taking place.

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AT THIS EXHIBITION there will be "broadcast" wireless concerts and demonstrations throughout the day.

AT THIS EXHIBITION you will find a comfortable lounge opposite the demonstration stand.

AT THIS EXHIBITION the Wireless Society of London have made every arrangement for a convention, having the full support of all the affiliated societies and clubs.

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screw of which is replaced by a short piece of brass rod, say 1 in. long. The cup is filed down to a shallow ring, as in Fig. 1, and the rod firmly soldered to it. This figure shows the adaptation complete. Now make a band by rolling up a small piece of tinfoil; wrap and press this tightly round a suitable crystal (Fig. 2) and clamp

the whole inside the ring. The tinfoil should then be well packed down round the crystal. This gives good contact without danger of heating; whilst by loosening the screw on the contact post the crystal and holder may be turned right over or removed as required. Fig. 3 shows the complete detector. C. R.

ever, I strongly advise you to stick to a single-valve arrangement until you have become thoroughly conversant with all the little tricks and pitfalls.

Do not expect loud speech from Paris with one valve at this distance. Everything will have to be very quiet, and if you are able to clearly distinguish the music, you have reason to be quite pleased with yourself. At the time of writing I have just heard the first "Daily Mail" concert from The Hague, and it is about the same as from Paris. I can hear Writtle and Croydon considerably better; in fact, although rather faint, the speech from Croydon is always exceptionally clear.



Some Aerial Don'ts

- DON'T use iron wire for the aerial.
- Don't allow the lead-in to be too near

TELEPHONY RECEPTION ON SINGLE-VALVE SET.—II

Capacity Effect

IT is advisable at this stage to make one or two small additions to the set. You will probably have found that, as you bring your hand near to the condenser or reactance, you alter the tuning. This is a capacity effect, and to get over the difficulty you should fix long handles to your condenser and coil-holder as shown in Figs. 1 and 2. The handles can be made of strips of hard wood or ebonite about 18 in. long, 1 in. to 1½ in. wide, and ½ in. thick screwed to the ebonite knob. In order to get the fine adjustment necessary for telephony, it is best to connect one of the small rotary condensers, consisting of about five plates (often called vernier condensers), across the large condenser. A similar condenser should be connected across the reactance coil, the action of this being equivalent to a very fine adjustment of the reactance coupling. These small condensers should also be fitted with long handles, and should be left about in the midway position. After getting the best adjustment possible with the large condenser and the reactance coupling as described, you can finish off with the two small condensers. Try this each night for a week or more if possible, and with practice you will be able to get to the critical point without your valve oscillating.

but you will be able to try C.W. with your single valve provided you keep well away from the wave-lengths used for telephony.

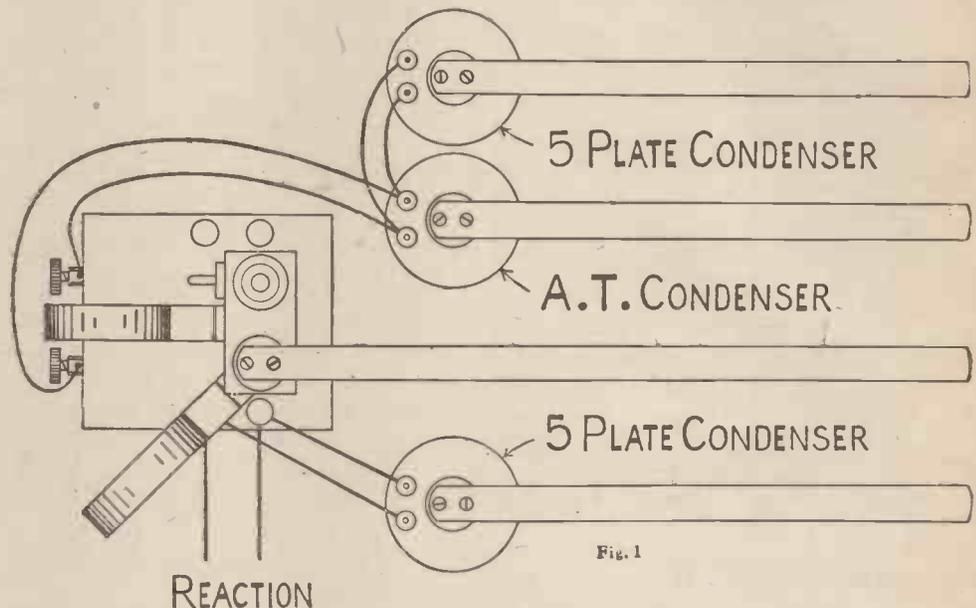


Fig. 1

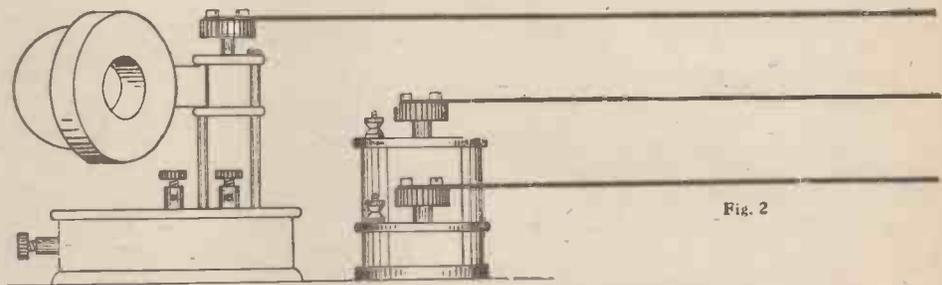


Fig. 2

Figs. 1 and 2.—Plan and Elevation of Apparatus Fitted with Handles to Avoid Hand-capacity Effects.

Valve Oscillations

The reason for the note in the telephones when your valve oscillates is that the high-frequency oscillations, which are inaudible themselves, combine with the high-frequency "carrier-wave" used for the telephony, the difference in frequency causing the note. If the difference is fairly great you get a high-pitched note, and if there is only a small difference a very low note. It is possible to get the two practically the same, and when this occurs there is no resultant note, but the speech will be very rough and broken up, and it will be impossible to distinguish what is said.

From this you will understand the reception of "continuous-wave" telegraphy, the continuous wave in telegraphy being exactly the same as the carrier wave in telephony, but sent out in dots and dashes by means of a sending key. A separate oscillator should be used for this reception,

Wider Experience

Having become proficient in the reception of the Paris telephony, I advise you to invite an experienced friend to help you with the other stations, as it is rather difficult to find a station without oscillating. This is one of the advantages of a multi-valve set, as you can use a separate oscillator to search for the carrier wave without interfering with anyone. How-

the side of the house; let it curve in at the bottom.

Don't run the aerial wire parallel to any other wires or metallic conductors.

Don't use knotty wood for the mast.

Don't omit to paint the mast; the wood will be preserved by doing so.

Don't allow any paint to get on the insulators.

Don't omit to stay the mast.

Broadcasting— The Situation

The Postmaster-General's Statement

THE statement on the present position regarding broadcasting, printed below, was issued by the Postmaster-General on September 20.

A conference took place on September 12 between the Committee of Manufacturers and representatives of the Postmaster-General in regard to the criticisms which he has had occasion to make on the articles of association of the proposed broadcasting company, and on the terms of the proposed agreement between the company and the firms who will constitute its individual members. Several of the points raised by the Postmaster-General were satisfactorily met, and in two or three cases in which the Committee felt unable to accept his views they made alternative proposals. These have led to agreement in principle, and, so far as the Postmaster-General's criticisms are concerned, it only remains for his representatives and the Committee to settle certain details.

Differences

It appeared at the conference that, apart from the Postmaster-General's criticisms, there were differences between members of the Committee themselves, which would have to be settled before the broadcasting company could be formed. It is understood, however, that considerable progress has also been made towards the solution of these differences.

