

Engineering
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The

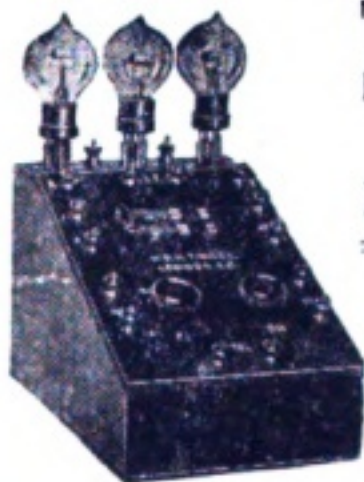
WIRELESS WORLD



FORTNIGHTLY

4th MARCH, 1922.

PRICE 6d. NET



THE TINGEY 3 VALVE RECEIVER

EFFICIENT ON ALL WAVELENGTHS

1 Valve H.F.—1 Rect—1 L.F.

PRICE (without valves) - - **£8 10 0**

THE TINGEY A* COIL

The exceptional efficiency of my short wave A Coil is well known, and now to fulfil the needs of modern short wave work this A* Coil has been designed. It has a range covering 150-450 metres with a .001 condenser. This coil used with the **TINGEY 3 VALVE RECEIVER** mentioned above, or with the **TINGEY UNIT RECEIVER**, oscillates on 150 metres with the greatest of ease while coils are at right angles to one another (*Prices on Application*).

WE CAN SUPPLY YOU WITH ALL WIRELESS ACCESSORIES

Ivory Scales 0-180	... Price	1/6	Valve Holders	... .. Price	1/9
Grid Leaks (unmounted)	... ..	1/-	" " A Type	... ..	2/-
" " (mounted)	... ..	2/6	6 Pole plug board, and 2 plugs	.. ..	2/-
Unmounted Filament Resistances with pointers	... ..	5/6	3 Valve Panels	... ..	5/-
Ivory Tablets in Sets. Aerial—Earth	— LT + — HT + Phones	... ..	per set		2/-
Knobs fitted with pointer	... ..	1/-	Contact Studs	... ..	per doz. 1/9
Valve Legs	... ..	3d.	Stops	... ..	2/6

Office and Works
Telephone:
1916 Hammersmith

W. R. H. TINGEY

:: *Specialist in Wireless* ::

Offices and Showrooms
92, Queen Street,
Hammersmith, W.6

SCOTTISH RADIO SUPPLIES

Works : 60, St. Vincent Crescent,
GLASGOW, W. Tel. : Central 2878

2, Royal Crescent, GLASGOW, W.
Tel. : Charing X 491

TRANSMITTING APPARATUS

	Price
Modulation Transformers, 20/1 ratio	£1 15 0
Air Core Choking Coils	1 0 0
Iron Core ditto, Low Frequency	1 5 0
Transmitting Coupling Coils, set of two	1 10 0
Variable Grid Leaks, 10,000 w ...	15 6
Set of Smoothing Condensers, 5 mfd.	15 6
Transmitting Variometers, 180 or 1,000 metres	1 7 6
Hot Wire Ammeters, any reading	1 10 0
Transmitting Batteries, 240 volts	4 0 0
Ditto 600 volts	9 0 0
Ditto 1,200 volts	12 0 0
Transmitting Keys, very heavy ...	1 5 0
Transmitting Variable Condensers to stand 2,000 volts	1 17 6
Filament Rheostats, to 6 amperes	15 0

And all other components, of our own manufacture.

RECEIVING APPARATUS

	Price
Low Frequency Transformers ...	£0 17 6
High Frequency Transformers ...	1 10 0
Ditto, Variable ...	1 18 0
Variable Condensers, '0005 mfd.	12 6
Ditto, '001 mfd.	1 0 0
Ditto, Vernier, '00002 mfd.	7 6
Fixed Condensers, '0001 to '01 mfd.	3 6
Filament Rheostats, wound on Ebonite, 5 w.	5 0
Slab Coils, set of seven, 250-25,000 metres	13 6
Basket coils, set of six, 400-25,000 metres	1 0 0
Valveholders, solid Ebonite ...	1 6
Duo-lateral coils on plug mountings, from	4/- to 15/-
Special short-wave Tuners, silk wire on Ebonite	15 6

Ask for details of our UNIT SYSTEM. Prices on application.

Every type of Receiver or Transmitter manufactured to specifications. Ask for lists.

OUR EXPERIENCE

in the Manufacture of High and Low Tension Condensers for all Types of Wireless Installations

IS UNIQUE

IT IS AT YOUR SERVICE.

DUBILIER

CONDENSER CO. LTD.

DUBILIER CONDENSER CO. (1921) LTD.

All American Enquiries to be addressed—

DUBILIER CONDENSER CO., Inc., 217 Centre Street, New York.

All enquiries other than American should be addressed to (Department W.)

DUCON WORKS, Goldhawk Rd.,
Shepherds Bush, London, W.12

Telephone: - - HAMMERSMITH 1084.

Telegrams: HIVOLTCON, PHONE, LONDON.

Code: - MARCONI INTERNATIONAL.

9 No. 51

GAMAGES

The Foremost Wireless Specialists
GOVERNMENT CONTRACTORS DURING THE WAR



THE NEW GAMAGE LOUD SPEAKER For Single Valve

Operates successfully off ordinary receiving circuit employing only a single valve, producing signal equal to four valve signals. It is possible to dispense with multi-valve amplifiers even when audibility is desired over a large area, thus saving both apparatus and filament current. This instrument is simply connected to the phone terminals of the receiving set, with the only addition of a 4 volt battery from which the current taken is very small. Soundly constructed instrument with mahogany base and metal horn. Demonstrated daily.

Price post free **£6 10s.**
Battery for same ... 1/9



"SONUS" UNIT VALVE PANEL

Designed to obviate use of several separate parts in valve receiving set. Having the necessary inductance and condenser all that is required is to connect them up with this panel and a valve receiving circuit is completed for the reception of all kinds of signals (C.W. Telephony and spark). Panel comprises valve holder, filament resistance, grid condenser and leak, phone condenser and necessary terminals for connections clearly engraved on the panel. Finished in polished Mahogany and Ebonite with heavy brass terminals. Size 7x7x3

Price - - **37/6**

This instrument will double the value of any single valve receiver. It is very quiet in operation and gives exceedingly good amplification when signals are received and is specially recommended for telephony. Can be easily connected to any one valve receiver. Hand-somely finished in polished mahogany and ebonite, and fitted with heavy brass terminals. Size approx. 7" x 5" x 4"

42/- Post Free.

EXPERIMENTAL CHANGE - OVER PANEL

A specially-designed panel for changing over from one set of receiving apparatus to another in one operation. The advantages of a panel of this description will be readily appreciated by those experimenters who are often testing the merits of one set, or circuit against another during the reception of actual signals.

The continual changing of connections is entirely eliminated when using this panel. When comparing results on two receiving sets it is essential to change from one to the other immediately, and in this the value of the panel is most pronounced.

One high-tension battery, one accumulator and one pair of telephones will suffice for both sets of apparatus under test. Highly-finished in polished mahogany, ebonite (matt [with polished bevelled edge] and burnished lacquered brass.

Size 12" x 7" x 3 1/2"



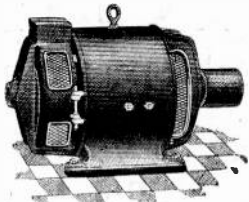
30/-
Post Free



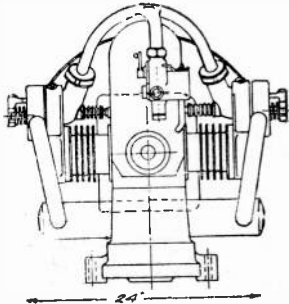
SINGLE VALVE AMPLIFIER

Write for our Wireless List, Post Free on Request
GAMAGES, HOLBORN, LONDON, E.C. 1

TATE DYNAMOS & MOTORS



A.C. and D.C. Motor Generators.



PETROL ELECTRIC SETS
50 Volts—220 Volts. £42.

ALL WIRELESS ACCESSORIES IN STOCK

ELECTRADIX EARTHING CLIPS

Officially approved.
6d. each.

NEW ACCUMULATORS

6 Volt 30 Amp. Hrs.,
£2 2 0
6 Volt 42 Amp. Hrs.,
£2 10 0

AMMETERS AND VOLTMETERS

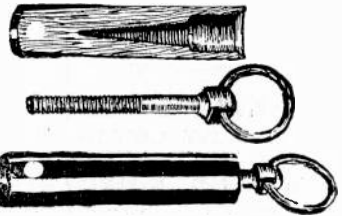
10/- each.

Inert Cells 2 1/4" x 4"
9/6 doz.

H.T. BATTERY BOXES



High polished mahogany case. 6-Plug Sockets and 2 Plug Leads. Size, 11" x 7" x 5".
Price, 7/6 each. 100 Volt Batteries to fit, 30/- each.

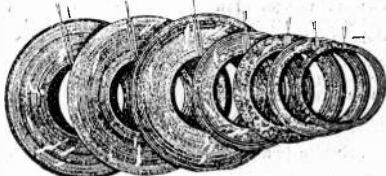


AERIAL INSULATORS

Light aerial insulators, Ebonite, 2 1/2" long, with brass eye bolt. Price, 6d. each. Price per dozen, 4/4, post paid.

LESLIE DIXON & CO., 9, Colonial Avenue, Minories, E.1
(OPPOSITE ALD GATE STATION.) Tel.: Ave. 4186

SLAB INDUCTANCES.



Per set of 8, range 300 to 30,000 metres, 15/-, postage 9d.
Per set of 7, range 300 to 25,000, 12/6, postage 9d. Including a set of curves, one on each slab, and suitable circuits.

Each coil specially tested before dispatch, and delivered in sealed box.

These Inductances are useful as Aerial Tuning Inductances, Reaction Coils, Loose Couplers, Variometers, etc., and specially useful with stand and holder, see Radio Constructa advertisement on page xxi.

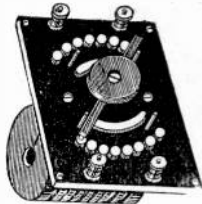
H.F. TRANSFORMERS

8 stage H.F. Transformers with switch tapping both Primary and Secondary. Ranges same as socket type.

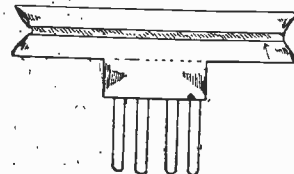
52/6

Enclosed in mahogany box
6/- extra.

Fully illustrated list,
post free 4d.



INTERCHANGEABLE TRANSFORMERS



H.F. Transformers interchangeable to fit standard "R" valve socket.

8 stages wound in 40 S.W.G. D.S.C. wire.

Primary and Secondary wound in same groove, insulated from each other with suitable insulating material.

Stage 1.	Range	300 metres	6/-
" 2.	"	600 "	6/3
" 3.	"	1,200 "	6/9
" 4.	"	1,800 "	7/6
" 5.	"	2,500 "	8/3
" 6.	"	6,000 "	9/9
" 7.	"	8,000 "	12/-
" 8.	"	24,000 "	14/3

A BATTERY OF MERIT.

36-volt H.T. Battery with wander plug for varying voltage in steps of 3 volts. This Battery is made from a special formulae, giving exceptionally long life and silent working. Made specially to withstand climatic conditions. 7/6 each. Postage 9d. 15 volt—3 Terminal, 3/6.

Office: BANK BUILDINGS, H. D. BUTLER & CO., Telephone: Hop 3029.
222, G.T., DOVER ST., S.E.1 Showroom and Works: 61, Borough Rd., Borough, S.E.1 Telegrams:
(Opposite Borough Tube Station) 3 minutes from Borough Tube Station. "Ingenuity, 'Phone, London."

All our goods obtainable at the ARMY & NAVY CO-OPERATIVE SOCIETY, LTD., 105, VICTORIA STREET, S.W.

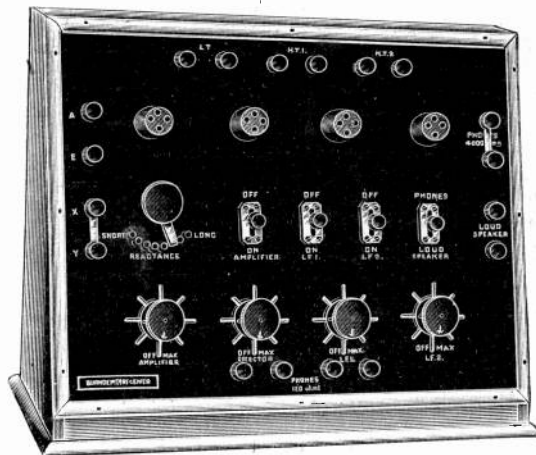
BURNHAM & CO.
WIRELESS BURNDDEPT APPARATUS
 MANCHESTER DEPÔT: 4, CORPORATION STREET
 LEEDS DEPÔT: 48, GT. GEORGE STREET.
 DEPTFORD, LONDON, S.E.8.
 LONDON RETAIL DEPÔT: 19, HAND COURT, HIGH HOLBORN, W.C.

THE BURNDDEPT ULTRA IV RECEIVER

RADIO FREQUENCY AMPLIFIER, DETECTOR AND TWO NOTE MAGNIFIERS.
 Each Valve can be used in combination with the Detector, or all together, as desired.

This is a newly designed receiver somewhat on the lines of the famous ULTRA III but with an additional note magnifier, an additional switch is also arranged so that head phones can be immediately changed over to LOUD SPEAKER. Extra terminals are also arranged so that PRINTER—MICROPHONE RELAY or other auxiliary apparatus can be added without interfering with the telephones, which can be used at the same time if desired. The well-known ULTRA features are retained giving individual control of each valve by change-over switches and separate rheostats so that each valve can be worked at its best point. This set will give all the magnification required to work a Loud Speaker at sufficient strength for an ordinary room, also to work a printing circuit using the ordinary type sensitive relay.

PRICE,
 in sloping cabinet
 as illustrated :
£35 0 0
 (valves extra)



Extras required to complete set :—

Tuning Panel including 2 condensers and coil holder, on sloping panel:

£7 10 0.

SET BURNDDEPT PATENT COILS to cover all wavelengths:

£5 17 6.

Four Marconi Osram Valves:

£5 9 6.

PRICE FOR COMPLETE SET including Receiver, Tuner on Sloping Panels, four M.O.V. Valves and complete set Burnddept Coils **50 Gns. net.**

If *further* STRONG magnification of speech or music is desired, so that a large room or hall shall be filled, we recommend the attachment of a BROWN MICROPHONIC RELAY (new pattern) which we find superior to further multivalve amplifiers after two steps of note magnification (which the ULTRA IV provides).

PRICE OF RELAY **£6** for L.R. (120 ohms) input, or **£6 2 6** for H.R. (2,000 ohms) input. If the relay is ordered at the same time as the receiver we will adjust it to work with the set before despatch.

BURNHAM & CO., DEPTFORD, LONDON, S.E.8

LESLIE McMICHAEL

M. I. Radio E.

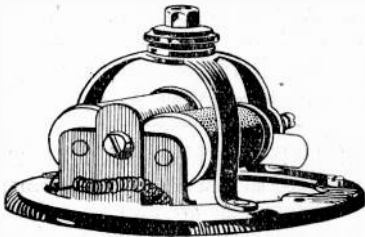
PROVIDENCE PLACE, WEST END LANE, KILBURN, N.W.6

(Bus Services 1, 8, 16, 28, 31 all pass West End Lane.)

Telephone: HAMPSTEAD 1261

Nearest Tube Station: KILBURN PARK (BAKERLOO)

HIGH NOTE BUZZERS



Highly Reliable Instruments

A limited supply ... only **3/6**

All Instrument Wire in Stock at
Lowest Prices

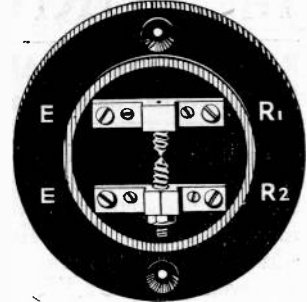
LIGHTNING ARRESTER



COVER

PROTECT YOUR SET
with a Lightning Arrester

In heavy ebonite, with screw on cover and inspection window.
Condition perfect **2/6** each



ARRESTER

ALL WIRELESS ACCESSORIES

in Stock, send your enquiries,
ask for catalogue (Stamp 2d.)

Valve Legs, with nut	3d. each
Slab Coils, superior make	10/- to 13/- per set
Basket Coils, most efficient	7/- set
Crystals mounted—Zincite	9d.
" " Copper Pyrites	6d.
" " Carborundum	6d.
Carborundum Detectors complete	2/6

HIGH-TENSION UNITS

"Siemens" 15 volt Units	4/3
"Ever-Ready" 15 volt Units	3/9
"Xcell" 15 volt Units	3/6
36 volt "Plug-in Type" Unit	7/6
Small Leclanché Cell, E.M.F. 1.5 v.	11/- doz.

SPECIAL BARGAIN

Large Dry Cells, size 2 1/4" square, 4" high 6d. each

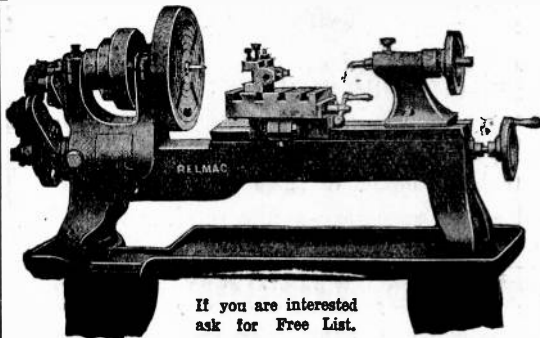
LARGE STOCK OF WIRELESS BOOKS, Elementary and Advanced SEND FOR LIST

LEADING-IN TUBES



5/8" Ebonite with Terminals each end ... 6" long 2/3 ... 12" long 3/- ... 18" long 3/9

Special Terms to the Trade.



If you are interested
ask for Free List.

RELMAC & SUPER RELM LATHES FOR THE WIRELESS ENGINEER

4 1/2" CENTRES, BACK GEAR, SCREWCUTTING, ETC.

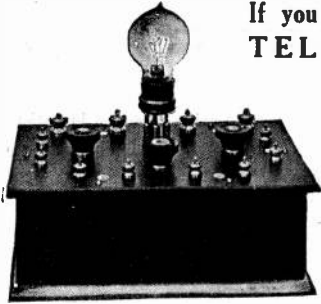
Our aim is to ensure in these machines ACCURACY, RIGIDITY and RELIABILITY, and that is why THEY SELL. You cannot afford to buy any other Lathe, because in PRICE and SERVICE ours are CHEAPEST. PRICES FROM £14 8 0

COME AND SEE US.

CHELTENHAM LATHE WORKS,

PHONE: BRIXTON 2001.

86, ACRE LANE, BRIXTON, S.W.2



If you cannot receive
TELEPHONY

— USE A —
**SUPER VII
RECEIVER**

PRICE
£3 15 0
without valve

For Single Valve reception of telephony and music that cannot be bettered, use a **SUPER VII RECEIVER** and **G5 TUNER**. There are no condensers to buy, there are two condensers fitted, and the only extras required are the valves, batteries and phones. No disposal or second-hand parts are used in the manufacture, and the high-class workmanship and finish (inside and outside) is unparalleled.

For full particulars, see my New Price List, post free on application.

AGENTS:

Russell & Shaw, 38 Gt. James St., Bedford Row, W.C.1
G. H. Parker, 10 St. James Parade, Muswell Hill, N.10
Beresford Bros., 2-3 Bull Street, Birmingham.

E. T. Chapman, A.M.I.R.E., 38 Serpentine Road, Poole, Dorset.

SOLE AGENT FOR SCOTLAND:

Wm. Kerr Dewar, 206 Bath Street, Glasgow.

GORDON CASTAGNOLI
MANUFACTURER OF WIRELESS APPARATUS
15, Rayne Road, Braintree, Essex

**OOJAH
HIGH FREQUENCY TRANSFORMERS.**

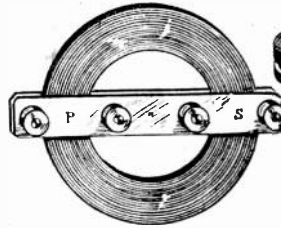


Fig. 1.

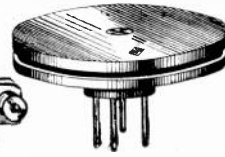


Fig. 2.

Patent pending Rd. No. 685488

These H.F. Transformers have been designed to meet the growing demand of the Wireless Experimenter for a cheap and efficient H.F. Transformer.

They were used Successfully in the recent Transatlantic Tests. All transformers are wound with D.S.C. paraffin-waxed copper wire (affording the highest degree of insulation) of a gauge far thicker than transformers now upon the market; the H.F. resistance being extremely low.

No. 3 is recommended for the reception of the Dutch Concert and general telephony.