A Statement

It was agreed at the conference referred to that, as soon as a settlement had been arrived at in regard to the above matters, the Committee of Manufacturers should call a meeting of all the firms who desire to join the broadcasting company (who, it will be remembered, must be bona fide British manufacturers), at which the whole situation will be explained to them.

Valve Patents

In the meantime, the Postmaster-General and the Committee desire it to be known that membership of the broadcasting company will not, of itself, entitle a member to use the patents of other members in the manufacture of receiving apparatus. In particular, the Marconi Company claim to hold patents which are necessary for the construction and use of "valve" receiving sets. The company have stated that they are prepared to allow members of the broadcasting company to use these patents on terms which can be obtained on application.

Licences

THE Postmaster-General has not yet begun the issue of the simple form of licence which is proposed for broadcast reception, and he does not propose to do so until the broadcasting company has actually been formed—provided, as he hopes, that there is no further material delay in its formation. In the meantime, he is issuing experimental licences to all who can satisfy him that they have a sufficient knowledge of the subject to enable them to make proper use of such licences.

We Reassure Our Readers

FROM information which we have obtained from a reliable source we feel confident in asserting that the amateur's interest will be found to have been safeguarded when the agreement between the Postmaster-General and the Broadcasting Company has been completed and published. We are very glad to learn that the Post Office authorities, in recent negotiations, have been insisting upon the rights of the amateur and of the host of small firms in the new industry. More than this we are not, at the moment, in a position to state, but we wish these words to go forth as a message of good cheer to the many thousands of amateurs and potential broadcast "listeners-in" who may have been disappointed by the many rumours which could not help coming into existence owing to the secrecy with which all the negotiations have been conducted. We anticipate a prompt settlement of the outstanding difficulties and an early start with broadcasting. We are looking forward to good things.

FORTHCOMING EVENTS

Nottingham and District Radio Experimental Association. Sept. 28. Meeting at Room 74, Mechanics' Institute. Discussion on Mr. Ford's lecture on "Radio Measurements."

West London Wireless and Experimental Association. Sept. 29. Lecture by Mr. F. E. Studt. "A Three Circuit Variometer Tuner."

Wireless Society of Highgate. Sept. 29. At Highgate Literary and Scientific Institute, South Grove, Highgate, N.6. Annual general meeting.

Belvedere and District Radio and Scientific Society. Lecture on "Oscillatory Circuits," by Mr. A. G. Warren, M.Sc.

Ilkley and District Wireless Society. Oct. 2, 8 p.m., at Regent Café. Morse practice.

Greenwich Wireless Society. Oct. 3, 7-45 p.m. at Rangers' House, Blackheath. Ordinary meeting.

Wireless Society of East Dorsetshire. Oct. 4. Formation of winter programme. First lecture on the construction of a single valve receiver.

Portsmouth and District Wireless Association. Oct. 4. Lecture by Mr. Donkin, "Portable Receivers."

TELEPHONY TRANSMISSIONS

Eiffel Tower (F L) 2,600 metres. Each afternoon (Saturdays excepted).

The Hague, Holland (P C G G), 1,085 metres, B.S.T. Sept. 28, Oct. 1, Oct. 5, 8-9 p.m.

Writtle (2 M T), 400 metres. Oct. 3, 8 p.m.

Radiograms

SMALL manufacturers and importers of wireless apparatus have asked the Postmaster-General to receive a deputation to state their case against the monopoly of wireless instruments. A member of one of these firms is reported to have stated that "if the Postmaster-General does give the broadcasting combine a monopoly we should put the whole scheme to the test by simply importing, manufacturing, and selling as usual, and it will then be for the Post Office to take legal action against us and suppress us if they can."

A demonstration of weather forecasting by wireless was given by the Meteorological Office during a meeting of the British Association at Hull with the object of showing how anyone possessing a small wireless receiving set can pick up and utilise the weather reports broadcast from the Air Ministry, the Eiffel Tower, and other European stations.

The Postmaster-General has temporarily suspended the issue of licences for the reception of wireless telegraphy and telephony, except for experimental work. The suspension is only until the negotiations between the broadcasting companies and the Postmaster-General are completed. Any bona-fide experimenter can still have a licence, but licences will not be issued at present for mere reception of broadcast.

Wireless press traffic in Germany has increased by over two hundred per cent. in the past twelve months.

Over 20,000 visited the first wireless exhibition, which was a complete success. Visitors came from America, Norway, Denmark, France, Spain, and India. Business with the firms exhibiting was brisk, one company alone sold 600 sets.

Whilst in mid-ocean the Atlantic liner *Mauretania* received, and relayed messages to the *Aquitania*, then on the point of entering New York Harbour. These messages, dispatched from the wireless station at Devizes, were read, and passed on to the American coast by a chain of Cunarders, no fewer than six of which were in touch on that particular day.

Wireless experiments have been carried on in a Staffordshire coal mine 700 feet deep with the idea that in case of accident, cutting-off sections of the mine and imprisoning workers, a small transmitter would be used to give the exact location and the extent of the damage.

The Prince will Greet the Boy Scouts by Wireless

HIS Royal Highness the Prince of Wales has graciously consented to broadcast by wireless telephony, from York House, through Marconi House, London, on the evening of Oct. 7, an address to the boy scouts of Great Britain. This address will be directed specially to those scouts who, for various reasons, are unable to be present in the afternoon of that day at the great rally being held in his honour at the Alexandra Palace, London.

The Prince will speak by wireless between 7.30 and 8 p.m., the Marconi House station wave-length being 360 metres and the call letters 2L O.

In order that a maximum number of scouts may "listen-in" on that occasion special arrangements are being made with the wireless societies throughout Great Britain, whereby they place their services at the disposal of the local troops.

CORRESPONDENCE

Results on a Crystal

SIR,—Having carried out exhaustive tests with valve and crystal detectors, I was naturally interested in "W. E. W.'s" letter in a recent number of AMATEUR WIRELESS, and I should also like to join him in his effort to impress other amateurs that there is nothing to equal a well-adjusted crystal for a rectifier. Why so much prejudice I fail to see, and in my opinion those who assert that crystal sets are "toys" probably have not the patience to give them a fair trial. I have built a set for a friend similar to the one described in "Wireless Telegraphy and Telephony" ("Work" Handbook), and he gets the Writtle concerts quite O.K. using a Permalite crystal and copper wire. Writtle is 45 miles from here. Does this constitute a record? I have just fitted a single-valve amplifier to my own crystal set, and apart from my "stock-line" concerts, etc., I can get amateur concerts every evening within a radius of 50 to 60 miles. I think an ideal receiving set is either a crystal set with one or two stages of L.F. amplification, or one-stage L.F. amplification, crystal rectification, and one stage L.F. amplification. With reference to

W. E. W.'s remarks about the necessity of a double-slide inductance, I find that two sliders on the one rod give excellent results. The second slider cuts out all "dead-end" effects, and very fine tuning can be obtained this way—much finer, in fact, than with a loose coupler. I have never yet obtained any better results by using variable condensers, and I consider these quite unnecessary providing one has a really efficient tuner.—O. J. R. (Sutton).

When a Heterodyne Set is Radiating

SIR,—May I claim the hospitality of your columns to point out that a statement made by your contributor "J. F. S." in his excellent article on "A Single-valve Heterodyne Receiver," in No. 15 of AMATEUR WIRELESS, while correct in itself, is liable to mislead novices who may be operating similar sets.

After describing the method of adjusting the reaction coupling for the reception of continuous wave signals, he goes on to say: "If a loud rushing noise or a whistle is heard the coils must be pushed apart immediately, as the set is then radiating." This, of course, is quite true as far as it goes, but the novice should beware of the implication that it is only when "whistling" or "howling" that a heterodyne set is radiating. The fact is that so long as a single-valve reaction set is oscillating (that is, so long as it is in a condition to receive C.W.), it is radiating, and will cause interference if it is tuned to a wave-length upon which such radiation is objectionable (that is, the telephony wave-lengths and short waves in general). This fact cannot be too strongly urged upon the attention of beginners, since many of them have the idea that if they keep their sets from "whistling" they are safe, whereas they are really making public nuisances of themselves despite their good intentions. It should be realised that it is impossible to prevent a certain amount of radiation from a single-valve set when in the oscillating condition. Even the loose-coupled circuit given by "J. F. S." in Fig. 8, while considerably reducing the trouble, does not entirely eliminate it, and hence it is very doubtful whether the P.M.G. will allow it to be used for broadcasting reception.

The only safe way to employ reaction is to use two (or more) valves, the first being a high-frequency amplifier with tuned-plate circuit, and the second a detector whose reaction coil is coupled back into

the H.F. plate circuit.—G. P. K., B.Sc. (Leeds).

Broadcasting

SIR,—I read with much interest Mr. Malone's article "Broadcasting: a Rumour" in the issue of Sept. 16, and I heartily agree with all he says. May I add a few words on the question of advertising by wireless. I would go further than Mr. Malone and say that spells of advertising (say five minutes before the concert and a minute or so between each item) would be a positive boon to all amateurs. It would enable the beginner to get his set adjusted before the actual items of the programme were broadcast, and the more serious amateurs would thereby be able to enjoy the concert in peace and quiet!

I was trying to listen to Writtle last Tuesday on a friend's set, and the interference from local amateurs was terrible.

If my suggestion were adopted it would be appreciated, I feel sure, by all.—R. W. B. (Cheltenham).

CLUB DOINGS

Fulham and Chelsea Amateur Radio Society

Hon. Sec.—MR. R. S. V. WOOD, 48, Hamble Street, Fulham, S.W.6.

A MEETING was held on Sept. 13th at the society's temporary headquarters, when during a discussion on reception Mr. Whitts kindly gave a short but exceedingly interesting lecture on "Ether."

Streatham Radio Society

Hon. Sec.—S. C. NEWTON, "Compton," Pendennis Road, Streatham, S.W.

A MEETING of the above society was held on September 13 at the headquarters, 35, Streatham Hill. The treasurer arranged for a photograph to be taken of the members, and several new members were proposed and seconded. A demonstration was given by Mr. Smith, who used a 4-valve set, very kindly lent for the occasion by Mr. Travers of the Radio Appliances, Ltd., Streatham. The secretary stated that application had been made to the Postmaster-General for a receiving licence. Several members promised to read papers, and a committee meeting was arranged to discuss and arrange a programme for the winter session. The secretary will be pleased to receive applications from wireless enthusiasts resident in the district.

(Continued on page 370)

OUR INFORMATION BUREAU

Expert Replies to Readers' Questions. Hundreds of Replies are sent by Post.

TO ENSURE A PROMPT REPLY PLEASE OBSERVE THE FOLLOWING RULES

Write distinctly, give all necessary details and keep to the point. Ask one Question at a time—never more than two. Send a Stamped and Addressed Envelope. Send the Coupon cut from page 370.

WHAT TO SEE AT



"Exide" 12-volt High-tension Battery with Glass Test-tubes.

The type of battery that enabled the first S.O.S. call to be sent out—one of the well-known "Exide" batteries, made by the Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester. On their stand will be found all the latest types of batteries, for every wireless apparatus, in glass, ebonite and celluloid cases. A point should be made of seeing the special high-tension storage battery with the long thin plates in glass test tubes. (Stand 30.)

Bulldog-grip fittings for the ends of telephone cords, exhibited by C. F. Elwell,



Elwell's Cabinet "Aristophone."

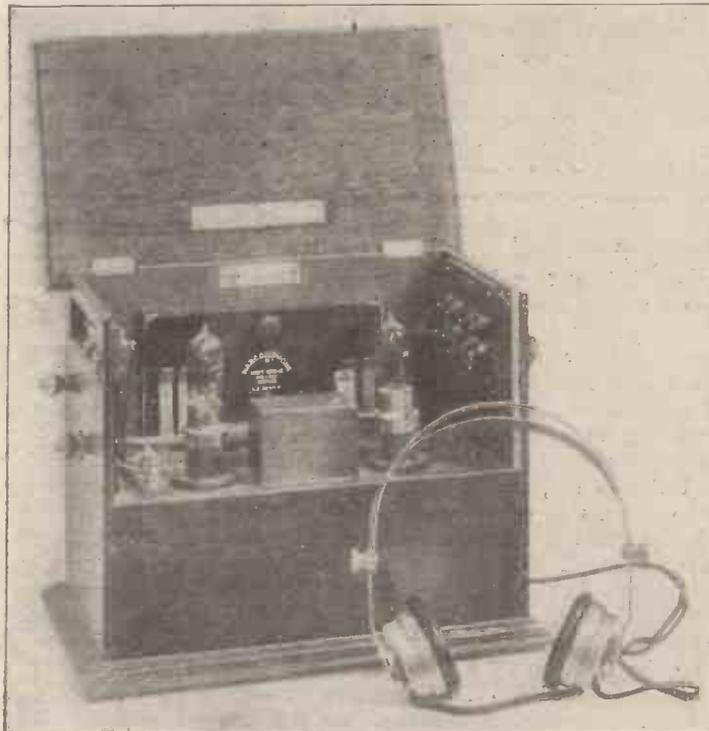
Ltd., Craven House, Kingsway, London, W.C.2. In addition, this firm are showing a number of panels (a speciality being the Elwell amplifying unit) and cabinet receivers for drawing-room use made in Cromwellian, Sheraton, lacquer, and Adam styles. (Stand 23.)

Historical apparatus, marking the progress made in the science of wireless telegraphy and telephony during the last quarter of a century, is to be seen on the Marconi stand. Another exhibit of popu-

lar interest on this stand will be the "Marconiphones," which have been specially designed for the reception of broadcast telephony in the home. In addition, there will be shown the latest pattern wireless direction finder as used by the Air Ministry at the London Air Port. By means of this instrument the plane of the received signals can be accurately determined as well as the absolute direction of reception. Another exhibit will be the Marconi aircraft wireless-telephone transmitter and receiver such as is fitted to all the British commercial aeroplanes flying between London and the Continent. A feature of the V₂ model "Marconiphone" is that, though it is constructed in accordance with Post Office requirements and is

not capable of radiation, there is a throw-back circuit by means of which additional low-frequency magnification is obtained although, as a matter of fact, reaction is not employed. (Stand 32.)

Unit dry cells, which may be made up into high-tension batteries, made by the Ever Ready Co., Ltd., Hercules Place, London, N.7. In the construction of the unit cells special care has been taken regarding insulation, so that any number may be connected in series without fear of



"Marconiphone," Two-valve Type.

leak. Each cell is fitted with a brass-screw terminal to the carbon and with an insulated connecting wire from the zinc. (Stand 11.)

Valves—transmitting, receiving, rectifying and amplifying—ranging from the well-known V 24-type receiving valves to the latest high-power transmitters, exhibited by the M.O. Valve Co., Ltd., Brook Green, London, W.6. The new low-temperature emitter valve works on a filament voltage of 1.8. In combination with this firm the General Electric Co., Ltd., of Magnet House, Kingsway, are showing two types of crystal receiving sets, and in addition a high-class two-valve set. (Stand 28.)

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Igranic Horn and a

THE ALL-BRITISH EXHIBITION

of
HORTICULTURE
SQUARE, WESTMINSTER
(A few minutes' walk from the Exhibition)

SATURDAY,
10 to 12 SATURDAY
10 a.m.