	Min. W/L.	Max. W/L.	Un- mounted.	Fig. 1.	Fig. 2.
No. 1 ..	300 to	800	1/3	3/9	4/6
No. 2 ..	600 to	1,400	1/6	4/-	4/6
No. 3 ..	900 to	1,900	2/6	5/-	5/6
No. 4 ..	1,800 to	4,000	3/-	5/6	6/-
No. 5 ..	3,000 to	5,000	4/-	6/6	7/-

Postage Extra.

GREENSLADE & BROWN
JELF RD., S.W.2 'Phone: Brixton 639

VARIABLE H.T. BATTERIES

DISTANT LOW POWER TELEPHONY can only be received by using correct H.T. Voltage the value of which varies with the type of valve and filament voltage.

THE W.A.S. VARIABLE H.T. BATTERIES will increase the efficiency of your set and give you undistorted speech and music.

These batteries being made from a special formula have a longer life than any that are on the market and are perfectly SILENT in working.

If a cell gives out it can be quickly "shorted" with only the loss of 3 Volts. In other makes the whole unit would have to be thrown away.

PRICES —

15 Volt Unit, tapped every 3 volts	4/3	postage 9d.
36 " " "	7/6	" 9d.
60 " " "	13/6	" 1/-

AGENTS WANTED. Sole Manufacturers—

**W. A. SAXBY & CO., 3-5, Gayford Road,
London, W.12** Telephone: Hammersmith 443.

Sensational Reductions !

OOJAH SLAB INDUCTANCES,—300-30,000 metres, set of eight, with useful circuits, 10/-. Post 8d.

OOJAH BASKET COILS,—300-3,500 metres, set of seven, with useful circuits, 7/-. Post 6d.

2 BASKET INDUCTANCES,—Especially wound for the Dutch Concert, 2/6. Post 3d.

IVORINE INDICATION TABLETS, 1" x 1/2" Engraved.

AERIAL, EARTH, A.T.I., REACT., +H.T.-, +L.T.-, 3d. each, set of 6 1/3. Post 2d.

3" SEMI-CIRCULAR IVORINE ENGRAVED SCALES,—0 to 180 degrees, 9d.

TURNED EBONITE VALVE HOLDERS, 1/6. Post 2d.

VALVE SOCKETS with screws and washers, 10d. set of 4. 2/3 per doz. Post 2d.

VALVE LEGS for plugging into sockets with 2 nuts, 10d. Set of 4. 2/3 per doz. Post 2d.

THE POPULAR H.T. BATTERY,—We recommend our superior Batteries in Cardboard Cases, as follows:—

18 Volts. 36 Volts. 54 Volts. 72 Volts.
2/6. Post 8d. 4/9. Post 1/- 7/- Post 1/- 9/- Post 1/3.

These Batteries are meeting with universal approval owing to their high efficiency and low initial cost and maintenance.

VERNIER CONDENSER for fine tuning with extension arm. Ideal for telephony, 6/6. Post 6d.

OOJAH H.F. TRANSFORMERS

Minimum wavelength	Maximum wavelength	Unmounted	Mounted to plug into valve holder
300 to	800 metres	1/3	4/6
680 ..	1,400 ..	1/6	4/6
900 ..	1,900 ..	2/6	5/6
1,800 ..	4,000 ..	3/-	6/-
3,000 ..	5,000 ..	4/-	7/-

Sole Agents for OOJAH COMPONENTS in S.E. London.

SCIENTIFIC SUPPLY STORES,
8, NEWINGTON CAUSEWAY, LONDON, S.E.1
'Phone: Hop 4177.

THE BEST AND CHEAPEST
"R" TYPE VALVES

Price **11/6** Post Free

Mr. W. Corsham, Willesden, with three
of these Valves received signals in
The Transatlantic Tests.

This is a Guarantee of Efficiency

- "ORA" VALVES (Mullard) - 15/-
- "DUROS" CELL, 2 Volt, 45 Amp. - 11/6
- P.B. AERIAL WIRE, 100 ft. Reel - 8/-
- H.T. BATTERIES, 60 Volt - 14/-
- " " 36 " - 8/-
- " " 15 " - 4/-
- VALVEHOLDERS, 1/6, 1/9, & 2/3
- 4 volt Batteries, 8d. each ; 1 doz. 6/6
- CARRIAGE AND PACKING FREE

All Lines cheaper to Callers, Registration 4d.

Wireless Crystals Wholesale & Retail

RUSSELL AND SHAW,

38, Great James St., Bedford Row, W.C.1

From Holborn through Brownlow Street. or Hand Court

The Wireless Equipment Company

RECEIVING APPARATUS

The demand for a COMPLETE RECEIVER is now met with
by our "VARIO" type Receivers.
No condensers are required and all Tuning is effected by various
adjustments of coils.

The Experimenter has in this type of instrument an efficient and
reliable receiver of Spark, Tonic Train, C.W. and Telephony
signals, which needs only batteries and telephones to obtain results
with the minimum adjustments.

These sets are very compact and portable and are exceptionally
efficient on all wavelengths and the tuning is very simple.
Provision is made for increasing wavelength up to 20,000 metres,
without having to interfere with the interior and a "dead end"
switch is fitted for all wavelengths under 1,200 metres.

Prices of "VARIO" Receivers as below :-

- Type "AB" WAVELENGTHS
500 to 5,000 metres ... £5 10 0
- Type "AB 1" WAVELENGTHS
500 to 5,000 metres (with 1 valve
L.F. Amplifier built into set) ... £7 5 0
- Type "AB 2" WAVELENGTHS
500 to 5,000 metres (fitted with 2
valve L.F. Amplifier built to set) £9 5 0
- Type "ABL" LOADING UNIT,
with variable condenser for attach-
ment to above sets. Wavelength
5,000 to 20,000 metres ... £4 10 0

All Valves Extra.

Illustrated Lists sent on receipt of stamp.

Works: WICKFORD, ESSEX.

Experimental Stations: BRENTFORD.

Office: 22, PARK ROAD, COLLIERS WOOD, S.W.19

Agents for Holland: "RATABOS," DEVENTER.



TRADE MARK

The WHITECROSS

COMPANY, LIMITED

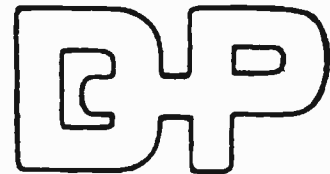
:: WARRINGTON ::

Manufacturers of All Descriptions of

**WIRE ROPES
AND WIRES**

MARCH 4, 1922.

The most reliable and efficient
Batteries for Wireless Work are



**STORAGE
BATTERIES**

D.P. Batteries are made to fit al-
most any size of box. The output
of our Works runs to hundreds
of thousands of plates yearly.

Write us for particulars

The D. P. BATTERY CO., Ltd.
BAKEWELL — DERBYSHIRE
& 11 Victoria St., London, S.W.

viii

Please mention the Wireless World

AFA "DUROS" CELLS

The only accumulator supplied in a charged state. They retain their charge for very long periods,
Stocked by all leading dealers in "Wireless Supplies."

E. G. LIND & CO., 58a, BUCKINGHAM PALACE ROAD, WESTMINSTER S.W.1

THE WIRELESS WORLD

THE OFFICIAL ORGAN OF THE WIRELESS SOCIETY OF LONDON
A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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Contents continued on next page.

A NEW YEAR'S RESOLUTION:—

"To get out of the rut in 1922."

WHY?

Because otherwise you will very soon be one of the "Also Rans" a "Back Number" Etc., Etc.



HOW?

Just drop a Post Card in the nearest letter-box and leave the rest to me. Don't wait until tomorrow or next week.

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Micawber waited "for something to turn up,"—but that won't do in 1922, and besides Micawber was not interested in *Wireless*.

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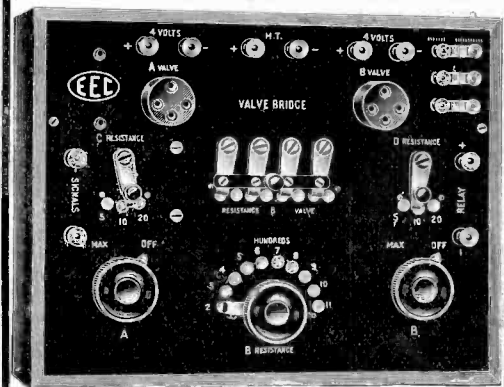
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THE WIRELESS WORLD

THE OFFICIAL ORGAN OF THE WIRELESS SOCIETY OF LONDON

Vol. IX. No. 51.

MARCH 4TH, 1922

FORTNIGHTLY

A Pocket Receiver WITH DETAILS FOR CONSTRUCTION

By W. WINKLER.

THE problem of designing an efficient valve receiver on a very small scale is rather different from that of the design of a larger piece of apparatus. The following description of an efficient single valve set, where the whole of the apparatus, with the exception of batteries and

That the set is really efficient is testified by the results obtained. With an average aerial the Dutch Concert can be heard quite well in Edinburgh. The finished product is shown in Fig. 1.

The material used in construction is teak wood and polished ebonite sheet $\frac{1}{16}$ -inch in thickness.

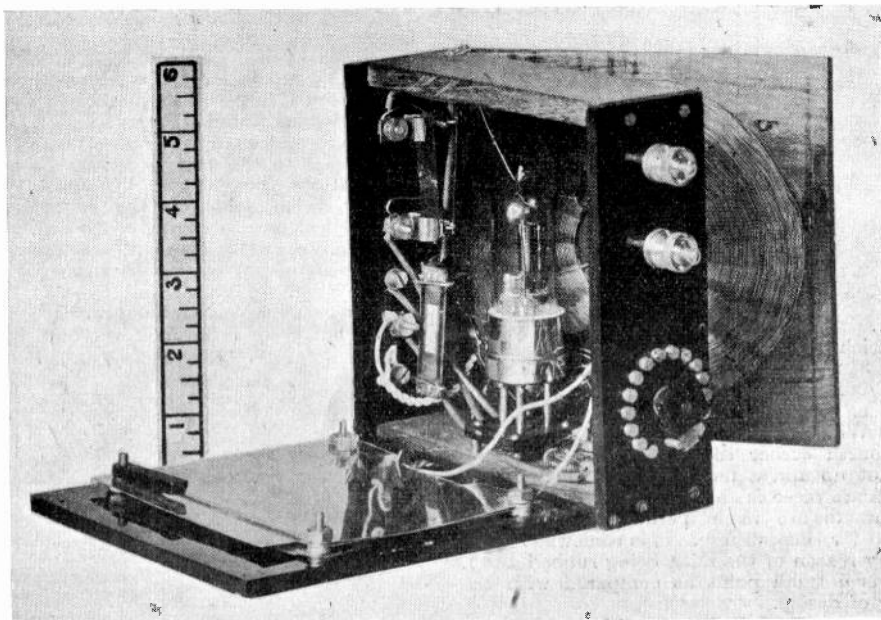


Fig. 1.

telephones, is contained in a box $6 \times 6 \times 2$ inches, is therefore probably of interest. Perhaps the very fact that all the apparatus is contained within so small an area, with the necessary result that all the connections are extremely short, may be one of the principal factors contributing to its efficiency.

The set consists of a square frame 6×6 inches which stands vertical when the set is in use, the top and bottom being of teak and the sides of ebonite. On the front side (Fig. 1) are mounted the aerial and earth terminals, and below these a 15-point switch having studs $\frac{3}{16}$ -inch in diameter

set on a circle $1\frac{3}{8}$ -inch in diameter is arranged as indicated in Fig. 2. Fig. 3 shows the arrangement of the back side, the grid condenser and leak are above, and below are the four terminals with 0.002 microfarad condenser across the high tension and telephones. The base shown in Fig. 4 carries the valve holder and filament resistance. Suspended by threads from the sides of the case is the aerial tuning inductance, which is a basket coil $2\frac{1}{2}$ inches inside diameter, $5\frac{1}{2}$ inches outside diameter, wound with No. 36 S.W.G. D.S.C. wire on 17 pins, wound as full as possible and tapped off in an approximately equal number of turns to each stud in order. The ebonite front and back are 6×2 inches and the teak top and bottom $6 \times 1\frac{3}{8}$ inches. This enables the hinged side on the left to sit level with the frame and there is thus less liability to damage when the set is being carried. A sheet of ebonite $5\frac{1}{2} \times 6 \times \frac{1}{4}$ inches carries the aerial tuning

The condensers are built up from 0.002 inch mica $\frac{1}{8}$ -inch wide, 2 inches long and tinfoil 1 centimetre wide 4 inches long. With this it is very easy to make up any size of condenser in small

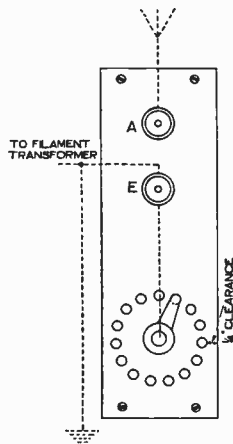


Fig. 2.

condenser. This is shown in Fig. 5. The condenser, which is variable, is composed of two sheets of tinfoil $3\frac{1}{2} \times 4\frac{1}{2}$ inches, secured each to a sheet of mica 0.002 inches thick, shellac being used for the purpose. The condenser is held at three corners by $\frac{1}{8}$ -inch Whitworth screws spaced $\frac{1}{2}$ -inch apart. At the fourth corner the pillar for the moving plate is set up and a moving plate which is cut from a square piece is shaped as shown in Fig. 5. Both contacts are made permanent, light flex being used for this purpose. It is somewhat liable to wear by reason of the mica being rubbed away, but this is a small point as compared with the simplicity of design.

The right side of the box is of teak hinged vertically, and to this is fixed the reaction coil by means of paraffin wax. The dimensions of the reaction coil are the same as the aerial tuning inductance, but is wound with No. 26 S.W.G. D.S.C. and connected to the outer portion with light flex. A description in detail of one or two units may be helpful in the construction of the set.

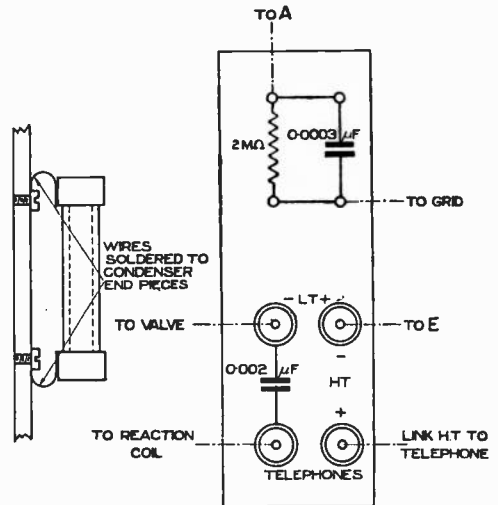


Fig. 3.

bulk. The whole is put together, using shellac put on very thinly with a camel hair brush. The long overlaps of tinfoil allow good solid folded ends to be made and small pieces of soft metal bent over are clamped to the ends in a vice. Pewter does very well for this purpose but must be treated carefully when soldering the connecting wires. The grid leak is made with cardboard, indian ink and graphite. The filament resistance which is $\frac{1}{8}$ -inch in diameter, is easy to construct from the diagram (Fig. 4), gauge and type of wire used depending on the valve employed.

Although there is nothing very unusual in the

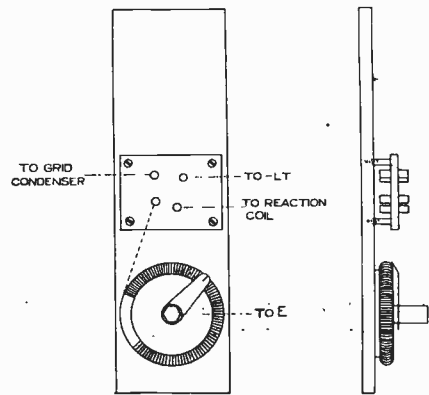


Fig. 4.

A POCKET RECEIVER

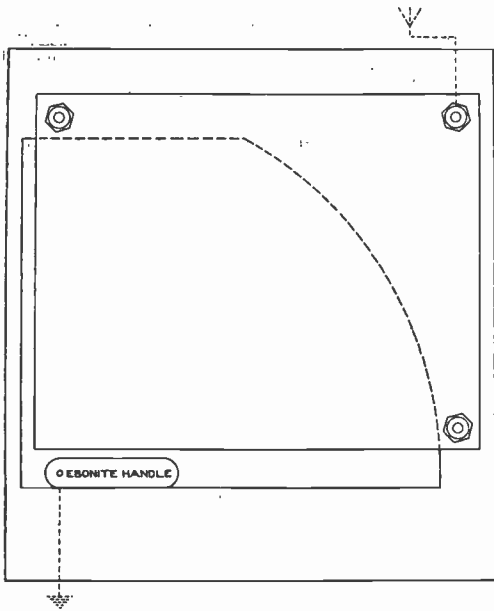


Fig. 5.

construction of this set, it has caused comment where it has been shown. Stations such as MSK SEW, HB and SAJ, are unusually good here in

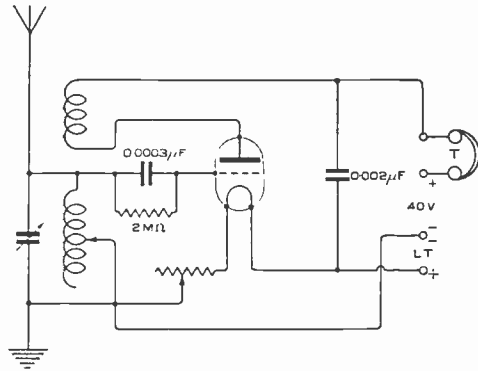
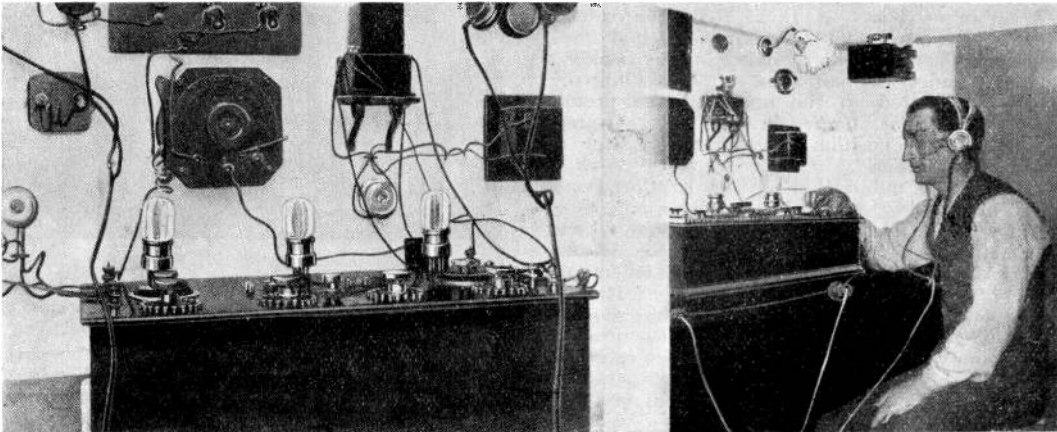


Fig. 6.

Edinburgh, the aerial in use being a single wire with an average height of about 25 feet, the lead-in of 10 feet and 35 feet down to the earth connection. The set was designed for an E.S.2 valve, but will take any other type of valve when the box is open. The best results have been obtained using a French "H" soft valve. PCGG is quite audible, although the speech is not perhaps as clear as the musical items. The range of the set is 700 to 5,000 metres, and with a series condenser in use ships come in quite well. The diagram of connections given in Fig. 6 shows the wiring of the various parts and this circuit is quite standard.

A Successful Transatlantic Set



The above photographs show Mr. T. Cutler with the apparatus used by him in the successful reception of transatlantic amateur signals in the recent tests. A description of this apparatus appeared on page 719 of the last issue.

The New Volume

THE WIRELESS WORLD is about to commence on its tenth year, and it is fitting that the pioneer British wireless magazine should show that it is keeping abreast of the times and entering fully into the spirit of development of wireless telegraphy and telephony, which was never more pronounced than at the present time.

Just two years ago it was found necessary to publish the magazine fortnightly, instead of monthly, owing to the enormous increase in the demand for space in which to include the increasing volume of matter which our readers had the right to expect. Perhaps at the time the publishers felt some trepidation in launching a fortnightly magazine, but it was very quickly realised that this was a step in the right direction and one which met with the whole-hearted approval of our readers.

With the new volume of *The Wireless World* a further venture will be undertaken with the weekly publication of the magazine.

For some time past it has been apparent that *The Wireless World* has been unable, owing to lack of space available, to meet the requirements of all its readers. What we may term a "middle" standard has had to be adopted, and all the while it has been felt that those who are quite beginners have been somewhat neglected, whilst the same remark is applicable to those readers who are in possession of advanced knowledge in matters "wireless," or who are professionally engaged in the science in their everyday occupation. With the weekly publication of *The Wireless World* it is hoped to remedy these shortcomings without increasing the price which will remain at 6d. per copy.

Advanced students of wireless are no doubt well acquainted with our monthly publication, *The Radio Review*. This journal will cease publication with the commencement of the new volume of *The Wireless World*, when the title of *The Radio Review* will be incorporated with that of *The Wireless World*, and the magazine will be known in future as *The Wireless World and Radio Review*. There will be included in the weekly a section, under the direction of Mr. Philip R. Coursey, devoted to the needs of the present readers of *The Radio Review*; Mr. Coursey occupying the position of Research Editor to *The Wireless World*.

The weekly publication of *The Wireless World* will also allow for the inclusion of more articles of an elementary character, and special attention will be devoted to detailed descriptions of the construction of amateur apparatus of all grades. It is felt that this feature is one which will be popular with a very large number of readers and may help to lessen the present congestion of our Questions and Answers columns, since the bulk of these questions now received relate to the practical side of wireless and the construction of apparatus.

The more frequent publication of the magazine will enable topical subjects to be dealt with promptly and announcements of forthcoming events of wireless interest, including Club Meetings, will also be a feature in *The Wireless World*.

In conclusion, we would emphasise that the new volume will not commence a new magazine. It will be an improved *Wireless World*, appearing twice as often, which it will be our earnest endeavour to fill with matters most acceptable to our readers.

In this connection we shall at all times welcome criticism and suggestions from our large circle of readers, to whom we tender our sincere thanks for their support in the past.

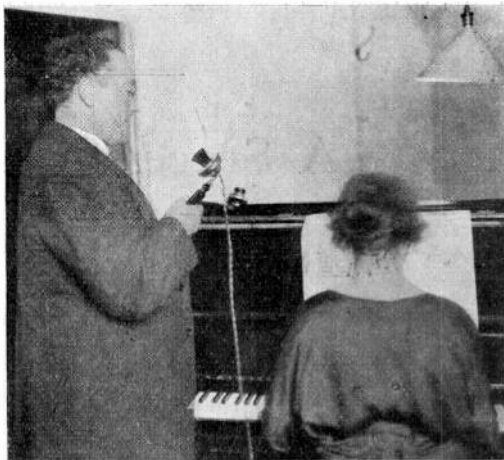
HUGH S. POCOCK,
Editor.

Regular Transmissions for Amateurs

THE accompanying photograph shows Mr. Robert Howe singing into the microphone on the occasion of the first regular transmission of telephony for amateurs, authorised by the Postmaster-General. This first transmission took place on Tuesday, February 14th, 1922.

These transmissions will take place regularly every Tuesday evening, preceded by transmissions of C.W., calibration waves, as announced on p. 729 of the last issue of *The Wireless World*.

Unfortunately, experience showed that a considerable amount of jamming took place, particularly from GBL, on the wavelength allotted for the



telephony transmission, and it is understood that the Postmaster-General has been asked to permit a change of wavelength for this transmission.

As we go to press we learn that Tuesday, February 28th, being the date fixed for the Royal Wedding, the Marconi Scientific Instrument Company, Ltd., under whose direction the transmissions are being made, has conceived the happy idea of transmitting appropriate wedding music on that evening, and it is hoped to include the actual music which will be played in Westminster Abbey for the ceremony.

Amateur Wireless in Buenos Aires

By ADRIAN B. JONES, M.I.E.C.

BEFORE giving a short account of the state of development of amateur wireless in this country, it might be of interest to those whose geography is rusty to have a few figures indicating the size and importance of the Argentine Republic.

It is roughly 2,300 miles in length, and its greatest breadth is about 900 miles, giving an area of over one million square miles. The population is over eight millions, of which one million two hundred

thousand live in Buenos Aires. However, it is as well not to be too optimistic on this subject, as I have heard that the enthusiasm of some amateurs has somewhat eclipsed their respect for the law, and the territory beyond the 300-metre limit has already been trespassed on. The authorities naturally keep a sharp eye on this matter, and cannot permit amateurs to poach on their preserves, and so for the moment the situation is not quite clear.

Considerable difficulty has been experienced in obtaining apparatus, a small amount of American and English parts have been received, and a little French material is now making its appearance, but prices are rather high, probably owing to the import duty, which is between 40 and 45 per cent. A certain amount of apparatus is being manufactured locally, but is also expensive owing to the high price of labour, and to the fact that sufficient quantities of a suitable type have not been turned out.

The first valve I ever obtained was an American Marconi soft valve. A firm received six one day, and I was fortunate enough to get the last; this was within 24 hours of their receipt and the cost worked out at nearly £3. With the present rate of exchange, the price is even higher, the same make of hard valves being about £4. A fairly good supply of French, or "R" valves is now coming along, they are of a very good type, and cost 25s., but I hear there will shortly be some cheaper ones, of perhaps somewhat inferior quality, for 10s.

Some eighteen months ago, an amateur transmitting station was put up in one of the chief theatres, El Coliseo (Fig. 1), and during the last two

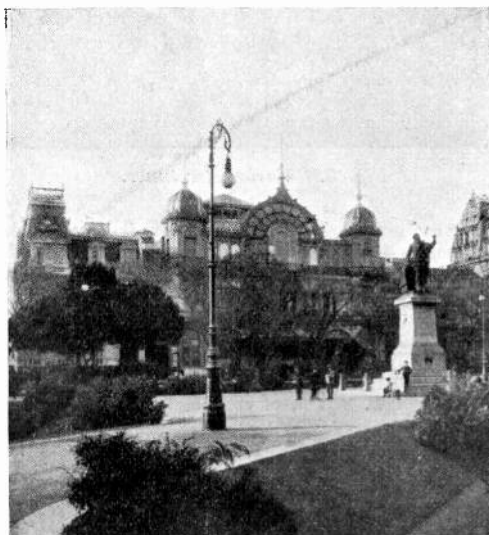


Fig. 1. The Theatre, El Coliseo, where a transmitting station is installed for telephony.

thousand live in Buenos Aires. There are, besides Buenos Aires, the other important cities of La Plata, Bahia Blanca, Rosario, Cordoba, and Mendoza. There are at present over 22,000 miles of railways.

Buenos Aires, being the capital, is naturally the chief seat of wireless activities, but the subject is not unknown in Rosario and Bahia Blanca.

Permission for the installation of amateur receiving stations is very easily obtained; in my own case it took exactly 10 days from the time I lodged my request, to the time I received the official sanction. Permission for transmission has also been very liberally granted. There are no restrictions as to circuits, one can use crystals or valves, as one pleases, and the subject of oscillating receiving aerials, has not yet received attention. As the law stands at present, amateurs are limited to 50 watts, and to below 300 metre waves for transmitting; but recently a movement was on foot for reframing these regulations in the following manner:—The use of arc or spark to be prohibited, and the length of wave with C.W. to be of any dimensions so long as official stations be not inter-

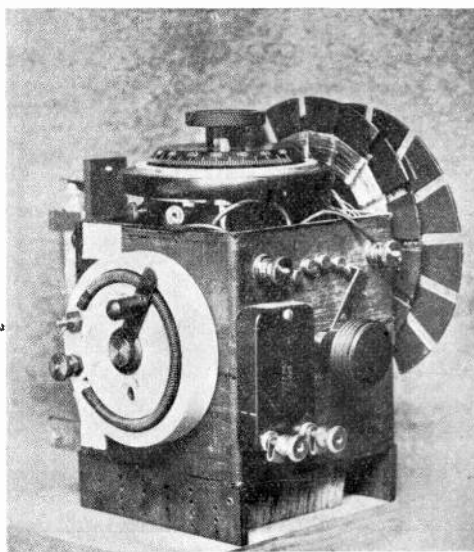


Fig. 2. Short-wave tuner.

seasons, those possessing suitable receiving gear could listen to first-class Italian Opera, and also to concerts and recitals by some of the finest musicians in the world. The gentleman who kept this station going has merited the sincere gratitude of all amateurs.

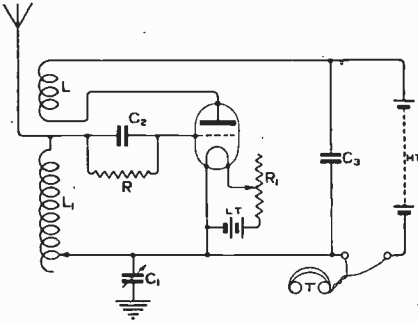


Fig. 3. Short-wave tuner circuit.

In the evenings one now hears sometimes three gramophone concerts and the Coliseo performance all going on at once, and by just turning the tuning condenser or variometers, as the case may be, one takes one's choice. Two other theatres are being fitted with transmitting apparatus, and recently the Municipality voted £1,000 for the Municipal Theatre, El Colon, for such an installation. It is said that 400 watts is the power to be used in the latter case, so that people in Buenos Aires will be able to receive with a frame, thereby obviating the necessity of erecting aerials.

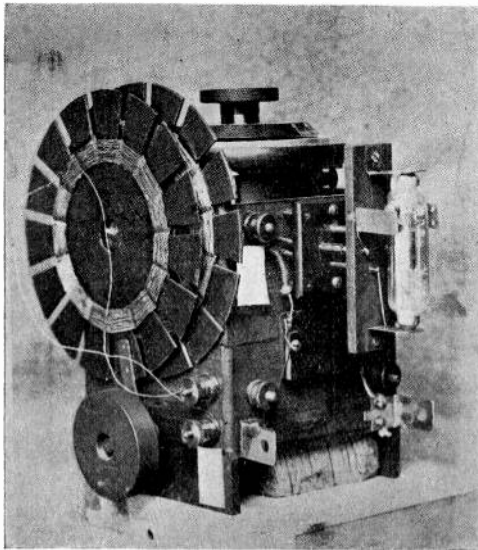


Fig. 4. Short-wave tuner.

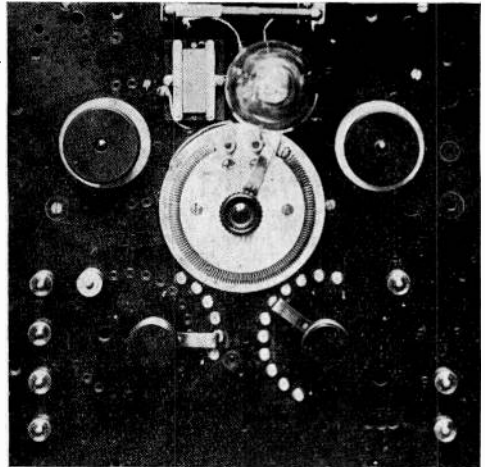


Fig. 5. Variometer tuner.

It is evident that amateur wireless is being given great scope here, which is a somewhat different tale from that which is heard of some European countries.

I cannot refrain from giving an experience of mine in this line. When in London in 1919, I tried to buy a galena crystal from a well-known firm, and to my surprise was asked to produce the P.M.G. license, which, of course, I did not possess,

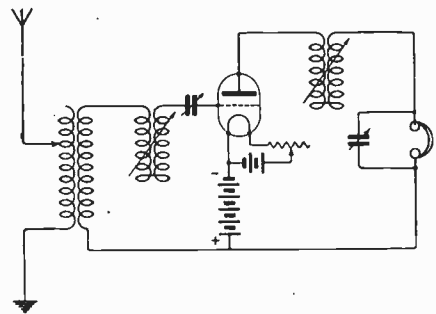


Fig. 6. Variometer tuner circuit.

nor did I have time to obtain one, as I was leaving for South America within a few days, so I left without the crystal.* Even out here, the subject of wireless was somewhat dangerous during the war, so on my return I approached the matter with temerity. Imagine my surprise, when encouraged by a friend to go boldly to the Naval Radio Station to find out under what conditions I should be allowed to use a galena crystal, the most courteous

* This, of course, refers to a time when the restrictions, as a legacy of the War, were still in force.—Ed.

AMATEUR WIRELESS IN BUENOS AIRES

gentleman then in charge, not only put every facility in my way for obtaining the official permission, but presented me with the finest silicon crystal I have ever had!

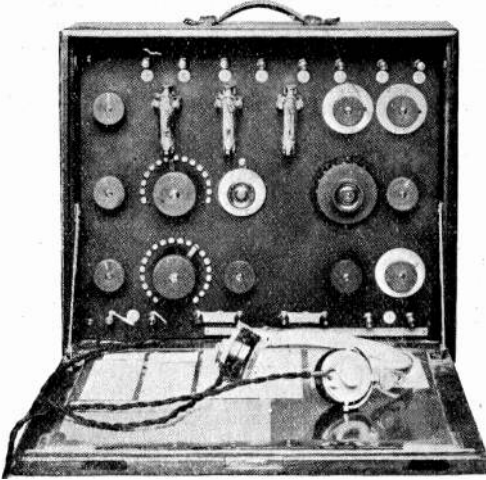


Fig. 7. Portable Receiver, tuning to 300 to 1,700 metres.

Recently a preliminary meeting was held with a view of forming the "Radio Club Argentino," and, judging by the enthusiasm shown by the 70 persons present, who voted by acclamation to the post of President that most courteous gentleman before mentioned, it bids fair to be a success.

With regard to reception, I am situated in rather an inconvenient place, it is 30 kilometres from Buenos Aires, and so located that it requires over two hours to get to town. The train service is very poor, so going to a theatre is out of the question: one therefore more appreciates hearing Opera music when one lives in such an inaccessible position.

I have two short-wave tuners (home made), one with a circuit (Fig. 3) as that of Fig. 133, page 170, of Scott-Taggart's new book. The other tuner is of the variometer type, with a circuit (Fig. 6) similar to that which was given in *The Wireless World*, April 30th, 1921, but with the jigger coupling, and leaky grid condenser and telephone condenser fixed. I receive the Coliseo Theatre, working with 10 watts, quite well with one valve, and the other day I received some gramophone music at a place 100 kilometres from Buenos Aires, with the help of a three-valve L.F. amplifier, and a temporary aerial slung from a signal post, the transmitter registering only 0.4 amps. in the antenna. I have often wondered why so little is done in England with variometers, they are really excellent with short-wave work and tuned anode circuits.

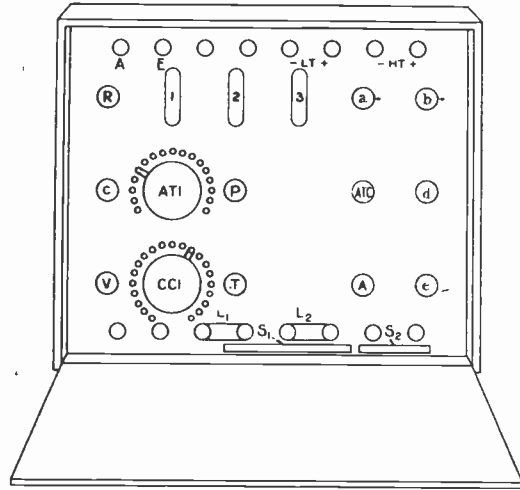


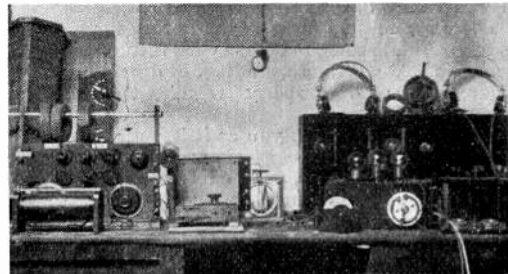
Fig 8.

Key to Fig. 8.

- a = Billi condenser.
- b = Switch for second and third valves.
- c = Series parallel switch for A.T.C.
- d = Off switch for L.T.
- e = Filament resistance for first valve.
- R = Reactance coil switch, giving whole or $\frac{1}{4}$ coil.
- P = Potentiometer, 800 ohms.
- V = Switch giving 1 or 3 valves.
- T = Reactance coil control handle.
- A = Aerial coil control handle.
- S₁ & S₂ = Scales showing relative positions of T and A.
- L₁ & L₂ = Terminals for loading coils.

A Six-Valve Set

The accompanying photograph shows the receiving set of Mr. Louis J. Wood, of 26, Glen View, Halifax. The set has a range of 300 to



25,000 m and 3 or 6 valves can be used. American stations of high power are heard and British amateur telephony comes in well. The Dutch concerts are excellent with the loud speaker when six valves are employed.

Third Annual Conference of Affiliated Wireless Societies

THE Third Annual Conference of Affiliated Wireless Societies was held at the Institution of Electrical Engineers, London, on Wednesday, January 25th, 1922, at 2.30 p.m., Admiral of the Fleet Sir Henry B. Jackson, G.C.B., K.C.V.O., F.R.S., D.Sc., M.I.E.E., presiding.

The minutes of last year's Conference were read and confirmed.

The President.

It gives me great pleasure to preside on this occasion of the Annual Conference of Wireless Societies, convened by the Wireless Society of London, and to welcome members from the wireless societies from different parts of the country. I am very glad to see so many here, and we are all very anxious to hear your views on the subjects which have been placed upon the agenda.

I propose to take each item on the agenda in turn, item by item, and the speakers are requested to keep to the item in hand and not to wander off into other subjects, as there is a long programme and I expect it will take us all the afternoon to get through it. I propose that as each item is read out, the Chairman of the Wireless Society of London, Mr. Hope-Jones, should make a preliminary statement and perhaps give us information which may not be known to all of us. After the discussion on the various items, in which I hope everybody will take part, they will be put to the meeting. I may say that agreement can only signify that the meeting wishes the Wireless Society of London to take action. It does not mean more. There is no machinery at present existing between the Wireless Society of London and the Affiliated Societies to bring about action in these matters. It is a case of asking you to come here and take part in a Conference with us, but we have no machinery to give effect to decisions at present. Indeed, I have no business to be here in this chair; if you care to elect another Chairman you can do so. Perhaps you will leave things as they are for this afternoon, but your vote can only convey the hope that the Wireless Society of London will take action as you resolve.

There is one item on the agenda that may enable us to formulate some machinery for future meetings, item No. 2, so that here is an opportunity of organising some properly regulated machinery for the future.

Now, I will not keep you as it is you we want to hear talk, but I hope speakers will hold to the point under discussion, and be as concise as possible because there are a large number of items to get through. I might mention, with regard to some of the items, that it may be a matter of cost which is involved to carry them out, and it may therefore not be possible to do so, even if the resolutions are carried *nem con.* I will now ask Mr. Hope-Jones to make a statement with regard to the first item on the agenda.

Mr. F. Hope-Jones.

We have some letters of apology from those

whom we know would have liked to have been present. Our Vice-President, Dr. Eccles, regrets that he is going abroad and cannot be here; Sir David Salamons is unable to come because his medical adviser does not wish him to be out at night, and we shall therefore not see him at the dinner or the Presidential Address afterwards. Sir Henry Norman cannot attend the Conference, but we shall see him later in the evening, I am glad to say. Mr. Hollingsworth, President of the Manchester Wireless Society, regrets that at the last moment he is unable to attend through illness, but sends his greetings. I have a telegram from the Altrincham Wireless Society who wish the Conference every success, but regret inability to join us. We also regret that Mr. E. Blake, of the Marconi Company, who, as you know, is carrying out some very interesting matters for us, is unable to be here. He hoped to report to this Conference in person, but he is unable to be present.

The first item on the Agenda is a statement regarding the transmission of speech and calibration waves on fixed wavelengths at definite times for the benefit of amateurs and experimenters throughout the country, and the result of the Petition that was handed to the Postmaster-General recently. You will recollect that that idea had its inception at the Conference held 12 months ago. I have in my hand a letter dated August 19th, expressing the position at that date. It is a letter from the Post Office as follows, and is addressed to the Hon. Secretary, The Wireless Society of London:—

Sir,

With reference to your letter of the 15th inst. to the Inspector of Wireless Telegraphy, I am directed by the Postmaster-General to say that a permit has just been issued to Marconi's Wireless Telegraph Co., Ltd., authorising them to transmit signals by wireless telegraphy (but not wireless telephony) from a station at Chelmsford for the benefit of Wireless Societies and amateurs during a period of half-an-hour (7 p.m. to 7.30 p.m.) each week, on any one day except Saturday and Sunday. The Company have been asked to state which day is selected.

The maximum power allowed for transmission is 1 kW. Fixed waves of 180 metres and 450 metres may be used for spark and C.W., and a further fixed wave of 1,000 metres for C.W. only. The call signal allotted to the station is 2 MT.

It is regretted that it has not been found possible to agree to the inclusion of wireless telephony in the arrangement.

I am, Sir,

Your obedient servant,
(Signed) F. W. PHILLIPS,
For the Secretary.

Most of you have no doubt seen in the current issue of *The Wireless World*, dated January 21st, the Petition, set out in full, which the officials of

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your various societies have signed. You have already seen how it was presented and you have heard that it was favourably received. It will be no surprise, therefore, to hear that we have received the following letter from Mr. De Wardt, dated January 13th :—

Sir,

With further reference to your Petition, on behalf of the Wireless Societies of Great Britain, for the grant of authority for periodical transmissions of wireless telephony, I am directed by the Postmaster-General to say that, with the concurrence of the other authorities concerned, he has now authorised Marconi's Wireless Telegraph Company to include a programme of 15 minutes telephony (speech and music) in the weekly transmission from their Chelmsford station for the benefit of wireless societies and amateurs. The power for telephony is limited to $\frac{1}{4}$ kW., and fixed waves of 180 and 700 metres are to be used, as suggested by the Marconi Co.