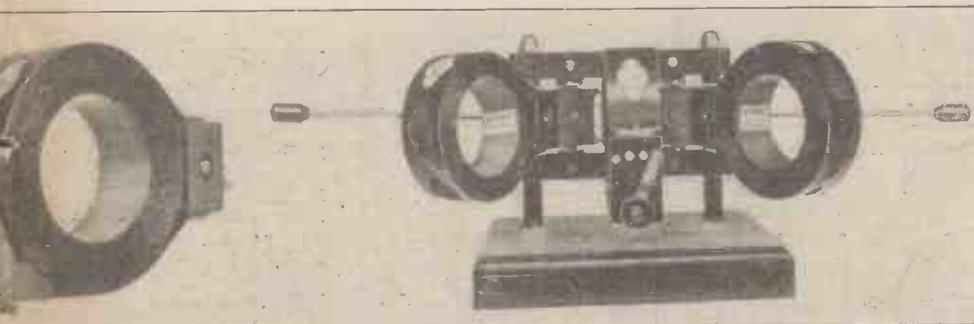
For Plan and List of Exhibitors

THE EXHIBITION

Double-circuit tuning units of novel construction exhibited by the Radio Communication Co., Ltd., Norfolk Street, London, W.C.2. In these a number of replaceable inductance coils are provided, each fitted with a direct-reading wave scale, which enables the wave-length to which the circuit is tuned to be seen at a glance, and accurate measurements of any incoming waves to be taken. The secondary circuit can be used as a standard wavemeter. The coils are tuned by the "Polar" "square law" variable

coils in operation, one using the paper interlay method and the other the cotton interweave method. Various types of coil-holders and tuners are shown, some of which are illustrated on this page. (Stand 4.)

The patented colour scheme adopted by H.P.R. Wireless, Ltd., Carlton House, Great Queen Street, London, W.C.2, allowing of complicated instruments being used by novices with no previous knowledge of wireless. This is rendered possible by means of the H.P.R. automatic

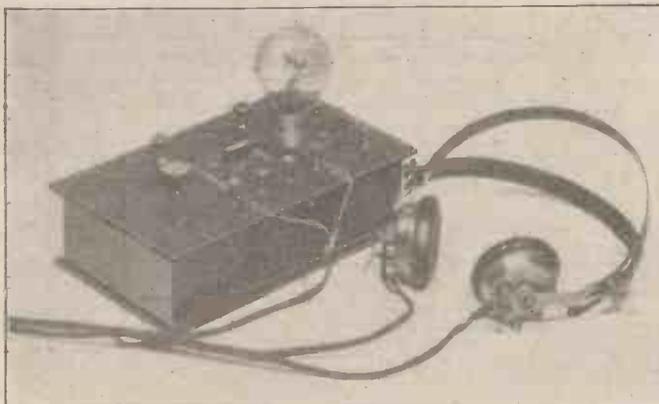


Honeycomb Coils with Switches
Coil-holder with Coils.

BRITISH WIRELESS & CONFERENCE

held at the
AL HALL, VINCENT
NSTER, LONDON, S.W.
(Walk from Victoria Station)
from
SEPTEMBER 30
AY, OCTOBER 7
to 10 p.m.

Exhibitors, see page 364



H.P.R. One-valve Set

condenser, which has just been placed on the market. This condenser gives a reading such that each graduation produces the same proportional change in the wave-length, an advantage of value in heterodyne reception when working near the zero point. This firm also are showing a large range of general apparatus. (Stand 45.)

Duo-lateral or honeycomb inductance coils, a speciality of the Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, who possess the sole manufacturing rights of these coils under the De Forest patent. The coils in the actual process of winding by machinery will be shown on the stand. In addition, there are two machines winding transformer

wave-length indicator which is simply moved to a figure denoting the wave-length required which indicates the correct settings of the switches. (Stand 35.)

The new "Xtraudion" three-electrode valve on the stand of the Economic Electric, Ltd., 10, Fitzroy Square, London, W.1. Advance particulars of this were given in No. 15 of AMATEUR WIRELESS. The special features are the peculiar form of the grid and plate with which construction the filament may sag to any extent and yet cannot short-circuit with the grid. The valve is also of low price. (Stand 51.)

Valve bridges for use in recording wireless signals in conjunction with a record and Morse inker, also shown on Stand 51,



Vario-coupler on one of the Economic Electric Valve Sets.

A new replaceable dry battery factored by Harwell, Ltd., 28, John St., London, W.C.1, and claimed to have approximately five times the life of the usual type. The cells are made up in units of two cells, the unit giving approximately three volts. Another neat idea is a coupling for connecting up flash-lamp batteries. (Stand 5.)

Wireless cabinets, the principal feature of the Alfred Graham & Co. exhibit. These are so arranged that the sound-amplifying horn may be used alternatively either for reproduction of gramophone records or for wireless reception. Additional exhibits of this firm are the Amplion loud speaker and adjustable head-gears. (Stand 44.)

(Continued on next page)



"Amplion" Loud-speaker.

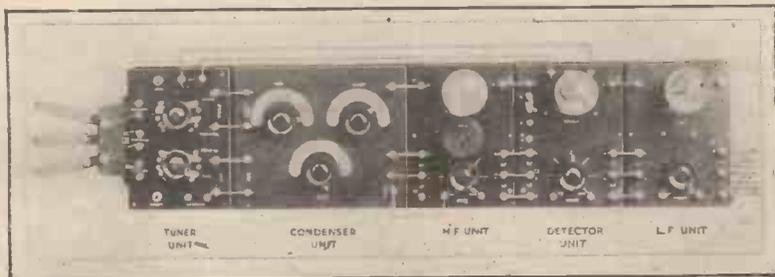
What to see at the Exhibition—

(continued)

The Peto Scott unit-constructed receiver, which in the complete instrument com-

Villiers Road, London, N.W.2. On this stand examples of high-tension transformers and choke coils also will be shown. (Stand 3.)

trodes are in the form of hemispherical shells, fixed and movable shells being interleaved with one another somewhat similar to the arrangement of the ordinary movable-vane condenser. This arrangement secures great mechanical rigidity and ensures constancy of calibration. A variety of condensers for all purposes are shown by this firm. (Stand 36.)



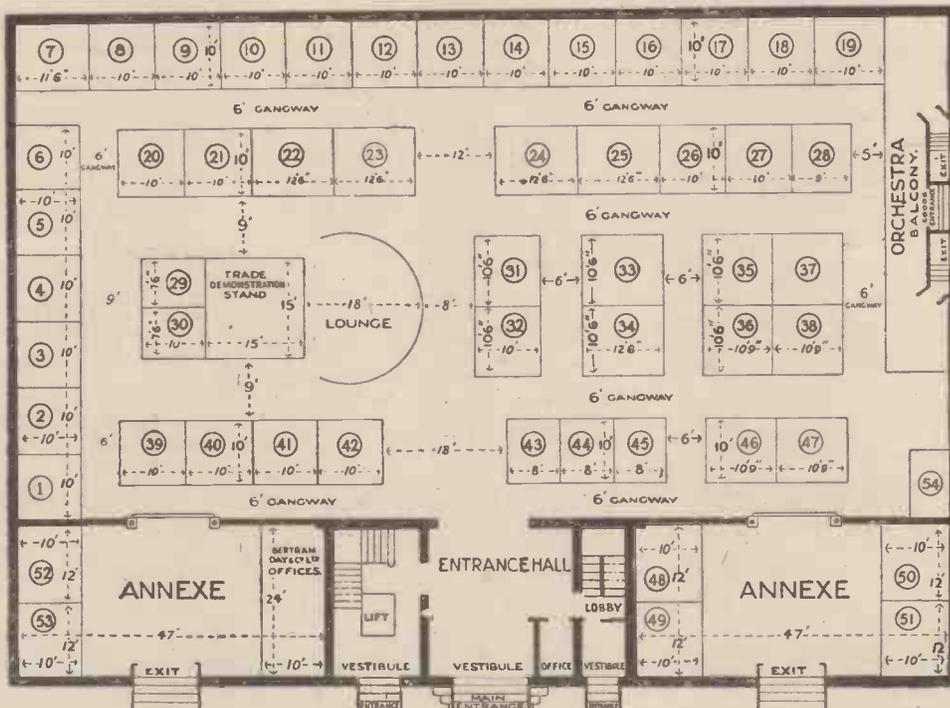
Peto Scott Unit Receiver.

prises tuner, condenser, high-frequency, detector and low-frequency units, enabling the amateur to advance stage by stage without great initial outlay. (Stand 34.)