I am, Sir,

Your obedient servant,

(Signed) J. I. DE WARDT,

For the Secretary.

The Marconi Company at once set to work to see what arrangements could be made. The latest information from them is this, that the first of these transmissions can commence on or after February 14th. The day of the week (excluding Saturday or Sunday) can be chosen by this Conference and the result submitted to the Marconi Company. The programme to commence at 7 p.m. with, in the first place, C.W., calibration signals on 1,000 metre wavelength, sent with successive input powers of 1 kW., $\frac{1}{2}$ kW., and $\frac{1}{4}$ kW. for about five minutes in each case. The following 15 minutes (with a short pause for changing over) will consist of telephonic transmissions on 700 metres wavelength, with the usual preliminary introductory remarks, followed by gramophone selections. The power to be used for the telephony will be approximately $\frac{1}{4}$ kW. input. It is hoped that arrangements will be made at a later date for the inclusion of other wavelengths, such as 180 metres and possibly 450 metres, in the programme of calibration wave transmissions.

I think you will agree that the Petition appears to have served its purpose, and that the modest request, as originally framed, is now granted up to the hilt. We hope that these transmissions will commence in a fortnight or a little more.

The first of the suggestions that have been submitted for discussion is as follows :—

That the Wireless Society of London be asked to assist in appointing lecturers to periodically visit affiliated clubs and societies for the purpose of giving lectures and practical demonstrations, the club visited to pay the travelling expenses of the lecturer.

That suggestion has been made by a number of societies, such, for instance, as the Leeds and District Wireless Society, the Manchester Radio Society, Altrincham, Hull, West London, North Middlesex, and the Leicester Radio Society. The Committee has already taken some steps towards

the fulfilment of the wish expressed in this suggestion, but as the President has already reminded you, it is you who are here to speak and not us at this end of the room. No doubt one of the representatives of the societies I have mentioned will speak on the subject.

Mr. A. J. Dixon (North Middlesex Wireless Club).

As a member of the North Middlesex Club I should like to point out that the resolution as we sent it in read as follows : " That a list of Wireless Society of London members be compiled, who would be prepared to give lectures and, or, demonstrations before affiliated societies. It would perhaps help matters if it could be arranged that in the event of this suggestion being adopted, those Wireless Society of London members residing in different parts of the United Kingdom, agreed to lecture within a certain radius of their residence. In this way all affiliated societies would share in the benefits of the scheme, and it would avoid heavy travelling expenses." That simply means that the lecturers would be confined, more or less, to a certain distance of their homes. As we all know, wireless societies are not exactly well off, and it would limit the travelling expenses if the lecturers were confined to a certain radius of their homes. For instance, a man might be able to give an excellent lecture in London, but if he had to go to Newcastle to do it, it would be impossible for the wireless club to stand the expenses.

Mr. J. R. Halliwell (Radio Scientific Society of Manchester).

The proposal I have to make in connection with this item on the agenda, standing in the name of the Radio Scientific Society, is that the London Society should take in hand the organising of a system of interchange of lectures between the various affiliated societies. We are told that it is not good to live unto ourselves alone, and therefore it is in the best interests of progress that we should have this interchange of pulpits, as it were. Some societies are singularly fortunate in possessing a rich strata of men who are capable and willing to give of their experience and instruct others of their knowledge. Other societies are decidedly poorer in this respect. Also some societies can afford to pay for outside lecturers to come to their meetings; others cannot. My suggestion is, briefly, that the Wireless Society of London should take the matter in hand on behalf of the affiliated societies and arrange a programme on the following lines. Each society should be invited to send the names of any of their members who would be willing, if called upon, to give a lecture, stating at the same time the radius from their own headquarters in which each particular individual would travel, and also, if possible, a choice of subjects that might be selected from. I would also suggest that, if possible, in drawing up the schedule, one of the London Society's well-known men, of which it has so many, might be allocated to each area (not necessarily each Society) at least once, or, if possible, twice per session. On such occasions invitations from the Society in the particular area at which the lecture would take place, could be sent out to all

members of all societies within reasonable distance to be present. This would have the dual object of enabling a maximum number to take advantage of the lecture at a minimum cost and, at the same time, provide the means of introducing the members of respective societies to one another, which I maintain is all to the good. To instance a few examples from my own area, which I know is an easy one to work under my scheme—and difficulties might be met with in other areas, which difficulties I have no doubt would readily be overcome if the subject were to be taken up with enthusiasm.

I have here a list of ten imaginary lecturers making such journeys, as Mr. Brown, Manchester to Sheffield, fare 9s. 5d.; Mr. Jones, Liverpool to Manchester, fare, 8s. 9d.; Mr. Robinson, Manchester to Liverpool, fare 8s. 9d.; Mr. X., Bolton to Liverpool, fare 6s.; Mr. Z., Manchester to Bolton, fare 2s. 8d.; Mr. A., Halifax to Bolton, fare 9s. 6d.; Mr. S., Manchester to Sheffield, fare 12s.; Mr. Anode, Sheffield to Halifax, fare 10s.; Mr. Grid, Liverpool to Sheffield, fare, 18s. 6d. The total fares amount to £4 5s. 7d., which divided by ten gives an average cost of, say, 8s. 6d. per lecture. That is to say, when the list has been drawn up I would suggest that the cost be averaged out as shown, and that for any particular lecture the society pays the average cost into a central fund and the lecturer draws his actual expenses from this fund. My argument in favour of this method of costing is that the benefit the society may derive from a visiting lecturer does not bear any relationship to the distance travelled by the lecturer in going to deliver his lecture. I think it can be seen very plainly that the cost of arranging six such lectures in one session need not be very high (if it averages out as my example, cost would be roughly 50s. per session), and, to my mind, the cost is insignificant compared to the benefit that would be derived in general. The cost of the proposed lectures delivered by members of the London Society to the various provincial centres also would be borne by the same fund, and would be taken into average when the scheme was drawn up. I have purposely left out of my reckoning any expenses which might in certain circumstances arise, *i.e.*, when it would be necessary for the lecturer to remain the night in the town he visits as, for instance, Mr. Grid, who visits Sheffield. Speaking of my own experience, I have always found a very kindly and hospitable welcome awaiting me from some member of the Society visited, and I think the various societies could always arrange for one of their members to entertain the visitor under similar circumstances. I have also purposely left out any mention of fee to the lecturer, as I presume that under the scheme none would be required.

Mr. G. Marcuse (Bristol Wireless Society).

I should like to say a few words in support of what Mr. Halliwell has said. We are a very poor society in Bristol, and we find great difficulty in arranging lectures for our various meetings. Thus we generally live from hand to mouth, and I am sure that if some such scheme as that outlined by Mr. Halliwell could be worked out, we should, as

far as Bristol is concerned, support it wholeheartedly.

Mr. H. Cotton (West London Wireless Society).

I should like to support the scheme that has just been suggested, and I should like to move that the prospective arrangement as put forward by Mr. Halliwell be submitted to the affiliated societies. The result of their vote upon it should be used to guide the Wireless Society of London in what action to take and on what method these lectures should be arranged for.

Mr. E. M. Savage (North Middlesex Wireless Club).

I should like to second that.

Mr. F. Hope-Jones.

The proposition before the meeting will require to be framed, which we shall be pleased to do quickly; but, first of all, is there any further discussion?

Mr. C. H. H. Hainsworth (Sheffield and District Wireless Society).

I should like to say a few words. The suggestion which is before the meeting has been talked about in Sheffield, although I do not think we are one of the societies which put it forward. Nevertheless, I think I am right when I say that we should be pleased to support, as strongly as possible, any suggestion which our good friends behind us have put forward, or any other which may be put forward and eventually carried. We have had no real difficulty, perhaps, in Sheffield up to the present in getting sufficient papers to cover the session. At the same time, we have felt that if, say, once at least during the session, we could get some very prominent man to come down either from London or elsewhere and give us a paper with practical demonstrations, it would be very much to the benefit of the Society. We have certainly proved that at Sheffield during this last session. We had one Marconi Company man down, and he gave us an excellent lecture with demonstrations, and when I say that we filled a hall with 400 people, and we could have filled it twice over as we made it a semi-popular lecture, I think that indicates the general enthusiasm which would be shown in almost any town with a society, if such a scheme as the one proposed were carried out properly so that it would come on the ordinary programme. I think I am right in saying that we would support any proposition of that nature as strongly as possible.

Mr. F. Hope-Jones.

It seems to me that the speeches we have heard on this subject have been excellent, and I do not think we ought to devote further time to the discussion of it. I suggest that we frame a resolution with a view to carrying it out, and I would like to join in the discussion myself just to say that some of us on the Committee have been considering this, and have taken the trouble to write down the names of men of real distinction, really well above the average as lecturers: not

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members of the Committee of the Wireless Society of London, but members in the Provinces, and we totalled quite easily sixteen at once. We have one each from Liverpool, Leeds, Wakefield and Edinburgh; three from Cambridge, one from Oxford, one from Manchester, one from Rugby, two from Brighton, one from Plymouth, one from Malton (Yorks), one from Gravesend and one from Canterbury, which is enough to show that effect could be given to any such proposition, as I understand it is your intention to move, second and carry unanimously, as I have no doubt you will. I would however, like to warn you that I rather gathered from Mr. Halliwell's scheme that it involves a certain amount of organisation, pooling of funds, considerable circularising and general office work, which the Wireless Society of London, with their overworked honorary secretary, might not be prepared to undertake. I suggest that you put your proposal in general terms to allow the Wireless Society of London to make a recommendation as to what it is prepared to do on these lines. I suggest that you be good enough to frame your proposal now, Mr. Halliwell has proposed it and Mr. Cotton has seconded it. Perhaps those two gentlemen will reduce it to writing right away.

Mr. W. Winkler (Edinburgh and District Radio Society).

We have had some experience in the North which the South might like to hear of. We recently had a demonstration which included an exhibition. It was merely advertised by the members of the Club distributing amongst their friends some 300 or 400 handbills, and we had an attendance, in a small town like Edinburgh, of about 2,000 persons. Surely, with an example like that, it would be quite simple for any other society, having a lecture by somebody well known in the electrical and wireless world, to charge to those who are not members of the Society, so much for admission. That would assist in procuring the necessary funds and pay the travelling expenses of the lecturer on a little more liberal scale than the mere railway fare from one place to another. From our experience, I should not think that would be very difficult. It is a matter of risking a little to gain a good deal.

Mr. L. Sims (Borough of Tynemouth Y.M.C.A. Amateur Wireless Society).

I wish to support the last speaker.

The resolution of Mr. Halliwell was then read in the following terms:—

“That a schedule be drawn up of members of the Wireless Society of London, and of the affiliated societies who would be willing to give their services as lecturers within a stated radius, giving at the same time a choice of subjects, the cost of such lectures to be defrayed from a central fund to which each society should subscribe.”

Mr. L. C. Holton (North Middlesex Wireless Club).

Before that resolution is put to the meeting, I think we should have some further guidance as to what proportion the affiliated societies would be called upon to subscribe to the central fund. I

should like to know the views of those present, whether the membership total should form the basis of the amount to be subscribed.

Mr. Frank S. Adams (Birmingham Experimental Wireless Club).

With regard to what the last speaker said, I take it from the form of the resolution that the expenses of the lecture would be practically the same irrespective of the size of the society, and that each society would be asked to subscribe practically an equal amount. I really fail to see that the membership of the Society would affect the question of expense very considerably.

Mr. E. M. Savage (North Middlesex Wireless Club).

Would it be possible to devote any portion of the sum subscribed as fees for affiliation, towards meeting these expenses?

The President.

One or two members have raised the point of how much subscription each society should pay towards the expenses of these lectures, and how it should be divided. I think you will have to leave that for us to look into. This is a resolution and we will do our best to get it into working order in the course of a month or so. I think you must leave that to us. Someone else raised the question as to whether the entrance money paid to the parent society could not be used for this purpose. I think you must leave it that this is a resolution, and we will work out the details which will have to be thought a good deal about. I do not think we can get it formulated and agreed to here this afternoon. We have already had nearly 40 minutes on this one item on the agenda, and it is not yet finished. Therefore, I will ask you to agree to the resolution now in a general sense, leaving it to the Wireless Society of London to get out the detailed arrangements which will suit the affiliated societies.

The resolution as set out above was then agreed to.

Mr. F. Hope-Jones.

The second item on the agenda is:—“The possibility of the formation of centres in each county or district throughout the country with a view to linking up the various wireless societies within these districts with the Wireless Society of London as the central body, under some such title as ‘The Wireless Society of Great Britain’ or ‘The British Wireless Association.’”

That opens up a very wide field for discussion, and I know there are some in the room who have thought of it very deeply. You will be so good as to speak concisely and to the point, and we will give ourselves 15 minutes, if necessary, for an open discussion on quite an important and wide subject with respect to which I can hardly hope that there will be any definite proposal proposed and carried. Perhaps I should remind you that this proposal comes from the City and Guilds Wireless Society of London, the Leicester Radio Society, the Wireless Society of Hull, and the Altrincham Wireless Society. Will any gentleman representing either of these societies kindly speak?

Mr. C. H. B. Nutter (Croydon Wireless and Physical Society).

May I ask what would be the benefit of this scheme to the various societies linking up?

Mr. F. Hope-Jones.

I think that is a very fair question to put to the representatives of any of the four societies whom I have named as having brought this matter forward.

The President.

May I ask if there is a representative of any of these four societies in the room?

Mr. C. Atkinson (Leicestershire Radio Society).

I represent the Leicester Society but I must plead some ignorance of the way in which our resolution has been construed into having connection with this resolution. Possibly it has been taken from something we previously said, and I am not quite clear as to the manner in which it was worded. As far as I am aware we only put forward one resolution for discussion at this Conference, and this has not been included in the agenda. This is the reason I was not speaking at once.

Mr. F. Hope-Jones.

I hope I am not taking up too much of the time of the meeting, but if no one else is desirous of speaking I may say that I have very often heard it discussed that the Wireless Society of London appears to be doing national work, work in the name and on behalf of all the societies. I can say, without hesitation, that though they did not originate it, that was the origin of the idea of a possible change in the name of the organisation. Beyond that, I know nothing.

Mr. A. J. Dixon (North Middlesex Wireless Club).

I think some such scheme as this could be drawn up with advantage, because if such a thing were done it would certainly set up machinery which our worthy President said to-day is at present lacking, between the parent society and the affiliated societies. If some such scheme as this were formulated, I take it there would be machinery established through which the G.P.O. and similar authorities could be approached by the London Society as representing all the wireless societies of Great Britain, and it would then be known that it had the unanimous backing of all the wireless amateurs of Great Britain, whereas at present, as the Wireless Society of London, it does the best it can for us, and very satisfactorily. It could not, however, go and say that it had the unanimous backing of the whole of the wireless amateurs of the country. If such a scheme, therefore, was prepared, machinery would be established between the Wireless Society of London and the affiliated societies which would enable them to consult and act with unanimity.

Mr. L. McMichael (Hon. Secretary).

This subject was mentioned by Leicester, Altrincham, Hull and the City and Guilds Societies. All of these societies mentioned something of this

kind in their Agenda Proposals, and I will read extracts from their letters:—

The City and Guilds Wireless Society writes:—The present scheme of affiliation might with advantage be pressed a step further, and our suggestion being that the Wireless Society of London and its affiliated clubs be formed into one British National Amateur Wireless Association, with the present clubs as branches. This, it is suggested, would be a step towards bringing clubs into a closer relationship one with another and induce them to exchange views more freely.

The Wireless Society of Hull and District writes:—Affiliated societies to be brought more in touch with one another by the formation of centres in each county and by the holding of conferences in the provinces at regular intervals during each year.

Leicestershire Radio Society says:—To endeavour to get all affiliated societies to arrange to admit members of other societies to their meetings on production of suitable proof of such membership, and that this in future be made a condition of affiliation.

Mr. F. Hope-Jones.

One very obvious way of interpreting all these suggestions and putting them into a concrete form would be to suggest the establishment of a society in London under such an all-embracing name as "The Wireless Society of Great Britain," or "The British Wireless Association," and to have permanent offices and salaried servants, and a constitution similar to that of the institution in whose hall we now meet—the Institution of Electrical Engineers, which has a very large membership. They are all members of the central body, with its home here and there are district centres—northern, midland, western, and so on, where they have local meetings. Such a scheme, however, seems very ambitious, and I do not think it is called for by the amateur radio telegraphists of this country at the present time. It seems to me that our science is too new; so many improvements are appearing so rapidly, and there is so much local enthusiasm, that I doubt if any one of our affiliated societies in the Provinces would desire to give up their club rooms and their frequent meetings. This, it seems to me, is a condition of our hobby, and it is not on all fours with such an institution as the one I have outlined, which represents an old-established industry.

The President.

There seems no support for this item, so I am not going to put it to you. I agree with Mr. Hope-Jones that the Wireless Society of London could not afford to run a British Wireless Society on the present subscription. As we were coming in through this door this afternoon we saw trays and boxes which filled the whole of the passage, and they are all index files of the Institution of Electrical Engineers' provincial branches, and we should have to start something like that. I am quite certain the Wireless Society of London could not do it, and I think we shall have to drop that. I think the reasons are obvious; but there is another way in which we might manage something of the sort—

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an association of the wireless societies. That is really what it is now, with the provincial clubs affiliated to the London Society, each having their own club rooms. We might call them all the British Wireless Society, or Association, and let them keep the same machinery that they have at present. That is about the only way I see, and there is certainly no resolution likely to be passed to-day, and I think we must drop it for another year. We might think of it during the course of the year, because if we do get an association of that kind we should be in a very strong position in dealing with matters such as the Petition we sent to the Postmaster-General, which showed that we meant business and we got a very prompt reply. I think that was simply an example of the strength of having the affiliated societies joined up to the main society. Therefore, we will leave the item out and say that no resolution is necessary.

Mr. J. Scott-Taggart (Wireless Society of London).

I think the general feeling of the meeting is that we agree with the Chairman that the expense attached to the establishment of a central body, with sections in the different large towns, is certainly not likely to be met at the present time. Quite apart from the expense is the complicated machinery that would be necessary. All that would be done away with if, as the Chairman has suggested, we established a federation of wireless societies of this country. Such a federation would not involve any expensive machinery and, in fact, it could easily be arranged that the Wireless Society of London carried out the duties. For instance, the Committee of the Wireless Society of London could be deputed to carry out the work with the addition, perhaps, of specially selected members from different societies, and that general committee could be the Committee of the Federation of Wireless Societies, which would have all the advantages of the other arrangement without any of the disadvantages. It might be called the British Federation of Wireless Societies, or the British Wireless Society, or something like that; and it would probably carry greater weight than merely the name of the Wireless Society of London. I think there is a general feeling that there should be some machinery to express the will of the representatives assembled here, and I think that if some federation of the kind I have mentioned were formed it would involve no complicated machinery to carry out all the necessary work. I should like to make the suggestion that a Committee be formed to consider the matter and settle upon some suitable name and that the matter be put in working order.

Mr. C. F. Phillips (Wireless Society of London).

I should like to move that the remarks that have been made should close the discussion on this item, because I consider that the scheme of affiliation which now exists may be all that is necessary if the third item on the agenda is acted upon.

Mr. A. W. Knight (Wireless and Experimental Association).

I second that.

The President.

I put the Resolution that the discussion be closed.

The Resolution was carried without dissent.

Mr. F. Hope-Jones.

The next item on the agenda is—

“That the Wireless Society of London shall send to each affiliated society or club, each month, a circular letter embodying any matters of interest or policy, in order to keep affiliated societies and the parent society in closer touch with each other.

From the moment that was suggested, our honorary secretary and others have been trying to see if it is not possible to grant such a request, and I think we have come to the conclusion that it can be done. At the same time I would remind you that there is no change left out of the affiliated societies' subscriptions. Nevertheless, we are very fortunate in having the really substantial help and co-operation of *The Wireless World*, our official journal, and with that help I think it will be possible for our honorary secretary to carry out such a request. At the same time, we would like to have the request formulated more thoroughly than it is on the agenda, and I hope that some of those who have asked for it will speak on the subject.

Mr. E. M. Savage (North Middlesex Wireless Club).

In view of the fact that *The Wireless World* is now published twice a month, could not the matter that would be sent in the circular be printed in *The Wireless World*? We should then receive it more frequently and at a saving in expense.

Mr. F. Hope-Jones.

I ought to have said that that matter has been before the Committee. The main object of the circular would be to send round such information as could not very well be published. There are confidential matters which would make us feel in very much closer touch if they were sent round regularly; for instance, such matters as negotiations with our good friends at the Post Office, and so on.

The Hon. Secretary.

I cannot say any more than that I will let you know what we are doing and what we hope to do, and I hope you will write in and let me know what you want done. I cannot say any more than that. I will arrange to send you a letter every month, giving just what information is available at the time of writing and our future plans, for the benefit of all of us, with the help of *The Wireless World*.

Mr. L. C. Holton (North Middlesex Wireless Club)

There is nothing to prevent a confidential letter being circulated from time to time without requiring the Hon. Secretary of the London Society to send out a letter every month. Moreover, in view of the information given in the opening announcement with regard to the Postmaster-General's sanction to

the use of telephony, I rather think that use should be made of that form of transmission to circularise such information which could be treated as not confidential.

Mr. E. H. Shaughnessy (General Post Office).

I rather think the last suggestion may interfere with the Postmaster-General's right of communication between A and B.

The President.

I think the Hon. Secretary will make the necessary communication with you when occasion arises, and if you agree, we will pass on.

This was agreed to.

Mr. F. Hope-Jones.

The next item on the agenda deals with an exceedingly important point:—

"In view of the increasing interference by amateur stations with commercial stations, that special means may be discussed to minimise this interference and bring offenders to book who are jeopardising the licences of all genuine experimenters."

With reference to this item, the Wireless Society of London have received from the Post Office an important communication which will be discussed. This letter is dated January 13th from our old friend and Vice-President, Captain Loring, and is addressed to our Honorary Secretary as follows:—

DEAR MR. McMICHAEL,

We understand from recent press references and from personal representations, that the attention of the Wireless Society of London has frequently been directed by its members to the interferences which arise, more especially on the wavelengths at present reserved for experimental work, through the negligent working of experimental apparatus or the deliberate non-observance of the necessary rules laid down by the Post Office for the guidance of experimenters. Inaccuracy in tuning has led on several occasions to serious interference with Government stations which are working on adjoining wavelengths, and has hindered the safe landing of aircraft.

The Post Office would be loth to impose additional restrictions on bona-fide experiments, but that course may be unavoidable if the irregularities continue. The Wireless Society is, it is understood, willing to assist the Post Office in maintaining reasonable discipline amongst its members and, if desired, the Post Office is willing to grant authority for the installation of direction-finding apparatus at a few selected addresses in the London area for that purpose. Perhaps you will let me know whether the Society wishes to avail itself of this offer and would be prepared to take such measures in the case of its members as would ensure the non-recurrence of irregularities.

It is presumed that, if any irregularities on the part of non-members in London or in the provinces, came to the notice of the Society, they would be reported to the Post Office with full details, so that any necessary action could be taken.

Yours truly,
(Signed) F. LORING.

You do not need to be told that we very much welcome that letter which gives us an opportunity of serving His Majesty's Government, which we have always wanted. We appointed a Committee at once, and although that letter is dated less than 10 days ago, that Committee has reported and I want to read you their report. It is as follows:—

**STATEMENT FROM THE SUB-COMMITTEE
CONSIDERING P.M.G.'S LETTER re
REGULATION OF TRANSMISSION.**

WAVELENGTH.—We propose to inform experimenters when they are off their correct wavelength and to request them to remedy the defect, giving where necessary any assistance in calibration.

POWER.—It is believed that unnecessary power is frequently used, and in certain cases power in excess of the licence granted. Attention is drawn to the fact that only sufficient power should be used to communicate with any particular station. The Committee will take steps to investigate any suspected use of undue power. The Society will endeavour to make arrangements to measure power for experimenters where necessary.

TIMES OF OPERATING.—Most experimenters are allotted definite time for transmission, and while the Society are endeavouring to obtain certain concessions, experimenters must adhere rigidly to the terms of their licence. Attention is drawn to the voluntary arrangement arrived at last year when the majority of those who then held transmission licences met and agreed that no station should transmit for a longer period than 15 minutes to be followed by 15 minutes silence. Since then a number of new transmitting licences have been issued, but it is hoped that all concerned will endeavour to adhere to the arrangement made. It is a condition of licences that the call sign of the station calling, and station called, be repeated at the beginning and end of every transmission. It is a breach of licence for the experimenter or experimenter's name, or name of the town to be used in the place of the call sign.

LISTENING-IN.—It is essential to listen-in before and after every transmission and to cease working immediately if requested to do so by Government or commercial stations, special attention being paid to aircraft work. The Committee recommend that no amateur traffic be carried out in the London district or near aircraft wireless stations when aircraft can be heard communicating with the aerodrome.

As the Committee of the Wireless Society of London have been definitely requested to assist in the supervision of amateur transmission, they have arranged for certain stations to keep watch and report to them breaches of the terms of licences. The requisite action will be taken by the Committee to warn offenders and, finally, in case of persistent non-observance of regulations, the matter will be reported to the G.P.O., for further action. Members of this Society and affiliated societies will best serve their own interests by assisting the Committee in this respect.

Continuing, **Mr. F. Hope-Jones** said:—I suggest from what I have read that the Wireless

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Society of London is taking the necessary steps, but in order not to weary you I have not given you the details of what the Committee has already been doing for some months in a quiet and unauthorised way. I have simply read this report of our sub-committee and I can assure you that it is the intention of the Wireless Society of London to carry that scheme out, and we have plenty of expert help to enable us to do so. I hope we may have some comment on the proposals.

Mr. E. M. Savage (North Middlesex Wireless Club).

May I enquire whether this proposal originated out of one of the items on last year's agenda? I think it was the first one.

Mr. F. Hope-Jones.

I think, perhaps, that is a question we might ask our Vice-President, Captain Loring, to refer to when he speaks, as I feel sure he will do before the end of this Conference. The item you refer to was No. 1 on the agenda last year, viz., "That it be suggested to the Postmaster-General that he makes use of the societies in policing the ether in transmission and also heterodyne radiation in receiving."

Mr. S. S. Angel (North London Wireless Association).

As a representative of North London, may I bring forward a suggestion. The band of wavelengths allotted to amateur stations should be entirely different from commercial stations. The amateur wavelength is 1,000, and I suggest that it should be put up just a fraction.

Mr. F. Hope-Jones.

That will come more properly under the next item on the agenda.

Mr. G. F. Auckland (North London Wireless Association).

If amateurs would work a little more to the allotted wavelength, viz., 180 metres, probably a lot of this jangling would cease. The recent American tests have shown what can be done on these short wavelengths, and I see no reason why the very short wavelength should be continued to be ignored by the amateurs.

Mr. F. Hope-Jones.

Again, may I say that this will be specially discussed under the next item. We shall be approaching that directly.

Mr. A. J. Dixon (North Middlesex Wireless Club).

With regard to the point in the Sub-Committee's report that you are not to call anyone by name but only by his call signal, what is the position in the case of a man who wishes to call, as a test call, to some experimenter who has not a transmission licence and therefore no call signal?

Mr. H. H. Burbury.

The Post Office only recognise people with a transmission licence. We are not supposed to know that there is anybody else who is interested in wireless except the four or five people with whom we are allowed to transmit, so that I understand that you cannot call anybody who has not a transmission licence.

Mr. A. J. Dixon (North Middlesex Wireless Club.)

When you are given a transmitting licence, you are required to give the number of stations who are willing to receive from you. If a transmitting station wishes to communicate with a station which has not a transmitting licence, how does one call that station except by name or town, because it has not a call signal?

Mr. E. H. Shaughnessy (General Post Office).

What would be the object of calling this particular man? He could not answer.

Mr. A. J. Dixon (North Middlesex Wireless Club).

But there is the telephone to answer by.

Mr. E. H. Shaughnessy (General Post Office).

If he answers by post or telephone you can easily arrange that you are going to signal and he can listen out for you, and he can answer by telephone. Is there any need to call him?

Mr. R. H. Klein (Wireless Society of London).

Our objection was not so much to Smith calling up somebody by name or town, but failing to give his own call sign. There has never been any objection to saying "Can you hear me Ealing," even if Ealing sent a postcard to give the answer.

Mr. A. W. Knight (Wireless and Experimental Association).

I do not think there is very much in this. Supposing you are calling Mr. Brown (using his correct call letters), I do not suppose the Postmaster-General would object to your calling Mr. Green to get into touch with him at the same time.

Mr. C. F. Phillips (Wireless Society of London).

I had something to do with the actual wording used on the paper that was read by Mr. Hope-Jones. Our intention in framing it in this way was to ensure that people should not exclusively use their names or other people's names, or the names of towns instead of call signs. Perhaps the wording is not as perfect as it might be, but that was certainly the intention; that those people who possess call signs should call or be called by them instead of names or towns.

The President.

I think the arrangement as proposed by the Committee of the Wireless Society of London should be the basis on which we should try and help the Post Office to reduce this interference.

The motion on the agenda, as set out above, was then agreed to.

Mr. F. Hope-Jones.

The next item on the agenda is as follows:—

"That the Wireless Society of London be asked to point out to the Postmaster-General that subject to reasonable restrictions there can be no grounds for withholding licences from amateurs on the score of interference with commercial stations where such licences are limited to working on a short wavelength:—(a) When the wavelength is 180 metres or less, and the power 10 watts, or (b) when the wavelength is less than 400 metres, with complete freedom in hours of working, and in the number of stations with which communication may be carried on.

"(The 1,000 metre licences might be rescinded under these conditions.)"

You will understand that this item, like many of the other items, is a collection of suggestions that have emanated in widely different language from a number of societies in the provinces, and they are boiled down into this. I am sure we shall have an interesting discussion on this subject, and I know there are two or three who are bursting to speak on it. Some of them have attempted to deal with it prematurely, but we will hear them now.

Mr. S. S. Angel (North London Wireless Club).

I think the paragraph you have read covers the point I wished to make.

Mr. G. F. Auckland (North London Wireless Association.)

Neither do I think I have anything further to say, except to point out that amateurs might stick a little more to the 180 metres, and as we also have the 1,000 metres, which does not bring in any difficulties which could not be met by the average experimenter, it would ease things quite a lot.

Mr. A. W. Knight (Wireless and Experimental Association.)

I think it would be a good policy not to have the one wavelength of 180 metres, but that a little variation should be allowed. There are, to-day, some stations working at 50 watts, and there is a 10-watt man in the next street. They cannot work together. One is completely jammed by the other, but very often they get their two tests arranged for the same time and the small man is simply drowned out. I have had a note handed to me by the secretary of our Society to the effect that, considering the risk of jamming commercial stations, and particularly aircraft, amateurs should be encouraged to keep within 200 metres and should not work over 1,000 metres.

Mr. A. J. Dixon (North Middlesex Wireless Club).

I see no difficulty in this matter. As a pre-war amateur, we used to work in those days without any fine tuning of C.W. We had spark coils varying from a motor cycle coil to a 10-in. coil, and we used not to jamb one another. If we were jammed at 180 metres we just shifted a little. I happened to be living in a district where eight or nine other people transmitted on a short wavelength and we never had the slightest trouble from jamming one another. I therefore have great pleasure in supporting the motion on the agenda.

Mr. H. H. Burbury.

I quite agree with the general idea expressed in the second part of the motion, the Post Office might grant us some latitude in wavelength especially on the shorter waves. For instance, as far as I can ascertain, there are no commercial or Government stations below 300 metres, and it appears to me possible for the Post Office to allow us to use 250 metres and below. That would give ample room for any number of people to be sending at the same time without interfering with each other. A 2½ per cent. difference in wavelength ought to enable you to get quite clear on telephony and if the Post Office could also extend that by knocking us off 1,000 metres and putting us on to, say, 700 or

750, we should be equally clear of any other station that is working at the present time. I think we might have a margin of 7 or 8 per cent. on the longer wavelength, and unlimited below 250 metres.

Mr. Frank S. Adams (Birmingham Experimental Wireless Club).

When the representative of the Post Office makes his remarks later, may I suggest that he should tell us the reasons why 180 and 1,000 metres were definitely allotted to amateurs. Is there any reason why the amateur should not be permitted to use any wavelength below, say, 250 metres?

Mr. P. R. Coursey (Wireless Society of London).

With regard to Mr. Burbury's remarks, in the case of most transmitting licences, I believe they are for 180 and 1,000 metres, and there seems to be no reason why we should be asked to give up 1,000 metres when we already have it. There is nothing at present to prevent us using a shorter wavelength round about 180 if the Post Office would make a definite allocation, where necessary, of a band of wavelengths over 100 metres, round about 180 metres or so, and then everyone could make the necessary adjustments to their apparatus in that band of wavelengths so as not to interfere with anyone round about them, without raising the question of giving up the 1,000 metre wavelength. If we have both we can use which we like and as there are many advantages in the shorter wavelengths, why not use them. We could then use the thousand wavelength for any particular experimental work, and if we were given greater freedom round about the 180 metre wavelength there should not be any trouble.

Mr. G. G. Blake (Wireless Society of London).

I quite agree with Mr. Coursey. There are a great many amateur transmitters who have been to great expense in fitting their apparatus for 1,000 metres length, and if it could be so arranged that those who already have the licence should keep it, I think it would be a good idea. All new licences could be given the lower wavelength and consequently have a bigger range of wavelengths to work on.

Mr. C. F. Phillips (Wireless Society of London).

It seems to me that it might be the general opinion of the meeting that some alteration is desirable in the present regulations of the Post Office which the Post Office might, or might not, be willing to concede. It seems that negotiations with the Post Office will probably be necessary. It is impossible for this meeting to negotiate with the Post Office, so presumably we must ask the Wireless Society of London to do the negotiating for us. I should like to suggest that the Conference authorises the London Wireless Society to negotiate with the Post Office in certain definite respects, which are fully covered by the paragraph on the agenda which we are discussing. It might be well, for instance, that letters be written to the Post Office enquiring whether, first of all dealing with paragraph (b), the restriction of transmitting to five definite persons cannot be cancelled, and whether some other form of restriction cannot be imposed in lieu. I do not know quite why the

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Post Office decided that one should only transmit to five persons. They probably had exceedingly good reasons. I should hazard the guess that they might be willing to remove that restriction altogether, and possibly permit us to communicate with people within a certain radius, or some town or county or some district. The Post Office might be asked whether they would entertain such a suggestion. Another point that was raised on paragraph (b) was the hours of working. At present we are limited to two hours a day, which are definitely laid down. We appear to have all chosen the same two hours in the evening, and it becomes a little difficult to communicate with people. I think, perhaps, the Post Office did not mean us to work to two definite hours a day, and it might even be, if they were asked nicely, as long as we did not work our stations more than two hours a day in the aggregate, they would agree to our choosing our own time.

Mr. G. G. Blake (Wireless Society of London).

That is so in some cases already.

Mr. C. F. Phillips (Wireless Society of London).

But undoubtedly some of the licences have the time definitely stated, and it would not do any harm if the Post Office were asked to remove all such restriction. With regard to the matter of wavelength, as long as the 1,000 metre wave exists for use by amateurs, it appears that there is going to be a certain amount of danger of interference with aircraft. The letter that the Chairman read seemed to state that the chief ground of complaint was that aircraft were being interfered with. It is very possible they are, even when we are on 1,000 metres, because telephony is broad and we all know how far with a condenser we can hear Croydon. (Laughter.) Nevertheless, I suggest that 1,000 metres is not the best wavelength, but if we are to continue to use it, it might be possible for us to go up just a little bit. The danger does not seem to be increasing the wavelength; it seems to be that we must not go below it. Therefore, I suggest the Post Office should be asked if we might not go up to 1,025, or 1,050 might meet their views even better. Then with regard to the short wave working, I am very, very much in favour of short wavelength. Anybody can work at 1,000, and I do not see why they should not do so quite as easily with waves shorter than 1,000, and I think it would be a good thing to ask the Post Office whether they would consider at all the desirability of allotting definitely some other wavelength than 1,000 to amateurs, perhaps retaining 1,000 metres for those people who need it for some special occasion or some really good reason. It is too much to dictate to the Post Office what wavelength they should give us, but is there not some possibility of being allotted a wavelength between, say, 250 and 700. It would be less disturbing and less dangerous to aircraft, and incidentally of much greater value to ourselves if we could get more into our aerials with our 10 watts. I should like to put these points to the meeting, and propose that the Wireless Society of London be authorised to negotiate with the Post Office to ascertain their views with regard to these four matters that I have mentioned.

Mr. J. Scott-Taggart (Wireless Society of London).

I beg to second that.

The President.

Might I suggest that the Post Office would be more willing to discuss this matter with a committee than here. I should be pleased to be one of such a committee, which might wait upon the Post Office, when we might be taken a little more into their confidence. We are very much in ignorance on many points at the present time. Personally I do not know what wavelengths the Post Office are using and what they want, and if we could be given some information of this kind it would make matters very much easier for us.

Captain F. Loring (General Post Office).

Mr. Phillips has put into words very much that I would have said myself, and I agree very greatly with what he has said. Since the Conference last year, the Post Office really have had very few complaints to make of amateur interference, except on this one question of interference with aerodrome work. There have been a few people who have caused trouble, but the cases are so few that I think the amateurs can compliment themselves on their behaviour as a whole. With reference to aerodrome work, Colonel Blandy wrote me a private letter, in which he said:—

1,000 METRE W/T WAVE.

Constant interference with aircraft occurs from the use of this wavelength by amateurs, in part due to inaccurate tuning consequent on these stations not having an accurate wave metre.

Flagrant cases, where the use does not immediately stop when requested, are reported to you through the W/T Board but the interferences from amateurs who do try and help by stopping when requested is liable to be a cause of danger to aircraft.

It must be remembered that aircraft travel very rapidly—some 100 to 120 miles an hour—and if, owing to a sudden mist or other causes, aircraft have suddenly to ask for D.F. assistance, as is often the case in our climate, the time taken to get even a helpful jamber to cease is sufficiently long to cause serious danger to the aircraft we are trying to help.

(Signed) S. F. BLANDY.

Continuing, **Captain Loring** said:—

I think that is a perfectly reasonable letter and a reasonable point of view. All questions of wavelength are referred to the Imperial Communications Committee (a Board of the Services, the Post Office and every department interested in wireless telegraphy). I think the Government would be glad to see amateurs get sufficiently far away from the 900-metre wavelength to render it immune from amateur interference. With regard to wavelengths below 300 metres, which some of the speakers have referred to, you must remember that there is a very strong tendency at the present moment to make more and more use of these short wavelengths for commercial purposes. With regard to telephony, perhaps Mr. Shaughnessy will say something about that. At 300 metres and above, nearly every

single wavelength is allocated to some particular purpose or department, and it is not easy to sandwich in further demands, and we only put in 1,000 metres for amateurs after a certain amount of consideration. I wanted to make a few remarks about this item on the agenda, that the Wireless Society of London should be asked to point out to the Postmaster-General that subject to reasonable restrictions, etc. The point is, what are reasonable restrictions to prevent interference, and if we are to increase the number of transmitting licences, as is suggested, to amateurs and give them greater freedom of communication, it is perfectly obvious to me that we shall have to harden up the restrictions. There are a great number of amateurs, and there are a certain number of amateurs with transmitting licences who have not, I believe, very high qualifications. I do not know what proportion of them have wave meters, for instance, and know how to use them. I do not know whether the effect of such hardening up would be to increase the number of licences in the United Kingdom. I really have very little to say this time, as it was all summarised by Mr. Phillips so nicely. The reason why the 180 and 1,000 metres wavelengths were selected was because they happened to be available at the time. Every wavelength above 200 was allocated, and 180 was the next reasonable one down. As far as 1,000 was concerned, I think it was considered then that 1,000 would be clear of the 900, and it was just the wavelength between that one and the next one which was allocated to another department. I do not think there is the slightest chance of the amateurs being given any such wide permission as 250 metres and below; but it is quite a matter for negotiation, and if the Wireless Society will form a committee, as has been suggested by the President, and come to the Post Office and discuss the matter, we are most anxious to assist the amateurs and not stand in their way. But we have to consider every service, and you must remember that England is a very small place, and we are right in the thick of the most congested wireless traffic in the whole world. We cannot compare ourselves with Canada, Argentina and the United States, where there are vast expanses of country and where interference is apparently not so important as it is at home here.

Mr. F. Hope-Jones.

May I ask whether you have anything to say with regard to the spread-over of the two hours, and also whether you could tell us if the allocation of wavelengths above 200 up to 500 and 600 metres is of such a nature that it is likely to be interfered with by amateur traffic.

Captain F. Loring (General Post Office).

With regard to the last question, I am not in a position to commit myself or anybody else. It is a question for negotiation, and as the President said, if a Committee will call at the Post Office and discuss this, we can go into it. With regard to the spread-over of the two hours, we stated that an amateur should not have more than two hours because our intention was that amateurs should select two hours so that every man would get a look-in, but as a matter of fact it was found in practice that all amateurs wanted to work from

8 to 10 in the evening. I do not think the Post Office would have the slightest objection to the spread-over being over the 24 hours; all we ask is that a man shall not work for more than two hours a day, and that is because it would be to the benefit of all. I think that any suggestion made by the Society as to the period during which licensees should work would probably be agreed to. Somebody asked about call signs. We did not give call signs to receiving stations simply because there are such an enormous number of them, and as a rule a transmitting station does communicate with another transmitting station. We want to insist on any transmitting station that sends a signal shall give his own call signal so that we can pick them up and find out who they are. There are men who work for hours together without giving any call signal at all—that is not playing the game. We will play the game with you if you will play the game with us; that is what it comes to.

The President.

The resolution proposed by Mr. Phillips and seconded by Mr. Scott-Taggart is that the Wireless Society of London enter into negotiations with the Post Office with regard to wavelengths, and these other points, which Captain Loring has practically agreed the Post Office will be ready to do. That is the resolution, and I think we must include with that a vote of thanks to Captain Loring for his very lucid statement and his attendance and help here this afternoon.