Self-contained cabinet valve set employing entirely separate coils for each set of wave-lengths, made by W. R. H. Tingey, 92, Queen Street, London, W.6. For the

A condenser for wired wireless, enabling ordinary house electric-lighting wires to be used as receiving aeri-als. This condenser is termed the "Ducon" attachment, and it is tested to withstand a pressure of 2,000 volts. It is made by the Dubilier Condenser Co., Ltd., and is designed for inserting directly into an electric-lamp holder. Various other patterns of standard laboratory condensers and condenser units suitable for both spark and C.W. transmitters are also exhibited, the latter in-

Stand No.	Name
2	Anode Wireless & Scientific Insts., Ltd.
46	Auckland, G. Z. & Son.
52	Automatic Telephone Manfg. Co., Ltd.
19	Bower, J. B. & Co., Ltd.
7	British Thomson-Houston Co., Ltd.
42	British Wireless Supply Co.
43	Brown, S. G. Ltd.
12A	Burndep, Ltd.
30	Chloride Electrical Storage Co., Ltd.
18	Coomes & Co.
29	Cossor, A. C. Ltd.
36	Dubilier Condenser Co. (1921) Ltd.
50	Econ Manfg. Co., Ltd.
51	Economic Electric Ltd.
23	Elwell, C. F. Ltd.
11	Ever Ready Co. (Great Britain) Ltd.
10	Fellows Magneto Co., Ltd.
31	Gamage, A. W. Ltd.
47	Gambrell Bros., Ltd.
26	General Radio Co.
44	Graham, A. & Co.
12	Hambling, Clapp & Co.
17	Hart Accumulator Co., Ltd.
5	Harwell, Ltd.
35	H.P.R. Wireless, Ltd.
4	Igranic Electric Co., Ltd.



Plan of Exhibition and List of Apparatus Exhibitors.

Stand No.	Name
9	Isted, T. H.
8	K. B. Radio Equipment Co.
32	Marconi Scientific Instrument Co., Ltd.
24	Marconi's Wireless Telegraph Co., Ltd.
38	McMichael, L., Ltd.
33	Metropolitan Vickers Electrical Co., Ltd.
21	Mitchell's Electrical & Wireless Co., Ltd.
28	M.O. Valve Co., Ltd.
41	Mullard Radio Valve Co., Ltd.
16	Peto Scott Co. [Ltd.]
53	Pettigrew & Merriman, Ltd.
45	Radio Com'cation Co., Ltd.
37	Radio Instruments, Ltd.
6	Radio Service, Ltd.
22	Rogers, Foster & Howell, Ltd.
48	Siemens Bros. & Co., Ltd.
54	Sterling Prince & Co.
34	Stanley Telephone & Electric Co., Ltd.
49	Sullivan, H. W.
20	Telephone Manufg. Co., Ltd.
25	Tingey, W. R. H. [Ltd.]
15	Wates Bros.
39	Western Electric Co., Ltd.
14	Wireless Equipment, Ltd.
1	Wireless Supplies Co.
3	Zenith Manufg. Co.

A radio-gramophone—a combined valve receiving set and gramophone—enclosed in a cabinet, shown by Harwell, Ltd., 28, John Street, London, W.C.1. (Stand 5.)

High-tension accumulator units, as specially manufactured for wireless work by the Hart Accumulator Co., Ltd., Marshgate Lane, London, E.15. This firm also manufacture low-tension accumulators, a speciality being the M.E.U. type splash-protected accumulator. (Stand 17.)

Portable two-valve receiving sets, suitable for scout companies, clubs, tourists, etc., shown by Rogers, Foster & Howell, Ltd., Edward Road, Birmingham. (Stand 22.)

The potentiometers and resistances shown by the Zenith Manufacturing Co.,

operation of this the actual external connections are only the earth, aerial, accumulator and telephones. (Stand 25.)

Head-pieces and loud-speakers, the speciality of the Automatic Telephone Manufacturing Co., of Milton Road, Liverpool. In addition, the company are also showing condensers, trans-

formers, wave meters, etc. (Stand 52.)

The "Sphericon" variable air condenser, shown by the Dubilier Condenser Co., Ltd., Goldhawk Road, London, W.12. The elec-

cluding a standardised condenser unit enclosed in an aluminium case. (Stand 36.)

(Continued on page 366)



Two Examples of Condensers by the Dubilier Co., Ltd:



The discerning Amateurs and Experimenters require apparatus and parts of the highest quality and efficiency. These can be obtained only from :

Radio Supplies (Established 1920) 236, High Holborn, London, W.C.1.

The firm with a long-standing reputation for Superior Wireless Apparatus.

TRADE **Grelco** MARK



Filament Rheostat Solid Construction Phosphor Bronze Arm which will not work loose. Easy to fix to Panel.
Price 4/- each.

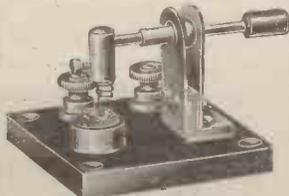
CRYSTALS.
N O T
EX-GOV T.
Zincite, Bornite, Galena-Silicon, Carborundum, Copper Pyrites, Tellurium.
Per Packet 6d.
Special Low Melting Point Alloy,
Per Stick 6d.



The Original Green Egg Insulator. Very highly glazed. Do not confuse with the cheap imitations.
Price 6d. each.



Crystal Caps, Turned Brass, well finished, with Milled Screw as illustrated.
Price 4d. each.



Crystal Detector Swivel Movement, allowing any point of the crystal to be used. Mounted on Ebonite complete.
Price 4/- each.



Sliders with Special Design Plungers, well finished, for 1/8 x 1/4 Brass Rod.
Price 6d. each.

The above items only represent a fraction of the large stock we hold at our stores and showrooms. We supply every article for wireless at the very lowest prices. A visit will convince you.

FULLY ILLUSTRATED CATALOGUE IN PREPARATION.

THE GRAFTON ELECTRIC CO.,

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Type A—Wave-length range 300 to 500 metres for Broadcasts. Price complete £4 10 0

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The above are carefully designed and well-made wireless instruments, of the highest efficiency, and are capable of receiving the concerts up to distances of at least 25 miles—often much more—and are covered by our guarantee.

In polished walnut cabinet, and supplied with complete equipment, including 4,000-ohm 'phones, aerial, insulators, lead-in tube, etc., and instructions. Sent carriage free.

These receivers, while complete in themselves, may form the nucleus of a more elaborate set, as special provision is made for the attachment of a high-frequency valve amplifier.

CALL FOR DEMONSTRATION, OR SEND FOR FULL PARTICULARS

All Wireless Accessories. List "A" Free.

THE OMNIPHONE WIRELESS CO.,
24, Warwick St., Regent St., London, W.1.

'Phone: Regent 3335. 20 yards from Regent St., between Robinson and Cleaver's and Maison Lewis.