The proposal was agreed to with acclamation.

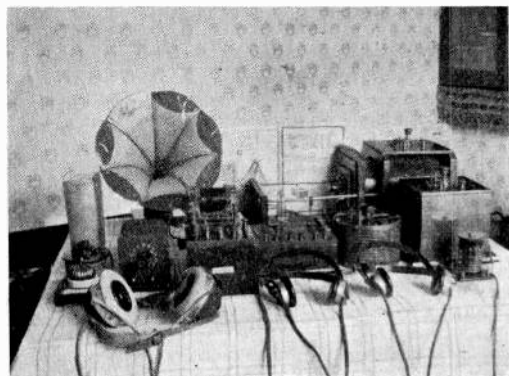
(To be concluded in next issue.)

A North London Station

The accompanying photograph shows the station of Mr. E. H. Johnson, Jr., of North London.

The different pieces of apparatus can easily be distinguished in the photograph. The valve used is a Marconi V.24, visible in the centre of the picture. A crystal of zincite-bornite combination is used at times in place of the valve for spark reception. An improvised loud speaker using a gramophone horn is seen on the left, alongside a copy of the *Year Book of Wireless Telegraphy*. The whole set is home-made with the obvious exceptions of telephones and valve.

The aerial is 60 feet long with an average height of 26 feet. Two wires are used spaced five feet apart.



Wireless Club Reports

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter in the exact form in which they are to appear and as concise as possible, the Editor reserving the right to edit and curtail the reports if necessary. The Editor will be pleased to consider for publication papers of unusual or special interest read before Societies. An Asterisk denotes affiliation with the Wireless Society of London.

The Wireless Society of London

THE Third Annual Conference of Affiliated Wireless Societies of Great Britain was held at the Institution of Electrical Engineers, London, on Wednesday, January 25th, 1922, at 2.30 p.m. Admiral of the Fleet Sir Henry B. Jackson, G.C.B., K.C.V.O., F.R.S., D.Sc., M.I.E.E., presiding. (A full Report of the Conference appears on pages 754 to 764 of this issue to be concluded in next issue.)

The Annual Dinner took place, as announced, at the Waldorf Hotel, Aldwych, on Wednesday, January 25th, 1922, at 6.45 p.m.

The Forty-fourth Ordinary General Meeting was held at the Institution of Electrical Engineers on Wednesday, January 25th, 1922, at 8 p.m., Major J. Erskine Murray in the Chair.

Major J. Erskine Murray, opening the meeting, said:—

My duty as President of this Society is to introduce to you—but I do not think he needs introduction—your new President. He has been longer associated with wireless than anyone else in this room or Society, and I need not say anything further. Admiral of the Fleet Sir Henry Jackson will now deliver his presidential address. (*Applause.*)

Mr. F. Hope-Jones.

Admiral Sir Henry Jackson, Ladies and Gentlemen: We feel that we cannot possibly allow Dr. Erskine Murray to vacate the chair without expressing to him our thanks and appreciation for his occupation of that office for the last twelve months. I therefore wish to voice what I am sure you all feel, that we could not have had a better President to follow Mr. A. A. Campbell-Swinton, F.R.S., who was President for the long period of seven years. Dr. Erskine Murray has spoken of our President-elect as having been one of the earliest connected with wireless telegraphy. Our President, who has just vacated the chair, may be included in the same category. He was one of the old guard, one of the early pioneers in wireless telegraphy and the author of the first standard work on the subject. He has been devoted to that science throughout the last twenty years or more, and has made a most excellent President. Dr. Erskine Murray, on behalf of the Society, we wish to thank you most sincerely for your occupation of the Presidential Chair during the year 1921. I happen to know that Sir Charles Bright wishes to add something to my own appreciation of your services. (*Applause.*)

Sir Charles Bright.

I have not been able to attend any of the meetings of the Society this year, but it gives me great pleasure to second the motion, because I know what an enthusiastic worker in wireless Major Erskine Murray is, and therefore I appreciate what a keen President he must have acted as during his year of office. (*Applause.*)

Admiral of the Fleet Sir Henry B. Jackson then delivered a Presidential Address. (*For full Report of the Address see next issue of "The Wireless World."*)

Professor G. W. O. Howe.

In a book entitled "An Admiral's Yarns," recently published, the author, himself an admiral, says that "Admirals are very often curious creatures, and they should be handled with great caution, like hand grenades, as you never know when they will explode." I therefore came to this meeting in some trepidation, but my fears were ill-founded, for I am sure that we have all enjoyed ourselves here to-night in listening to the masterly address of our distinguished President, Admiral Jackson. Admiral Jackson is associated in our minds with the pioneer work in this country in radio telegraphy; but we have seen to-night that he is just as familiar with the most recent developments and problems as he was with the early pioneer work in the subject, and I am sure that we have all had impressed upon us to-night how fortunate we are as a country in having Admiral Jackson as Chairman of the Radio Research Board. When such powers are appointed, a chairman is very often appointed for merely administrative reasons, his main qualification in the eyes of the Government being an absence of bias which might arise from any previous knowledge of the subject, but in Admiral Jackson we have at once a chairman of great administrative ability, with an intimate knowledge of the needs of the services and at the same time, as we have seen to-night—many of us knew it very well before—of very great ability in dealing with the technical details of the subject. Not only is the Radio Research Board to be congratulated, but I feel that the Wireless Society of London is very greatly honoured in having Admiral Jackson as its new President. (*Applause.*) I have myself greatly enjoyed listening to Admiral Jackson's explanation of these wonderful effects which make direction finding work so puzzling and so interesting, and I feel that there is a call to all wireless amateurs who have the opportunity, to take up this work, because direction finding work is work that requires a great number of observers. It is like meteorological work, it needs a large number of statistics that have to be analysed, and therefore I hope that what Admiral Jackson has said to-night may interest a number of able wireless amateurs to work along these lines and to try to get, if possible, accurate observations of these peculiar results. They are not only of great scientific interest, but of great practical interest.

There is one point that I would like to refer to in connection with the last lantern slide, where the Austin-Cohen formula was given. The exponential index in that formula was first stated to be $0.0015 D/\sqrt{\lambda}$, and then on the next line it was stated that a more recent value was $0.047 D/\sqrt{\lambda}$. The second value is thirty times the first value.

Now to me it is almost inconceivable that a later value can be thirty times the earlier value. The explanation is to be found, I think, in the units in which D and λ are expressed; if they are expressed in metres the constant will have one value, but if in kilometres it will have another value, which will be about thirty times the former value, and I think that 30 will explain the difference between 0.0015 and the 0.047.

This has just occurred to me as an explanation. I do not think that such an enormous difference can really exist between the experimental observations. I will not say any more, but I will ask Major Erskine Murray to say a few words. (*Applause.*)

Major J. Erskine Murray.

The subject of the variations observed in the determination of the direction of electromagnetic waves is of great interest to me, and has been for a long time, but I do not think I have ever heard a clearer statement of the function of a coil aerial in this respect than that given by Sir Henry Jackson. It is really a most fascinating subject and is a type of experiment we all can do. All that is required is a coil aerial and suitable amplifier. Observations of the apparent directions of various well-known stations can then be made and compared with those of other observers.

Admiral of the Fleet Sir Henry Jackson.

I have to thank both Professor Howe and Major Erskine Murray for their very kind remarks. With regard to the Austin-Cohen formula, mentioned by Professor Howe, the calculations are not my own, and I am afraid are not as detailed as they ought to be. Thank you very much, gentlemen. The meeting is now adjourned.

Sheffield and District Wireless Society.*

Hon. Secretary, Mr. L. H. Crowther, A.M.I.E.E., 156, Meadow Head, Norton Woodseats, Sheffield.

At a meeting of the Society held on the 27th inst., Mr. J. G. Jackson gave an account of "The Electron Theory."

The lecturer emphasised the necessity for every man to possess as wide a knowledge as possible of current scientific theory. Those triumphs of endeavour on account of which the human race has, indeed, cause to congratulate itself, were achieved almost entirely as a result of the labours of pure scientists.

It was shown how the electron theory, although by no means infallible, is capable of shedding much light on the mechanism of the universe. Atomic structure, metallic conduction, the formation of spectra, thermionic and photoelectric emission, and radioactivity all come within its purview.

On the 10th inst., Mr. W. G. L. Smith read a paper on "Accumulators as Applied to Wireless Work." He briefly touched on the researches of Ritter, Plante and Faure to whose labours we are indebted for the accumulator of to-day, which is rapidly becoming indispensable for many purposes.

Mr. C. Handford, B.Met., followed with a clear and graphic description of a separate heterodyne wave meter, designed and constructed by himself, which, in conjunction with a single valve produced signals as loud as those on a three-valve receiver.

A practical demonstration was given and an interesting discussion followed on both papers.

Derby Wireless Club.*

At the Annual General Meeting held at The Court, Alvaston, on January 14th, 1922, the minutes of the last Annual General Meeting held on January 4th, 1921, were read and confirmed.

The Hon. Treasurer submitted the balance sheet, showing a satisfactory balance in hand. This was approved.

The continuance of affiliation to the Wireless Society of London was approved.

The following officers were elected for the ensuing year:—

President, Mr. F. W. Shurlock, B.A.; Vice-President, Mr. T. P. Wilmshurst, M.I.E.E.; Chairman, Mr. S. G. Taylor; Hon. Secretary and Treasurer, Mr. R. Osborne; Hon. Librarian, Mr. A. T. Loeer. Committee, Messrs. E. F. Clarke, E. V. R. Martin, W. L. Bemrose, N. B. Harvey, G. L. Drury, and J. Lowe.

It was decided that meetings be held on Thursday evenings in future, at 7.30 p.m. The first and third Thursdays in each month to be devoted to lectures, the remainder to informal meetings and short papers.

Several offers to give lectures and read papers were received.

It was decided to obtain more books for the Club Library, for which purpose subscriptions were solicited from members. The Hon. Secretary and Librarian were authorised to purchase the books.

The Committee were left to draw up bye-laws with regard to collection of subscriptions from members, and the admission of new members.

The Willesden Wireless Society.*

All communications to the Hon. Secretary, Mr. F. A. Tuck, 87, Mayo Road, Willesden, London, N.W.10.

The Society met at its Headquarters on February 3rd in good strength. Mr. White in the chair. Mr. W. Corsham having resigned the chair. The Committee has been re-organised as follows:—Chairman, Mr. White; Vice-Chairman, Mr. Mann; Hon. Secretary, Mr. Tuck; Assistant Secretary, Mr. Corsham; Committee, Messrs. Dunham, Picker, Wyatt, Key and Arnoll. By the time this is in print the new society journal will have been issued, and will contain reprints of lectures, etc.: 300 copies are the first issue. A demonstration of wireless telegraphy and telephony by Captain W. R. H. Tingey is being held under our auspices at the Harlesden Public Library, and promises to be a huge success, practically all tickets have been issued and a request for a further lecture at another hall is already whispered. The lecture was by Mr. C. Dunham, of the Marconi Scientific Instrument Co., to whom we are indebted for the loan of the demonstrating instruments, upon the calibrating of long wave receivers, and was a huge success. The instruments worked very well indeed, and the lecturer explained his subject in the lucid manner we are accustomed to from Mr. Dunham, and he was accorded a very hearty vote of thanks at the conclusion of his lecture. The society met again on the 7th to hear Mr. W.

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Corsham's "Experiences during the Transatlantic Tests." In his opening speech he touched upon the general matters relating to the test, and stated that he was very pleased to read that Mr. Godley was treated here with true British hospitality by all he came in contact with on this side, and he was sure that in Mr. Godley the British amateur had a sympathetic friend. He then took us through the long night watches, unfolding before us the terrible jamming experienced by our men from spark, arc, C.W., and thoughtless amateur stations. Then on the morning of December 12th came success. IAFV with his code call YLPMV cut through the heavy static, arc, spark and QRM, and his code word was successfully logged. At the conclusion the lecturer was greeted with tremendous applause and a presentation was proposed and immediately passed. Mr. Corsham suitably replied and the meeting closed.

This Society is greatly pleased to think that the Test signals were received on "Amateur standard apparatus." Surely this is a World's record for short wave long distance receptions (authenticated) using only three valves on the P.M.G. aerial.

Bradford Wireless Society.*

Hon. Secretary, Mr. J. Bever, 85, Emm Lane, Bradford.

A meeting was held in the Club-room at 7.45 p.m. on Friday, February 10th, with Mr. W. C. Ramshaw in the chair. There was a very good attendance. The Chairman called upon Mr. N. Hammond to give his paper on "The Conversion of a Mark III Tuner to a Two-Valve Set." This paper was very well received and was of special interest to those present, as many of them have these instruments. The converted set was on view and at the conclusion of his paper, Mr. Hammond answered various questions concerning same. The lecturer was heartily thanked for his paper.

It is very gratifying to note the number of new members which our recent Exhibition has brought, and the Chairman, after their election, welcomed them in a few well-chosen words.

It is the Committee's hope that attendances will be maintained at the high standard set by this meeting.

North Middlesex Wireless Club.*

The 84th meeting of the Club was held at Shaftesbury Hall, on February 8th, Mr. A. J. Dixon taking the chair. The minutes having been read and passed, Mr. Geo. Evans was called on to give a further talk on "Kitchen Table Instrument Making."

Mr. Evans showed his audience how to make a simple drill out of a piece of steel rod, and demonstrated the method of tempering. He also gave some further demonstrations of cutting and working ebonite. He said that perhaps one of the processes which the average amateur regarded as being a bit of a mystery was lacquering brass parts of instruments. The lecturer showed that this was not really difficult if properly carried out, and having set before him the necessary utensils, Mr. Evans fixed a hand-drill to the table on two supports, and utilising the chuck to hold the parts to be lacquered, he gave a demonstration of the proper way to polish and burnish brass ready for

lacquering. He explained how to make a burnishing tool, and how to use it. Then having lit a small spirit lamp, he showed how to apply the lacquer. The process appeared simple, as, indeed, it is when the knack has been acquired. The tips given by the lecturer were exceedingly useful, and will, no doubt, be of great assistance in helping our members in acquiring that knack.

Several questions were asked by those present, to which Mr. Evans replied, and a vote of thanks proposed by Mr. Savage was heartily passed.

Particulars of the Club may be had from the Hon. Secretary, Mr. E. M. Savage, Nithsdale, Eversley Park Road, N.21.

Glasgow and District Radio Club.*

The meeting held on Wednesday, 21st December, was in the nature of a demonstration of Apparatus. The following was shown by Messrs. North British Wireless Schools, Ltd., 206, Bath Street, Glasgow, per Mr. Dewar:—

One 3-Valve Receiver, 1 Castagnoli G 5 Tuner, Super VII Receiver Panel, 2-Valve Note Magnifier, 1 Type "A" 2-Valve Receiver, 1 Brown's Loud Speaker.

Messrs. W. A. C. Smith, 236, Argyle Street, Glasgow, per Mr. Yuill, had:—

One Burndept Ultra 3 Receiver, with set of De Forest Coils, 1 Read 3-Valve Amplifier, 1 Brown Loud Speaker, 1 Single Valve Receiver (Scottish Radio Supplies).

All the foregoing apparatus was connected in turn to the Aerial, both with and without the Brown Loud Speaker, and Signals from the usual well-known Stations were audible and readable all over the room. An interesting and enjoyable evening was spent, and the meeting terminated at an unusually late hour.

Future Meetings:—

Wednesday, March 15th.—Lecture by Mr. A. F. Stevenson.

Wednesday, March 29th.—Open Night.

Wednesday, April 12th.—Lecture on "Capacity and Inductance," by Mr. M. McLennan.

Wednesday, April 26th.—Open Night.

Wednesday, May 10th.—Lecture by Mr. M. McLennan.

Wednesday, May 24th.—Open Night.

New Members are coming in steadily, and signs are not wanting that the ladies will be reinforcing us shortly. They are of course eligible for membership. We "mere men" imagine we hold the field in Amateur Wireless, but this is not the case so far as this part of Scotland is concerned.

A few subscriptions are still outstanding and the Hon. Sec. and Treasurer would be glad to hear from those members concerned, with as little further delay as possible.

Intending Members can obtain all particulars from the Hon. Sec., Robert Carlisle, 40, Walton Street, Shawlands, Glasgow, or during daytime from Mr. W. K. Dewar, 206, Bath Street, Glasgow.

Cardiff and South Wales Wireless Society.*

A general meeting was held at Headquarters, The Wireless College, St. Mary Street, Cardiff, on Thursday, 12th January, 1922, Mr. N. M. Drysdale presiding. The minutes of the past meeting were read and adopted.

The Chairman then called upon Mr. H. Russell Jones to read a paper entitled "Elementary Principles of Relay Working." The lecturer commenced by proposing that he should describe relays used in land-line working, and as Cable and Wireless Telegraphy are closely allied he thought that the description of relays in everyday use would enable one to design a relay suitable for insertion in a valve circuit. The constructional detail and principle of a relay followed, and was accompanied by sketches on the blackboard which made the lecturer's remarks quite clear. His view was that the introduction in a circuit amplified the ordinary efficiency of working to a great extent, besides providing, from an economical standpoint a great saving of battery power. He went on to say that the same principles applied when a Relay was used as a "Repeater"; the station at which the Relay is installed being known as a "Repeater Station."

Mr. Jones next described the two classes of Relays (a) Non-Polarised and (b) Polarised. The simple relay already sketched on the blackboard was the earlier type of "Siemens," and non-polarised. Owing to the electro-magnetic inertia, and heavy moving parts, this type of relay was comparatively insensitive. For high speed working a more sensitive instrument had to be devised; which was instanced in the "P.O. Standard Relay" universally used. The lecturer then dealt with the "Carpenter Relay" and terminated his lecture with the "Gulstad Relay." The principle of the "Gulstad" proved to be very intricate, and great credit is due to Mr. Jones for the clearness of his remarks and the demonstrations given. The Chairman proposed a hearty vote of thanks to Mr. Jones, which was carried with acclamation by all present.

At the meeting held on Thursday, 26th January, Mr. N. M. Drysdale occupied the chair. The minutes of the last meeting were duly confirmed. After which the Secretary dealt with the formation of a Buzzer Instructional Class. Quite a large number present signified their intention of settling down seriously to Morse Practice.

The Hon. Secretary, Mr. P. O'Sullivan, 16, Adamsdown Square, Cardiff, will be pleased to hear from gentlemen in the District who are desirous of becoming members of the Society.

Kensington Wireless Society.*

On February 2nd, the President, Capt. H. de A. Donisthorpe, gave a very interesting lecture, illustrated by numerous lantern slides, on "The Progress of Wireless in the Mercantile Marine."

Commencing with the coherer and spark coil, our lecturer gradually brought us up through the various stages of development, to the modern valve apparatus, our attention being drawn, on the way, to "Direction Finding," with which our President had a great deal of experience on war service.

At the conclusion of the lantern lecture, he successfully demonstrated the working of a very small frame aerial with a 7-valve receiver, the directional properties of such an aerial being especially marked.

A very hearty vote of thanks was accorded Capt.

Donisthorpe for his very instructive lecture and demonstration.

Next meeting, Thursday, March 2nd, at 8.30 p.m.

All enquiries regarding membership will be gladly answered by the Hon. Secretary, Mr. W. J. Henderson, 2, Hollywood Road, South Kensington, S.W.10.

Dartford and District Wireless Society.*

A very excellent and extremely interesting meeting of the above Society was held on Thursday evening, January 26th, 1922, at Dartford Grammar Schools, Mr. J. R. Smith, A.M.I.E.E., Vice-President, in the chair.

The programme arranged for the evening was a lantern lecture by Captain J. Doust, R.E., of Gravesend, the subject being "Wireless During the War."

A splendid series of slides were shown, which, with the lecturer's remarks, gave the members a very good idea of what was done by "Wireless" during the war. The kind of instruments used and the conditions under which they were used, was clearly demonstrated, the whole subject being of great interest to all present.

Hon. Sec., Mr. E. C. Deavin, 84, Hawley Road, Wilmington, Dartford.

Borough of Tynemouth Y.M.C.A. Radio and Scientific Society.*

Hon. Secretary, Mr. L. L. Sims, "Eynesbury," Cleveland Road, North Shields.

On Monday, January 23rd, Mr. R. Willis, of Armstrong College, Newcastle, lectured to the Society on "Generators." The lecture was splendidly illustrated by lantern slides and was enjoyed by the good number of members present. After a lengthy discussion a hearty vote of thanks was accorded to Mr. Willis.

At a meeting of the Society held on January 30th the Hon. Secretary was called upon to give a report of the Conference of Affiliated Societies. Various matters were then dealt with relative to the development of the Society. It was decided that the name of the Society be changed and that in future the name shall be the "Borough of Tynemouth Y.M.C.A. Radio and Scientific Society."

A library has been recently formed, and already there is a comprehensive list of books on wireless and scientific subjects at the disposal of the members.

A Sale and Exchange Section has also been formed, which it is hoped will prove of great help to the members.

The Secretary stated that he had received a letter from Mr. E. E. Triggs, of the Marconi Company, and one of the Vice-Presidents of the Society, now residing in Glasgow, enclosing a paper upon the "Thermionic Valve," which was his contribution to the syllabus of the Society.

The paper was read by the Secretary, and whilst not without our friend's usual touch of humour, the paper proved to be of great help and interest to all present.

Folkestone and District Wireless Society.*

The usual monthly meeting was held on Wednesday, February 1st, at 20, Bouverie Road West, at 7.45 p.m. A discussion was opened by Mr.

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Gothard on the "Transmission of Telephony" from the Marconi Works at Chelmsford. All members of the Society are eagerly awaiting the first transmission.

Mr. Piper demonstrated a very neat tuner of his own design.

Arrangements are being made to hold the annual dinner early in March. Members who desire to attend are requested to communicate with the Hon. Secretary, Mr. H. Alec S. Gothard, Associate I.R.E., 8, Longford Terrace, Folkestone, at their earliest convenience.

The South London Wireless and Scientific Club.

The Club held its first Ordinary General Meeting on Wednesday, January 18th, 1922, opening at 8 o'clock, when our Chairman (Captain de Villiers) called upon the Assistant Secretary (Mr. Ansell), in the absence of the Secretary (Mr. Allen), to report upon the finance of the previous year and produce the balance-sheet.

Mr. Ansell then replied with a short outline of the Club's history, stating that we were all greatly indebted to Mr. Seabrook, (Jnr.), for his work in connection with the "foundation," and further to Messrs. Allen and Stone for their services in organising, and, lastly, to Captain de Villiers for his hearty co-operation as Chairman.

The Chairman then remarked on the question of affiliation with the Wireless Society of London, stating that he hoped this would be arranged within a week or two; in reference to the Club's proposed three-valve set, which had been delayed owing to the Secretary's temporary indisposition, it was announced that this could now be proceeded with. After the election of the officers and Committee, the meeting adjourned at 10.30.

A hearty welcome is extended to all interested desiring to belong to a live association devoted to the advancement of wireless and allied subjects. Full particulars may be obtained from the Secretary, Mr. Allen, 8, Newington Causeway, S.E.1.

Plymouth Wireless and Scientific Society.

At the meeting held on Wednesday, January 11th, a demonstration was given by the Secretary of a Mark IV short wave tuner, which he has converted into a valve set with tuned reaction and crystal rectification. The wavelength range, by the use of pancake and honeycomb coils in a specially designed holder, is from 600 to 30,000 metres. Marion and Annapolis both come in quite well, and the coast stations in Morocco are quite strong on an aerial 30 feet long and 30 feet high.

At the meeting held on January 18th a lecture was given by Mr. Mitchell (the Chairman of the Society) on the Marconi Multiple Tuner and the Magnetic Detector. This proved very interesting, particularly to what I may call the "post-war" amateurs, who are all valve users and do not understand the difficulties encountered, and the search for efficiency which was necessary in the old days of the crystal receiver. The multiple tuner is certainly a fine instrument, and many were the envious glances cast at the three 0.01 mfd. condensers on the top of the instrument.

At the meeting held on January 25th, a lecture

was given by Mr. Carter on "The Evolution of Wireless Telegraphy." The lecturer dealt exhaustively from an historical standpoint, with the various systems that have been in use since the beginning of the wireless era. Hertz's experiments and their confirmation of Clark-Maxwell's predictions, the early Marconi and the Lodge-Muirhead systems with the coherer detectors, the magnetic detector, crystal rectifiers, and the balanced crystal circuit were all clearly described. An amusing touch was at this point introduced by the reading of extracts from a handbook for wireless operators published in 1901, one of the useful pieces of information offered to the operator being that he was to copy down the dots and dashes as they came in and transcribe them afterwards, as if he tried to look up their meaning right away it might cause him to miss some letters! The lecturer then described the introduction of the C.W. systems, briefly showing the principles employed in the Poulsen, Lepel and timed-spark systems of transmission, and the various methods used for reception of such signals. Altogether the lecture proved most interesting and instructive, and Mr. Carter was given a hearty vote of thanks.

On February 1st an excellent and well-thought-out paper was read to the Society by Mr. L. Currah on "The Structure of Matter." In the course of the paper the lecturer dealt with the molecular, atomic and electron theories. He stated that although the ancient Greek philosophers logically established the existence of the atom, no progress in the way of experimental proof or illustration was made until the nineteenth century. The structure of the molecule and the atom were dealt with and several striking examples given to convey some idea of their size, the mere figures given, of course, conveying no real idea at all. For many years the atom was considered as the real beginning of matter and quite homogeneous and indivisible. In the light of the electron theory, however, the atom is itself quite a complex structure, containing a positive nucleus and two or more negative electrons. The paper was eagerly followed by the members present, and a round of hearty applause showed how it had been appreciated.

As our winter programme shows that we have, in the near future, lectures on radium and radioactivity, the electron theory, and X-rays, it seems that we shall be following this fascinating subject very closely.

Full particulars and copies of the Society's rules may be obtained from the Hon. Secretary, Mr. G. H. Lock, 9, Ryder Road, Stoke, Devonport.

Radio Experimental Association (Nottingham and District).

Hon. Secretary, Mr. H. R. Cater, 22, Cranmer Street, Nottingham.

At the twelfth meeting of the re-organised Association Mr. J. Thornton (late Principal, City School of Wireless) lectured on the "Production of Electro-Magnetic Waves."

The experiments of Hertz and Marconi were outlined, comparisons being made on Marconi's first efforts. The production of high-frequency oscillations by means of condenser discharges was

fully explained. The whole lecture was most instructive and interesting.

The membership of the Association is rapidly growing, and the Hon. Secretary (H. R. Cater), 22, Cranmer Street, Nottingham, will be pleased to give any information desired by those interested.

Guildford and District Wireless Society.

The meeting of the above Society took place at the headquarters, 46A, High Street, Guildford, on Monday last, 23rd inst. At the commencement the members were engaged in Morse practice, after which Maj. Harris explained the working of batteries, both primary and secondary.

Following this a lecture was given by Mr. A. G. Walker, B.A., B.Sc., on the "Formation of Oscillatory Waves and the Propagation of Wireless Waves." The lecturer then led up to the various means of detecting these waves, including the crystal and thermionic valve rectifiers. Although the time was short, the lecturer was able to cover a good deal of ground, and the various circuits, etc., were admirably illustrated on the blackboard. At the close the Chairman (Alderman W. T. Patrick, J.P.) proposed a hearty vote of thanks to Mr. Walker, which was carried with much enthusiasm.

It is proposed to form these lectures into a series during the coming months, so all interested in wireless will be welcomed at the meetings on Monday evenings at 7 o'clock.

Hon. Secretary, Mr. F. A. Love, "Ivy Dene," Guildford Park Road, Guildford.

Smethwick Experimental Wireless Club.

Hon. Secretary, Mr. Ralph H. Parker, Radio House, Wilson Road, Smethwick, Staffs.

A very successful meeting of the above Society was held in the Botany Room of the Municipal Technical Institute on January 6th. After the minutes had been read and confirmed the Chairman (Mr. A. J. Hulme) called upon Mr. McKale to give thirty minutes' buzzer practice, which several members read admirably.

The Chairman then called upon Mr. L. Lee to give his lecture on "A Two-valve Receiver," apparatus of his own structure being exhibited. A hearty vote of thanks was accorded to Mr. Lee.

At a meeting held on Friday, January 13th, Mr. A. J. Hulme was in the chair. It had previously been decided to hold discussion evenings on alternate evenings, and the Chairman stated that this evening was arranged for discussion. Several members brought along queries, which were ably answered.

At a meeting held on Friday, January 20th, Mr. A. Adams, F.I.C., F.C.S., was in the chair. After the usual routine the Chairman called upon Mr. Sanders to give his lecture on "Electromagnetic Waves." The chairman then proposed a hearty vote of thanks to the lecturer. It was then announced that a section of the Society had been arranged for the study of X-rays, and anyone interested could obtain particulars from the Secretary.

Newark-on-Trent and District Wireless Society.

This Society continues to grow slowly but surely, both as regards membership and general usefulness

of the discussions that take place at the weekly Wednesday meetings.

There will shortly be given a series of lectures on the Elementary Principles of Wireless, by Mr. F. Maltby, B.Sc., as, owing to the number of beginners that have joined it has been thought they would prove beneficial. Endeavours are also being made to arrange for a Popular Lecture on Wireless Telephony, to be illustrated by a musical programme from a near-by station. Further particulars will be given later of this.

Several members gave a demonstration of wireless telegraphy at a local church bazaar on February 16th at Newark-on-Trent, causing some considerable interest to be aroused, and incidentally doing good for the 'amateur wireless' cause in the district.

Any persons interested in wireless are earnestly invited to become members, and full particulars can be obtained of the Hon. Secretary, Mr. Geo. T. Sindall, 6, Beech Avenue, Hawtonville, Newark-on-Trent.

Portsmouth and District Wireless Association.

During the winter session the Portsmouth Wireless Society has not been idle, and many enjoyable evenings have been spent at its Club-rooms at 49, Claremont Road. Several papers have been read and greatly appreciated by the members. On Thursday, December 22nd, Mr. Lawrence lectured on "Accumulators," in which he dealt with the care and maintenance of accumulators, the chemical actions involved and the various processes of manufacture in vogue at the present time! The lecture was profusely illustrated with lantern slides. On January 5th Mr. J. C. Harrold, Associate I.R.E., read a paper entitled "The History of Wireless Telegraphy," in which he sketched in a most interesting manner the progress of wireless telegraphy from the earliest researches of Hertz to the present day. On Thursday, February 9th, Mr. Harrold read another paper the subject of which was "The Wireless Experimenter." In the course of this most interesting paper the lecturer pointed out the wide scope possessed by the amateur for really useful research and illustrated this by drawing attention to Greenleaf Pickard's experiments with certain crystal circuits in America. He also drew attention to the little understood behaviour of iron in high-frequency circuits when used as a magnetic detector.

Many interesting lectures have been promised by members for the near future. The Secretary, Mr. R. G. H. Cole, 34, Bradford Road, Southsea, is always pleased to give full particulars of the Society to those in the district who are interested in wireless.

Cambridge and District Wireless Society.

The second meeting of the year took place in the large room of the Photographic Club, Ram Yard, on Thursday evening, January 26th, with Mr. W. S. Farren in the chair. The chairman introduced Mr. W. T. Wormell, M.A., the lecturer, for the evening, who had kindly consented to lecture on the subject "The Chemistry of Cells." Mr. Wormell dealt very thoroughly with his subject, and introduced a number of interesting

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experiments to illustrate the chemical action that takes place in various types of wet and dry cells. Experiments were also conducted to show polarisation and how it is presented in actual cells. Although the attendance was poor, those that did attend thoroughly enjoyed the meeting, and a very hearty vote of thanks was accorded the lecturer for his very interesting discourse.

The third meeting of the year, took place on Wednesday evening, February 8th, Mr. W. S. Farren being in the chair. Mr. Farren introduced Mr. E. J. E. Hubbard (Jesus College), President of the Cambridge Wireless Society, who had consented to lecture on the subject of "Relays." Mr. Hubbard first dealt with the chemical printer, made from strips of paper soaked in a solution of potassium iodide and starch, and showed that when passed between two contacts connected to the receiving apparatus the electric current caused a visible mark to show on the paper corresponding to the dot and dash sent out by the transmitting station. He next dealt with the P.O. relay and printer, the undulator, siphon recorder, Einthoven galvanometer, Siemen's and Weston relays. Mr. Hubbard then described a relay made by himself—a relay that had proved to be wonderfully sensitive and efficient. The Turner valve relay was next dealt with, followed by several useful circuits that had been found most effective for relay working. The lecture came to an end all too soon, and after Mr. Hubbard had been accorded a very hearty vote of thanks the meeting was declared informal.

Will all those who are interested in wireless communicate with the Hon. Secretary, Mr. J. J. Butterfield, 107, King Street, Cambridge, who will be pleased to furnish details of the Cambridge and District Wireless Society. New members are always welcome.

Redhill and District Y.M.C.A. Wireless Society.

An interesting evening was spent on January 25th, when Mr. C. C. Shaw, explained the standard, $1\frac{1}{2}$ kW. ships transmitting set. With the aid of diagrams he described the various apparatus used. The lecturer was thanked for his efforts and the meeting broke up after a general discussion.

On February 1st, after some business had been attended to, the Chairman was called upon to give a lecture on the action of condensers. With the aid of blackboard he explained the effects produced between two metal plates which were connected to some source of current, explaining the various ways in which the capacity could be varied, by using different dielectric, varying the distance between the plates and their area.

A discussion took place, and the lecturer then gave a description of the various ways in which condensers could be constructed. The meeting closed with thanks to the lecturer (Mr. H. G. White).

Liverpool Wireless Association.

The Liverpool Wireless Society held its third meeting of the session on Thursday, February 9th. In response to notices in the local press and *The Wireless World* over 130 amateurs attended.

Mr. Grindrod was in the chair, and opened the meeting by referring to the position of the Society in general, and its objects in the forthcoming year. Mr. James K. Wilkie, the Hon. Secretary, then said

a few words as to the objects of the meeting being to invite suggestions from anyone who had views on the conducting of Wireless Societies in general, and apologised for the published error of date. Mr. Balmer then took up the discussion, being followed by several well-known gentlemen. At the end of half-an-hour the Secretary introduced Mr. Lowey, who gave a very fine lecture, and demonstration on the Johnson-Rahbeck telephone system. The Dock Board, through Captain Mace, having given permission for music to be transmitted the meeting had the pleasure of half-an-hour's music which was remarkable for its clearness and strength being easily audible all over the room.

All this telephony was received on Mr. Lowey's set, and the highest credit is due to him for his design and building of the set.

A vote of thanks was proposed and carried amid loud applause.

The Secretary then announced that Messrs. J. H. Swift and L. Haggard and T. Burrows were elected as members. Messrs. Lowey and Grinden were elected members of the Committee. The Committee also gratefully acknowledged the gift of £5 from an anonymous donor—(loud applause).

Mr. W. R. Burne had accepted hon. membership of the Society.

About 40 prospective members had handed in forms of application for membership.

This terminated the proceedings. At the next meeting Mr. W. R. Burne will lecture on his experiences in the Transatlantic Tests.

Meetings are held second and fourth Thursdays.

Hon. Secretary, Mr. James K. Wilkie, Avondale, Knowsley Road, Cressington Park, Liverpool.

The Dewsbury and District Wireless Society.

Hon. Secretary and Treasurer, Mr. A. Horsfall, Willow Grove, 34, Lee Street, Ravensthorpe, Dewsbury.

In connection with the above recently organised Society, a General Meeting was held on January 26th, at Messrs. Johnson & Balmforth's Café, kindly placed at the disposal of the Society by Mr. C. J. Johnson.

Mr. C. J. Johnson was elected Chairman of the meeting, which was very well attended, especially in view of the very unfavourable weather conditions—the numbers exceeded all expectations.

The proceedings commenced by the election of officers, viz. :—

President, Mr. S. S. Davies. Vice-President, Mr. J. T. Foggo. Hon. Secretary and Treasurer, Mr. A. Horsfall. Committee, Messrs. C. J. Johnson, A. Spedding, W. R. Gibbings, F. Dransfield, B.Sc., and E. Reuss.

The aims and objects of the Society were next discussed and rules previously drawn up were confirmed and the following decided upon :—

Entrance Fee, 2s.

Annual subscription, 10s. over 18 years of age.

„ „ 5s. under „ „ „

„ „ 5s. if resident over 6 miles from town.

The Chairman stated that it was the intention of the Society to obtain rooms in a central position in Dewsbury and install transmitting and receiving gear for the use and instruction of members and

later to hold classes in buzzer practice, etc. At least two well-known lecturers in the District have promised to lecture to us and it is hoped that their number will be considerably augmented in the near future.

At the close of the meeting it was found that 43 members had been enrolled.

New members will be welcomed and enquiries for anyone interested will be gladly answered by the Hon. Secretary.

Bolton Wireless Society.

Hon. Sec., Mr. H. Chadwick, 9, Raimond Street, Halliwell, Bolton.

A Special General Meeting was held at 11, Oxford Street, on January 6th, 1922, Mr. Parkinson being in the Chair.

After a small alteration to the syllabus had been announced, the question of a new headquarters was discussed, and a resolution was carried that the committee have full control over this matter, a change of headquarters being very desirable.

Suggestions were made regarding a Public Exhibition and Demonstration on March 7th, and it is hoped to arouse interest by means of this.

The accounts were then presented by the Hon. Treasurer, Mr. J. Weller, and a substantial balance was reported on the half-year's running. This report was unanimously adopted.

This terminated the business and the meeting was declared closed.

A Whist Drive held on January 25th was a great success and considerably advertised the Society as well as increasing the Society's bank account.

In the meantime the committee have been negotiating for new rooms, and by courtesy of the Bolton Camera Club, these have been obtained in Bradford Buildings, Mawdsley Street, and all future meetings will be held there.

The first meeting in these rooms was held on Friday, February 3rd, when Mr. J. McLeod gave a further lecture on "Aircraft W/Telephony", and a very interesting hour was devoted to the how and why of Air Force methods, after which a vote of thanks was passed to the lecturer.

We are next to be favoured by a visit, on February 14th, of Mr. J. McKernan, Chairman of the Manchester Wireless Society, and we are looking forward to an interesting evening of "High Frequency Currents."

It is also proposed to run a Sale and Exchange of Members' apparatus, on February 21st. After an inspection of the "Collections" of one or two members it is expected that H.Q. will resemble nothing so much as an outsized "Junk Store," doing a good business.

The Society's congratulations are extended to all those gentlemen who have succeeded in gaining admittance for British amateurs to Mr. Godley's "Order of the Boiled Ham."

Will anyone interested in Wireless in this district please communicate with the Hon. Sec., who will gladly supply full particulars of the Society.

Dundee and District Amateur Wireless Society.

Through the kindness of the Dundee Education Authority the above Association has been granted the use of a room in the Morgan Academy, and

meetings are held on Tuesdays and Thursdays of each week.

A Three Valve Set has been installed for some weeks and splendid results have been received.

The meetings on Tuesday have been devoted to lectures by the various members, and on Thursday for Morse Practice, and reception on the Set.

The Three Valve Set has been constructed by Mr. R. L. Kennedy, Treasurer, and the Association is very much indebted to him for the splendid way in which he constructed it.

On Tuesday, 24th January, 1922, Mr. A. Cram lectured on a British Field Set, and in a very able manner described the various parts and also some experiences in the working of same under various conditions.

Mr. G. Petrie gave a lecture on Tuesday, 31st January, 1922, on Wave Propagation, and, commencing with the Marconi Spark Transmitter, went on to the United Wireless and Poulsen Systems. He described the various circuits to be used, and the members present enjoyed a very pleasant and interesting lecture.

Both lectures were well attended, and are being much appreciated by the members of the Association.

All interested in Wireless in Dundee and District are asked to communicate with the Secretary, Mr. R. H. B. Candow, 33, Cowgate, Dundee.

Crosby, Waterloo and District.

It is suggested that a Society be formed for wireless amateurs in the above district. Those interested are invited to communicate with Mr. S. Frith, 6, Cambridge Road, Crosby, Liverpool.

Sutton and District.

Will those interested in the formation of a Wireless Society for Sutton and District please communicate with Mr. J. A. Tully, "Elnwood Lodge," Benhill Avenue, Sutton, Surrey.

Colchester.

Mr. Sidney V. Andrews, of 10A, East Hill, Colchester, is anxious to meet others in the district interested in wireless with a view to the formation of a Club.

Amateur Licences in Great Britain.

In the House of Commons on Monday, February 13th, Sir Henry Norman put the following question to the Postmaster-General (Mr. F. G. Kellaway):—

"How many licences for wireless telegraphy have been issued to amateurs for reception and for transmission; what is the total sum received for each class of licence; and what has been the expenditure of the Post Office in respect of these licences?"

The Postmaster-General replied:—

"The number of wireless licences issued to amateurs for experiments in reception is 6,986, and in transmission 286. The annual revenue derived from the fees is at present £3,265 and £355 respectively. The annual expenditure incurred in connection with the issue of the licences and the inspection of the stations is about £5,200."

Correspondence

To the Editor of THE WIRELESS WORLD.

SIR,—In his admirable article and comments on the successful reception of American short wave low power stations, Mr. W. F. Burne omits reference to one supremely important factor: the comparative absorption during daylight of long and short waves.

Commercial radio companies must have a continuous day and night service. Their engineers are not going to pump kilowatts into the aerial if they can avoid it. At present it is necessary to cover the distance *during daylight*.

There is little difference between the day and night intensity of the longest wave American stations. What is the prospect of receiving the 200 metre amateurs during daylight?