What to see at the Exhibition *(continued from p. 354)*

The low-priced "Ideal" accumulators for filament heating, shown by Wates Bros., 132, Charing Cross Road, W.C.2. These accumulators are enclosed in a wooden case, and full instructions are supplied for their correct working. Wates Bros. also manufacture four types of valve sets. The cabinet type includes a loud-speaker with a horn constructed of wood. The cabinet is entirely self-contained, the only extraneous connections being the aerial and earth and 'phones. The "Sphinx" brand high-tension batteries are another speciality. (Stand 15.)

The mechanical analogy of a valve which automatically demonstrates the action of a 3-electrode valve by means of a large-scale wooden model on the stand of Mitchell's Electrical and Wireless, Ltd., of 188, Rye Lane, London, S.E.15. On this stand are also to be seen the "Lokap" coils, so that amateurs who wish to make up their own coils on the machine will have no difficulty in arranging an excellent 3-coil tuner. The principle of the holder provides a very simple method of varying by small degrees the magnetic coupling between the coils. Other exhibits are broadcasting receiving sets, both valve and crystal, and component parts. (Stand 21.)

The "Tele-phonograph" apparatus for transmitting gramophone music, shown by the Sterling Telephone Electric Co., Ltd., 210, Tottenham Court Road, London, W.1. Possibly the most attractive item on this stand will be the "Magnavox" loud-speaker, for which it is claimed there is an entire absence of distortion and metallic noises. Another interesting exhibit is the "Tele-megaphone" outfit for transmitting speech and music. The firm are, of course, very well known as makers of head-pieces, of which four patterns are shown. (Stand 34.)

The seven-valve cabinet set, entirely self-contained, with loud-speaker, frame aerial, and high- and low-tension batteries, made by Radio Instruments, Ltd., 12, Hyde Street, London, W.C.1, on whose stand is also shown a variety of other apparatus such as loud-speakers, variometer-type crystal receivers, condensers, head-pieces, etc. (Stand 37.)

A crystal receiver with an automatically-set detector, on the stand of the Telephone Manufacturing Co., Ltd., Martell Road, E. Dulwich, S.E.21. In spite of their simplicity, many crystal receivers suffer from the serious disadvantage that the tuning adjustment has to be made simultaneously with the adjustment for finding the most sensitive point on the crystal, and, therefore, the novice does not know

whether the lack of signals is due to a fault in his receiver or to the fact that no music or speech is being broadcast. A crystal receiver in which the crystal is automatically set in its most sensitive position is a big advance. Instead of depending on means to find one sensitive point on a crystal, a number of points of contact are always available, and in its adjustment one of these can always be relied upon to provide the necessary rectifying action. This new detector is made up in cartridge form and is held between two clips. The firm also make a de luxe cabinet receiving set at a price of 100 guineas, this including the supply and erection of the aerial in any part of Great Britain. (Stand 20.)

The simplest possible receiving set—the description claimed for the production of Mr. T. S. Isted, of Terling, Essex. Once the set has been calibrated to the broadcasting stations within its receiving area the operation of the instrument on subsequent occasions is mere repetition. One switch can entirely cut off the filament current, aerial, etc. (Stand 9.)

Portable receiving set of superior construction, on the stand of the British Thomson-Houston Co., Ltd., Rugby; it is claimed to be the only portable receiver capable of receiving the numerous time signals, weather forecasts, press reports, and messages from the large European stations without the need of either aerial or earth wires, but it is readily adaptable for use with aerial, etc. For those who desire to listen-in to broadcasting only, the company have designed a cheaper receiver of the crystal type which has many unique features, including the use of two crystals and a provision of terminals for additional coils for extending wave-lengths if required. Crystal receivers can be operated alone or combined with high- or low-frequency amplifiers. Another interesting piece of apparatus is a new head set, in which the whole ear-piece is of special moulded composition possessing good insulating properties, while the magnets are of cobalt steel. Other apparatus comprises several types of loud-speakers and a time-flashing device by means of which time signals can be flashed to the public with an accuracy of one-hundredth of a second. (Stand 7.)

Vacuum lightning protectors for the protection of the aerial and claimed to possess a number of advantages over the ordinary type. The opposing conductors being enclosed in a partial vacuum causes a breakdown at about 300 volts, while an insulation resistance of about 300 megohms is maintained right up to the point of breakdown. These are a product of Siemens Bros. & Co., Ltd., of Woolwich, London, S.E.18. Other exhibits by this firm are telephone head-sets, jacks, switches, ebonite accessories, batteries, accumulators, etc. (Stand 48.)

The loud-speaking telephone set with a trumpet 7 ft. long and improved transmitter on the stand of S. G. Brown, Ltd., Victoria Road, London, W.3. This type of instrument will enable an orator to address a huge audience in the open air under conditions where his own voice would be almost inaudible. In fact, it is claimed that this is the loudest speaker yet made, and it is approximately eight times more powerful than the type H. 1 loud-speaker made by this firm. Other exhibits are head-pieces and amplifiers. There are three types of telephones shown, the type A which has the novelty of adjustable magnets, the type D which is a flat disc type of telephone, which is excellent for all round work, and the newly devised type F an instrument of a cheaper nature possessing some novel features, in that the case and straps are constructed of aluminium and duralumin, and the provision of a special form of magnet which gives more efficiency. Its total weight is only 6 oz. (Stand 43.)

New type of 5-electrode valve on the stand of Hambling, Clapp & Co., 140, Strand, London, W.C.2. This new valve is very interesting and is suited to a set where it is required to receive Morse only. The circuit with which it is used is called the "balanced audio-frequency circuit." This circuit does not oscillate until an incoming train of waves affects the rectifying valve which is coupled to the 5-electrode or Prangell valve through a transformer, thus permitting the secondary circuit to oscillate. A large quantity of accessory apparatus is also exhibited on this stand, one speciality being a 3-valve experimental panel intended to provide the experimenter with a panel that any type of circuit can be used, and either H.F. or L.F. couplings can be quickly brought into circuit. (Stand 12.)

The general apparatus and component parts, shown by a very large number of exhibitors: The exhibits of the Economic Electric, Ltd., of 10, Fitzroy Square, London, W.1, and Peto Scott, 64, High Holborn, London, W.C.1, should not be missed, as every requirement of the amateur is obtainable from either of these firms. Other firms whose exhibits come within the category of general apparatus are A. W. Gamage, Ltd., Holborn, London, W.C.1 (Stand 31); The General Radio Co., Acton Lane, London, N.W.10 (Stand 26); The Anode Wireless and Scientific Instrument, Ltd., 265, Strand, London, W.C. (Stand 2); The Fellows Magneto Co., Ltd., Park Royal, London, N.W. (Stand 10); The "K.B." Radio Equipment Co., 109, High Road, London, N.W.6 (Stand 8); The British Wireless Supply Co., Ltd., 6, Blenheim Terrace, Leeds (Stand 42); H. Stanley Prince & Co., Abbotsford Avenue, London, N.15 (Stand 54); Wireless Supplies Co., 64, Mortimer Street, London, W.1. (Stand 1). Others will be referred to in our next issue.

PATENT RADIO INSULATORS

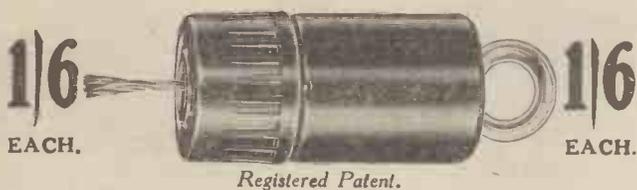
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Absolutely water and weather proof.

No soldering of aerial joints required.

Atmospherics and statics eliminated.

Universally adopted by the British, American, French, and Italian Naval, Military and Aerial Services.



Registered Patent.

GUARANTEE.

We guarantee these insulators to have a higher consistent insulation capacity than any other form of insulation at present adopted for Radio Transmission and Reception.

Generous Terms to the Trade.

ECON MANUFACTURING CO., LTD.,
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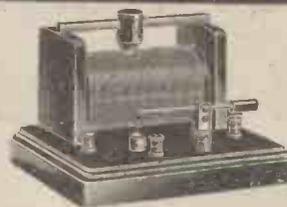
Phone: City 4148.

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Phone: Hop 2000.

ALL-BRITISH WIRELESS EXHIBITION,
Stand No. 50 (Annexe).

THE "UBIQUE"



CRYSTAL RECEIVER

NO BATTERIES REQUIRED

Receives SPEECH and MUSIC

A SPECIAL DESIGNED SET for Broadcasting, far superior to many of the complicated sets being offered at high prices. Ebonised End Supports and Base, Inductance Coil and Slider, Crystal Detector and Terminals wired up ready for use. Will give excellent results with a P.M.G. Aerial.

PRICE 15/- EACH DELIVERY POSTAGE 1/- PER RETURN

"Superfen" Double Headphones. Adjustable Bands, complete with Cords, 4,000 ohms, 25/-, postage 9d.

TUNERS, PANELS, ETC., ALL AMATEURS' REQUIREMENTS.

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Manufacturers of "R.W." Wireless Apparatus

SINGLE VALVE RECEIVER PANEL £3 3 0
Ditto complete from Aerial to Earth £11 0 0
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VALVE HOLDERS
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ACCUMULATORS.

Highest Quality. : : : : Lowest Prices.

In Celluloid Cases.

4 volts 40 amp. 18/6 6 volts 40 amp. 26/3
4 " 100 " 30/- 6 " 100 " 41/6

All Sizes In Stock. Packing Free.

AN ASTOUNDING OFFER.

QUITE GENUINE.

400 4 volt 6c amp., in Celluloid Cases, at 17/6 each.

These will not be sold before September 28th. This price cannot be repeated when the 400 are sold.

WIRELESS ACCESSORIES.

Head 'Phones, 4,000 ohms, 22/- each. Condenser Plates, 1/6 per doz.

Write for our Lists of Wireless Goods and Accessories. Also our Variometers and Variocouplers. Good Discounts to the Trade.

F. YATES AND SON, LTD., Wholesale Electricians,
144, CHURCH STREET, KENSINGTON, W.8.

Phone: Park 4276.

1 Minute from Notting Hill Gate Station.

AN EXHIBITION OFFER!

THE BRITISH RADIOPHONE COMPANY, in response to numerous requests, have pleasure in offering the following *Complete Wireless Stations*. Every detail is of the same high quality as the well-known B.R.C. PANELS, and each station has been designed to give the highest possible efficiency. In supplying every component for obtaining *perfect reception of all broadcasting and Wireless Concerts now being sent out*, we claim, as the result of our experience, to have solved the difficulties of the amateur. The diagrams and instructions provided with each set can be immediately understood by anyone without any previous knowledge of wireless.

As a Special Offer during the Exhibition, closing Oct. 9, we offer 100 of these sets at Half the ordinary prices.

**B.R.C.
SINGLE VALVE STATION.**

- French Polished Walnut Cabinet, fitted with Ebonite Panel 8 in. by 6 in., Engraved, and all Terminals.
- Valve Holder.
- One Ora Valve.
- One Filament Resistance.
- One Gridleak and Condenser.
- One Variable Tuning Condenser.
- Seven Honeycomb Coils, Best Quality, Mounted, for all Wave Lengths.
- One Solid Ebonite Coil Holder and Tuning Handles.
- One H.T. Battery, 30 Volts.
- One L.T. Battery, 4 Volts.
- One Set H.R. Headphones (4,000 Ohms).
- 100 feet 7/22 Stranded Copper Aerial Wire and Insulators.
- Insulated Earth Wire.
- Enamelled Instrument Wire.

ORDINARY PRICE ... £20 0 0
EXHIBITION WEEK, net. **£10 0 0**

L.F. Transformer for use with Loud Speaker, £1 0 0
Carriage and Packing Free. Net Cash with Order.
Immediate Delivery.

**B.R.C.
TWO VALVE STATION.
(One Detector, one H.F.)**

- French Polished Walnut Cabinet, fitted with Ebonite Panel 10 in. by 8 in., Engraved, and all Terminals.
- Two Valve Holders.
- Two Ora Valves.
- Two Filament Resistances.
- One Gridleak and Condenser.
- One Variable Tuning Condenser.
- Seven Honeycomb Coils, Best Quality, Mounted, for all Wave Lengths.
- One Solid Ebonite Coil Holder and Tuning Handles.
- One H.F. Transformer Holder.
- Three H.F. Transformers.
- One Blocking Condenser.
- One H.T. Battery, 30 Volts.
- One L.T. Battery, 4 Volts.
- One Set H.R. Headphones (4,000 Ohms).
- 100 feet 7/22 Stranded Copper Aerial Wire and Insulators.
- Insulated Earth Wire.
- Enamelled Instrument Wire.

ORDINARY PRICE ... £28 10 0
EXHIBITION WEEK, net. **£14 5 0**

**B.R.C.
SUPER THREE VALVE STATION.**

- (One Detector, Two H.F.)
- French Polished Walnut Cabinet, with Sloping Front.
- Drop in Ebonite Panel, 14 in. by 12 in., Engraved, and all Terminals.
- Three Valve Holders.
- Three Ora Valves.
- Three Filament Resistances.
- One Gridleak and Condenser.
- One Variable Tuning Condenser.
- Two H.F. Transformer Holders.
- Four H.F. Transformers.
- Seven Honeycomb Coils, Best Quality, Mounted, for all Wave Lengths.
- One Solid Ebonite Coil Holder and Tuning Handles.
- Two Vernier Condensers with Polished Calibrated Dials.
- Two Blocking Condensers.
- One H.T. Battery, 60 Volts.
- One L.T. Battery, 6 Volts.
- One Set H.R. Headphones (4,000 Ohms).
- 100 feet 7/22 Stranded Copper Aerial Wire and Insulators.
- Insulated Earth Wire.
- Enamelled Instrument Wire.

ORDINARY PRICE ... £35 10 0
EXHIBITION WEEK, **£17 15 0**

If for any reason your purchase is not satisfactory return it to us immediately, when your money will be refunded in full. Only one set can be supplied to each customer.

LETTERS CONTAINING TREASURY NOTES SHOULD BE REGISTERED.
CHEQUES AND MONEY ORDERS MUST BE CROSSED.

The British Radiophone Company

SALES DEPT. **BULWELL (NOTTS.)**

Fill in and Post this Order Form NOW

THE BRITISH RADIOPHONE COMPANY
BULWELL, Notts.

Please forward, carriage paid, one Money Order value £ s. d.
for which I enclose Cash

It is understood that if I am not satisfied my money will be returned in full.

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**SPECIAL OFFER FOR 2 WEEKS ONLY
HEADPHONES!!**

We have just received another 1,000 'phones which we are offering at the following keen prices:

- 4,000 ohms, **20/6**, POST FREE
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We have 18,000 sq. feet floor space entirely devoted to manufacture of wireless instruments.

Radio Receiving Sets to suit all pockets.

TRADE INQUIRIES INVITED.

CLUB DOINGS (Continued from page 361)

Peckham Wireless and Experimental Association

Hon. Sec.—MR. GEO. SUTTON, 18, Melford Road, S.E.22.

At the meeting of the above society on Sept. 6th, Mr. Voigt detailed the various experiments which he had carried out with the Postmaster-General's permission on a portable receiving set at the hotel where he stayed for a holiday. From above the roof to the metal pipes below the cellar floor and every inch in between he carried out his researches, and even did not cease experimenting in the railway carriage which conveyed him home, and, as one might expect, some of the results he got were marvellous. His fellow-members shared his successes with him, his failures they entirely sympathised with, and few did not add to their sum of wireless knowledge as the result. The association went into committee to consider what should be done to meet the vague threats on their liberties conveyed to them by means of the press, and the secretary was instructed to write to the Postmaster-General to seek light upon their present and future position.

Stoke-on-Trent Wireless and Experimental Society

Hon. Sec.—F. T. JONES, 360, Cobridge Road, Hanley.

At a meeting of the above society at the Y.M.C.A., Hanley, on September 14th, it was announced that permission had been received from Mr. Wenger to allow the use of the roof of the Mecca Café building for the purpose of erecting an aerial. Signals were received from several stations on the society's single-valve "Mediawaver" set, only using a frame aerial inside the club room. Mr. A. Hackney continued with his series of lectures on the construction of wireless apparatus. He

demonstrated a new method of winding inductance coils for tuners to receive the transmissions sent out on short wave lengths by the broadcasting stations and wireless amateurs holding transmitting licences. A sample coil was constructed and exhibited. Members who have wireless receiving sets that are not giving the expected results are invited to bring them along to the club room, when they can be tested and faults cleared

Sutton Wireless Society

Hon. Sec.—E. A. PYWELL, Stanley Lodge, Rosebery Road, Cheam.

THE Rev. F. C. Lees, F.R.G.S., F.R.A.S., has very kindly accepted the presidency of the society, and his expert knowledge of wireless and kindred subjects is of considerable benefit to the members. A two-valve set on the unit system is to be installed, and the society has already been presented with an L. F. transformer and .0003 variable condenser. On Saturday, August 26th, by the courtesy of the Controller of Communications, Air Ministry, a party of 16 spent an extremely interesting and instructive afternoon at the Croydon Aerodrome. The wireless transmitting and receiving gear was seen and working explained to the visitors by the engineers in charge. Passing through the hangars and shops, numerous types of British, French, and Dutch aeroplanes were viewed; light-houses, search-lights, control tower, and landing arrangements were shown, the whole organisation for the operation of Air Traffic being described by a guide.

Lowestoft and District Wireless Society

Hon. Sec.—L. W. BURCHAM, "Gouzeacourt," Chestnut Avenue, Oulton Broad.

THE above society opened the winter session on Sept. 12th, when a very good muster of

members attended. Before the meeting started the members' attention was drawn to the fact that the society were indebted to Messrs. Chipperfield, Ltd., Radio Engineers of Oulton Broad, for the excellent 4-valve experimental panel, which measures about 2 ft. by 1 ft 6 in, presented to the society by them. The set is very quiet in working and gives excellent results, especially with telephony. Mr. R. J. Hudson then delivered his lectures on "Wheatstone Receivers," which was thoroughly enjoyed by all present; questions were numerous, but the expert knowledge of the lecturer enabled him to satisfy all queries. Through the courtesy of Mr. C. Garrod a small party of members spent a very pleasant afternoon on August 16th in a motor-boat on the River Waveney. A 3-valve set was taken out and an aerial erected between two trees, and excellent telephony, etc., was received during the afternoon, Marconi House providing an hour's entertainment, to the delight of some farm hands working in a hayfield close by, also various owners of craft cruising the river.

ANNOUNCEMENTS

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

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

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

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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Fibre Sheet. Best hard vulcanised at greatly reduced prices. Per sq. foot, 1/4 in. 2s. 6d., 1/2 in. 4s., 3/4 in. 5s., 1 in. 6s. 6d.; other sizes pro rata. Postage extra. Trade enquiries invited.—F. W. Holt, 120, Arbor Vale, Slough.

Wireless Aircraft Telephones, 120 ohms, complete with headband and cords, 15s.; Telephone transformers, 12s. 6d. Variable condensers, 59-plate, 17s. 6d., 25-plate 10s. 6d., 5-plate 4s. These are suitable for table use or panel mounting. Ebonite plungers, with 13-in. brass rod, 1s. etc.—East Ham Wireless Supplies, 429, Barking Road, East Ham.

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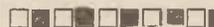
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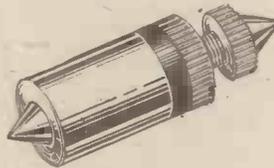
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The Crystal Receiver has three big advantages, as compared with the single or multi-valve type.

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In spite of their simplicity, however, present day crystal receivers suffer from the serious disadvantage that the tuning adjustment has to be made simultaneously with the adjustment for finding the most sensitive point on the crystal. Consequently in inexperienced hands, crystal sets are sometimes rather puzzling as the novice does not know whether the lack of signals is due to a fault in his receiver or due to the fact that no music or speech is being broadcasted, or as is generally the case, that he has failed to get his crystal and tuning adjustment simultaneously correct. It will be readily appreciated that a crystal receiver in which the detector is always automatically set in its most sensitive position and requires no adjustment of any kind would be a big advance.

We have produced and patented such a detector. The principle of this new detector is roughly that instead of depending on means to find one sensitive point on the crystal, a number of points of contact are always available, consequently this particular detector is automatic in its adjustment, as one of the points of contact can be relied upon always to provide the necessary rectifying action.

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This new detector is made up in cartridge form like a small fuse, and is held between two clips.

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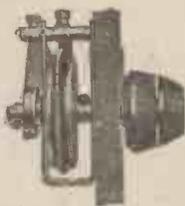
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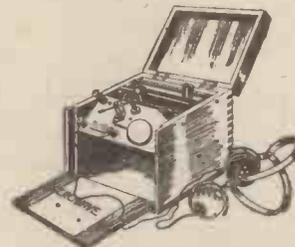
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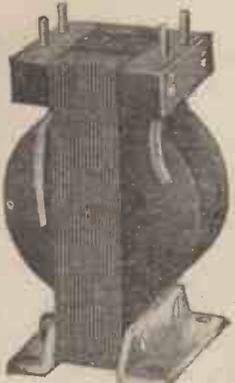
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(Continued on page 370)

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- Valve Holders. Flanged "A" type, 1/-. Ebonite with 8 nuts, 1/5 each.
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- Telephone Transformers (Army Type), 9/- each.
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- Condenser Screwed Rod. Brass 12" long, 1/8" 4d. 3/16" 6d.
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- Knobs. 1½" diameter with bush same thread as spindles, 6d. each.
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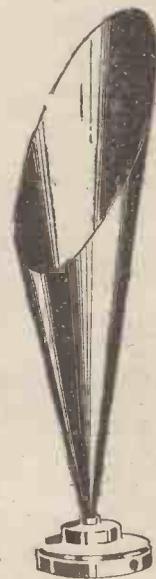
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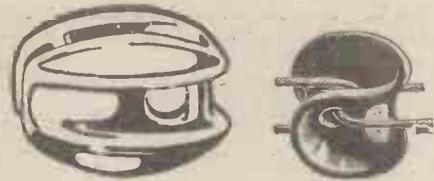
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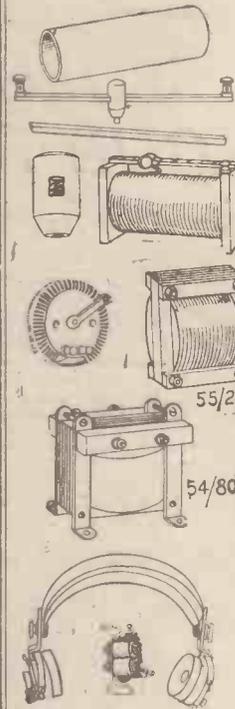
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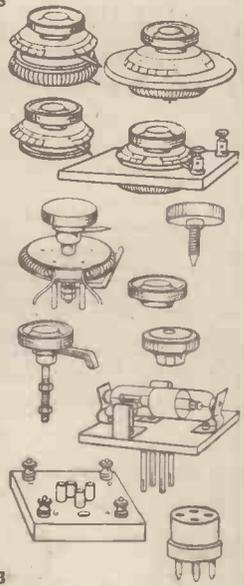
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