Interesting and instructive investigation in the direction Mr. Burne suggests—improving the efficiency of receiving apparatus—can be carried out by endeavouring to receive *during daylight*, the various coast stations working on 600 metres using 5 kW and upwards, and situated 900 to 1,500 miles away, such as Gibraltar (BYW), Malta (BYY), Las Palmas (EAL), Algiers (FFA), Santander (EAS), Cadiz (EAC), Lisbon (CTV), etc. They can all be read at night in London with a crystal, but 1,000 magnifications during daylight will not find them.

Though the feat of receiving the American amateurs is commendable in every way, the actual distance covered by 1 kW in the tests is not in itself remarkable when one considers that before valves were invented and no means of amplification known, low power ship installations were frequently picked up at distances of 200 miles and more and traffic carried on, but *only at night*.

Perhaps a daylight amateur test could be arranged.

B. S. T. WALLACE.

To the Editor of THE WIRELESS WORLD.

SIR,—A considerable amount having been written with reference to tuned H.F. transformers, it might be of interest to know that I have found a fairly high transformation ratio, say 1-6, gives very much stronger signals than the usual 1-1 ratio. For example, for 600 metres I have used a transformer 2½" in diameter, with 18 turns on the primary, and 100 on the secondary. In the original amplifier, I had the tuning condenser across the primary, but found that with the above large ratios, a large amount of capacity was required to effect tuning, and in consequence, the range of the transformers was rather limited. I have found, however, that by tuning the secondary, the range of each transformer is enormously increased, using the same capacity. The signal strength is unchanged. I have not tried a condenser across each winding, but the results might be interesting.

Using one of the transformers and a two-valve note magnifier, all home-made, the Eiffel Tower music has at times been clearly audible here in Edinburgh, 6 to 12 feet from the 'phones; in fact superior to having the 'phones on, as the A.C. hum of the transmitter is very imperfectly smoothed out, and is rather disturbing in the latter case.

Altogether, the transformer amplifier is infinitely superior to the resistance amplifier, and is well worth the extra complication of tuning.

Edinburgh.

MARCUS G. SCROGGIE.

December 1st, 1921.

To the Editor of THE WIRELESS WORLD.

SIR,—You do not hear of our little Island very much owing to our being so much out of the way. However, our Island is still in the centre of the Irish Sea. We have no Wireless Club as yet, although there are several of us "carrying on" and we find *The Wireless World* most useful.

I get good sig's from most of the English and European stations on a single Valve Set, and with a 3 Stage Amplifier I get the Dutch concerts *fairly* well. The FL Speech, Singing, etc., I get splendidly.

My aerial is the normal G.P.O. 100 ft. and 45 ft. high—so I feel proud of the results I get. *But I look well to the insulation of all parts, both inside and out; this is most important.*

In re charging accumulators where there is no charging station. Before I got my present small engine and dynamo to charge my accumulators, I used to charge them with primary batteries. I used the "Fuller" battery which I rigged up from some large glass jam jars and porous cells, the zinc plates I cut out of zinc sheet. I found these do very well. Those who cannot make up their own batteries could get a set of primary cells from any of the Wireless Manufacturing Firms who advertise in *The Wireless World*.

As before mentioned, we read *The Wireless World* with the greatest interest and profit from its many sided articles and tips. Your article *re* Mr. Godley's adventures in receiving the American amateur signals was most interesting—although many of us would like to be allowed to use the same length of aerial that he used. I did not hear of anyone on our Island trying to get these signals.

Hoping for more liberty from the P.M.C. to us amateurs—and wishing yourself and *The Wireless World* all best wishes,

G. GILLMORE.

Douglas, I.O.M.

January 25th, 1922.

New Marconi City Offices

Radio House, 2/12, Wilson Street, E.C.2. is the new address of the Main Telegraph Office of Marconi's Wireless Telegraph Company, Ltd., the removal from 1a, Fenchurch Street, E.C.3. having taken effect on February 19th. The new premises will be the Company's principal office for the receipt of Marconigrams.

Mr. A. Hayter, of Seaton Junction, Colyton, Devon, is anxious to be put in touch with the Secretary of the nearest Wireless Society.

Questions and Answers

NOTE.—This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules.—(1) Each question should be numbered and written on a separate sheet on one side of the paper only. (2) Queries should be clear and concise. (3) Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before. (4) The Editor cannot undertake to reply to queries by post. (5) All queries must be accompanied by the full name and address of the sender, which is for reference, not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (6) Readers desirous of knowing the conditions of service, etc., for wireless operators will save time by writing direct to the various firms employing operators. (7) Four questions is the maximum which will be accepted at a time.

E.R.M. (Wimbledon) has (1) Three interval transformers which, unless connected a certain way round give a natural wave of 600 metres instead of 1,000 metres. He asks for an explanation. (2) He also has a $\frac{1}{4}$ H.P. motor generator, which gives induction troubles, and asks if we recommend smoothed out A.C. (3) For a diagram of a two-valve transmitter.

(1) We cannot give any certain explanation without an examination of the set, but it appears that either the coils are wrongly wound, or more likely when you reverse the sign of the reaction you no longer get the reaction you desire, but in its place either a capacity reaction pronounced at short wavelengths, or a reaction effect between the different transformers.

(2) Rectified A.C. will be satisfactory for transmission, but not for reception.

(3) See diagram Fig. 1.

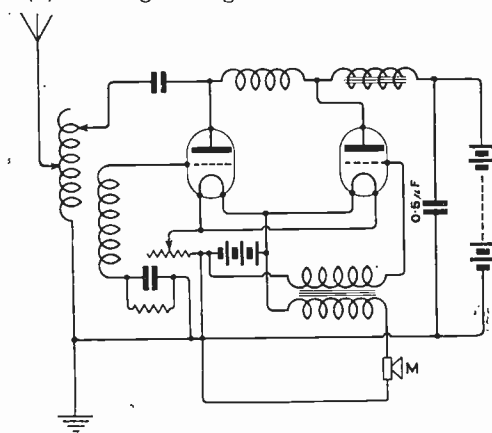


Fig. 1.

J.F.A. (Baldonnell) asks for criticism of a circuit, and for dimensions of the parts.

The circuit submitted is quite correct, and should give good results. Potentiometers to the H.F. valves would improve it, and you may find it advantageous to reduce the grid condenser somewhat. Short wave coil 8" x 6", of No. 22, without a parallel condenser. Additional coil for long waves, about the same size, wound with No. 26. Determine reaction by experiment—say using basket coils of about 1,000 mhs, closely coupled together.

A.N.G. (Stockport) asks for a two-valve circuit on the lines of his present one-valve set, not specifying the type of set desired.

Fig. 2 is about the simplest type.

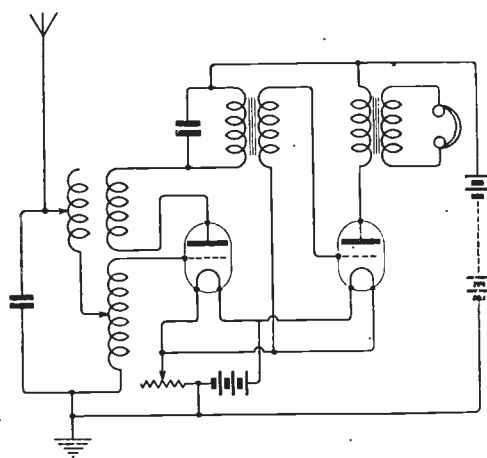


Fig. 2.

H.F.H. (Higham Park) sends a valve diagram for criticism and also asks questions about the circuit.

(1) Correct diagram is as in Fig. 3. Maximum

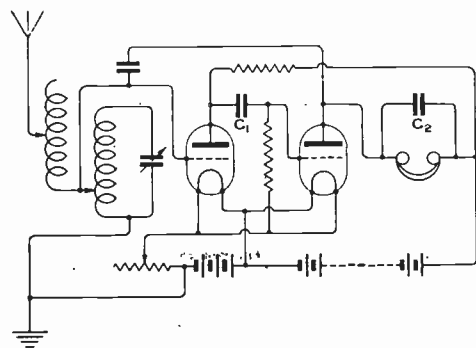
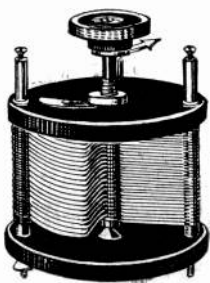


Fig. 3.



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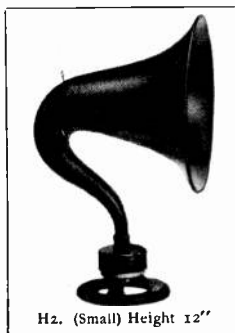
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4 " 66 "	...	1	12	0
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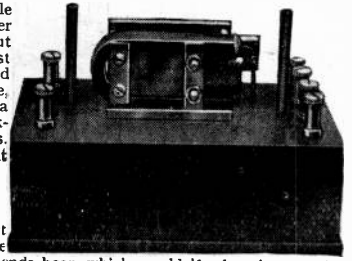
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This Amplifier magnifies signals, or music, without distortion, and is of considerable interest to amateurs and scientific investigators. The Magnification is much greater than that obtained from two valves, and the current consumption is about 50 milliamps. In construction, this instrument is simple, and it is much more robust than other sensitive relays of this class. This instrument satisfies the urgent demand for a reliable, inexpensive amplifier, which the most inexperienced amateur can use, and which the most experienced requires. It is much cheaper, ultimately, than a multi-valve amplifier, and the operator is relieved from many of the varied causes of breakdown. It includes a transformer suitable for low resistance telephones or loud speakers. The price of the "Brown" Microphone Amplifier is £6 for low resistance (120 ohms) input and £8 2s. 6d. for high resistance (2,000 ohms) input.



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With an Amplifier signals or telephony may be so magnified as to cause discomfort to wearers of head-phones, yet not be loud enough to be audible at any appreciable distance from the head. Every wireless experimenter sometimes wishes to let his friends hear, which would involve the use of several pairs of telephones simultaneously with consequent loss of signal strength, as well as considerable expense. The "Brown" Loud Speaker was designed to meet this need efficiently and economically, and is used in all up-to-date receiving stations. The sound is intensified by means of a horn.

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Panel Type, range 800 to 18,000 metres, H.F. Coupling, on 1st Valve, 2nd Valve Rectifying, 3rd Note magnifier,
2 Variable Condensers, 3 Fil. Res., Coil Holders and "Plug In" Coils—tested before despatch .. 175/-
Full Set of Parts for the above .. 125/-

3 Plate Vernier Condenser for remounting .. 4/6
5 Plate Skeleton Condenser for remounting .. 8/-
Grid Leak and Condenser for remounting .. 3/6
Fil. Res. and Valve Holder on Ebonite .. 6/8
2 Fil. Res. and 3 Valve Holders on ebonite panel .. 10/8
H.F. Coupling Unit—Universal Range .. 12/6
Ebonite Fil. Res.: Bobbins, 1/-; Fil. Res. Scrolls .. 9d.
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Set of 7 Ivorine Tabs—shaped and pierced .. 2/3
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"Keystone" Slab Inductances, Set of 8 .. 12/6
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MARCH 4, 1922.

xiv

Please mention the Wireless World

QUESTIONS AND ANSWERS

wavelength will be about 9,000 ms. A should be 0.0005 mfd. B should be 0.0015 mfd. Grid leak 2 megohms. Anode resistance 50,000 ohms. For the condensers use 2.5 mil. mica, and copper foils of about 8 sq. cms. area. Use 2 foils for the small condenser, and 4 for the larger.

H.B. (Lincoln).—(1) With the condenser you propose to use, coil may be 8" × 4", wound with No. 26.

(2) See diagram, Fig. 4. The addition of a reaction coil in the usual manner would considerably improve the set.

(3) 2,000 ohms telephones may be used.

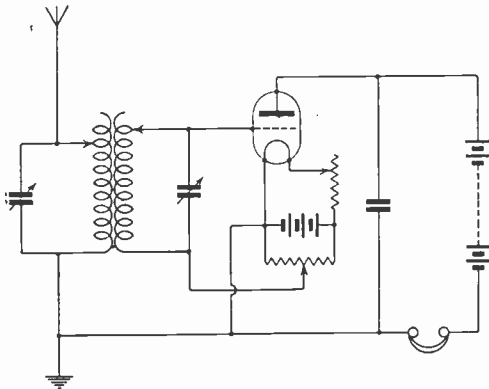


Fig. 4.

J.G.M. (Manchester) asks (1) For criticism of a circuit, sketched. (2) If results will be good with an outdoor aerial. (3) How to add a reaction coil. (4) Approximate range with an A.T.I. 12" × 4", wound with No. 26.

(1), (2) and (3) Circuit shown is bad in many ways. The circuit we give in Fig. 5 corrects these errors and, while possessing no particular merits,

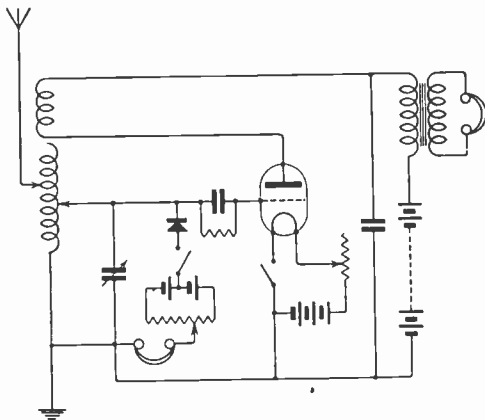


Fig. 5.

is about the only thing that can be done on the lines you suggest.

(4) About 4,000 metres.

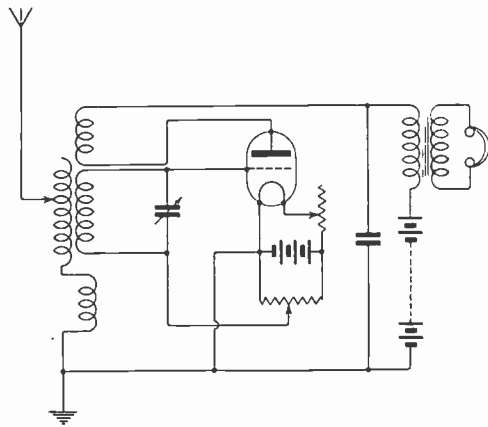


Fig. 6.

E.C.L.G. (Birmingham) asks (1) If a single-wire aerial will be efficient for PCGG. (2) For a good single-valve circuit.

(1) Yes, with a suitable circuit.

(2) See Fig. 6; but you will require more than one valve to receive PCGG properly at your distance.

W.D.C. (King's Lynn) has a loose coupler with fixed coils, tapped at every 20 turns, which he wishes to use for A.T.I. and reaction. He asks how to get more continuous variation of reaction without re-winding the coils.

Such a coupler is unsuitable for the purpose. For this continuous variation of reaction is almost essential. If mechanically possible you might add a slider to the reaction coil, or failing that, use a small spherical in series with the reaction coil, and coupling with the A.T.I.

J.D. (Cambridge) has a 3-valve set—1 rectifying, 2 L.F., which he wishes to adapt for Morse recording. He asks (1) What instruments will be required. (2) Where they can be obtained. (3) How to connect them up.

(1) You will require a Morse inker, a P.O. or other sensitive relay, and preferably an additional valve with a potentiometer for final rectification.

(2) From any maker of telegraphic instruments, for which consult an electrical trades directory.

(3) Arrange the input to the final valve through an iron cored transformer, put the relay windings, in series, in the plate circuit of the valve, and use the relay to close a local circuit for the inker. Use a local battery of about 20 volts (dry cells will do) for the inker circuit.

R.W.H. (Southampton) asks (1) Whether No. 44 copper wire will be as efficient as No. 40 for an H.F. transformer. (2) If No. 36 is suitable. (3) The probable efficiency of a former 1½" in diameter with grooves spaced ⅜" to ½" apart. (4) A question about an experimental former.

(1) Probably.

(2) Suitable for short waves, but too much wire would be required for long wavelengths.

(3) Quite good.

(4) Certainly, but you will not require such deep grooves.

C.J. (Weymouth) is using basket coils of No. 44 wire, and asks (1) Why he gets poor results. (2) The finest wire it is practicable to use. (3) The best relative proportions for the A.T.I. and reaction coil. (4) The best and the simplest ways of adding another valve to his circuit.

(1) Wire much too fine, also possibly reaction the wrong way round.

(2) About No. 30 for the A.T.I., and No. 36 for the reaction coil.

(3) There is no fixed value, it varies with different types of set, wavelengths, etc.

(4) Simplest, as an L.F. transformer coupled amplifier; best, as an H.F. amplifier, preferably transformer coupled for short to medium wavelengths.

"2KF" (Preston) is troubled with crackling noises on amplifier reception, and asks the reason (2) Asks for a circuit for short range buzzer reception.

(1) From the symptoms given, this appears to be due either to atmospherics (which are not likely to be very troublesome on a short aerial at short wavelengths, but might be bad at longer waves), or induction from neighbouring power mains. You can decide between these causes by noting whether the strength of the interference varies with the weather and season of the year. Atmospherics are worse in thundery weather, also in the summer than in the rest of the year. There is also a diurnal maximum after sunset.

(2) See figure 7 below.

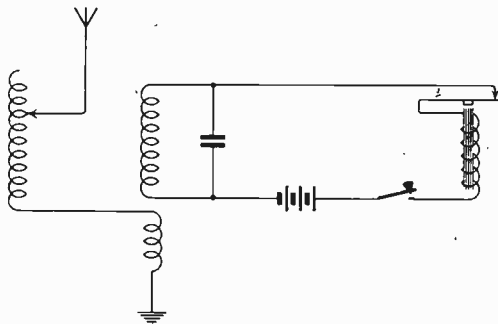


Fig. 7.

"W.11" (Tunbridge Wells) asks (1) Whether certain windings will be O.K. for a 3,000 ms. set. (2) Windings for H.F. transformers for certain wavelengths. (3) Windings for L.F. transformers. (4) Or if a resistance amplifier is better. (5) If a variometer is a satisfactory substitute for a variable A.T.C.

(1) O.K., except for A.T.I., which if of No. 20 should be about 7" x 10".

(2) See constructional article in progress.

(3) 1 oz. and 3 oz. of No. 44, on an iron wire-core about 1/3" diameter and 4" long.

(4) Both give good results; for reliability

and ease of manipulation we prefer the transformer.

(5) Yes, for short and medium wavelengths, but not for long waves.

H.A.M. (Leatherhead).—(1) We are afraid it is impossible to predict the dimensions of a frame to tune all stations with the same values of loading coil and condenser as required for a P.M.G.; in fact we do not think any frame could exist which would have complete equivalence in this way.

(2) A valve in which the filament has touched the grid might possibly be used as a 2-electrode valve, but would not give good results if the contact were of an intermittent nature.

(3) See curves given in an article, October, 1919, W.W., for approximate results.

(4) The station heard may possibly have been F.L., which has been carrying out telephony work lately.

R.W.B. (New Malden) asks (1) If resistance amplifiers will operate without grid leaks. (2) If 900 metres is too low for efficient reception on resistance amplifiers. (3) How to couple a separate heterodyne to a resistance coupled amplifier. (4) Wavelength and power of Leafield.

(1) No, unless the condensers themselves are somewhat leaky, in which case sufficient leak may often be obtained without the provision of an external leak, but this is an inefficient substitute.

(2) Rather low, but they will give some results.

(3) Connect a coil in the grid circuit of the first valve, to couple directly into the heterodyne.

(4) 250 kW arc in duplicate, normal wavelength 8,650 ms.

S.K.F. (Fence Houses).—(1) The reason for poor results at short waves is probably due to very poor amplification of the resistance coupled valve at such wavelengths.

(2) We do not think you will succeed in getting PCGG without accumulators, as the hum will be too bad from the A.C. mains. The circuit you suggest is probably as good as most for the attempt, except that we do not like the tuned reaction.

(3) Results could probably be improved in this way.

A.H.S. (Leytonstone).—We should recommend you either to dispose of the Mark III tuner and to make or buy an entirely new set, or else to dismantle it and use the parts for the construction of a new set. You will find many new circuits in recent numbers of this magazine. Your aerial is rather low for good results with a crystal, but should be fairly good with a single valve, and quite good if you use a little amplification.

"BRAMLEY" (Leeds).—We do not think that the device you describe has been used before. It will fulfil the required purpose if carefully made, but will be expensive in manufacture, and is liable to give trouble unless very accurately made owing to the number of brush contacts. You will probably find some difficulty in fixing the insulating segment sufficiently firmly to the arm OA.

(3) Not of general interest at the present time.

D.M.B. (Filey).—The howls you hear when listening to telephony are not due to oscillation of your own set, but to beating between other

1896 to 1921

The Experience
of twenty-five
years is embodied
in present-day

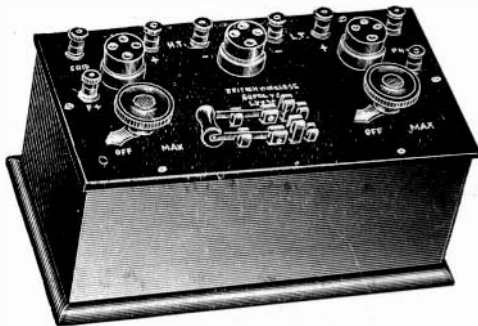
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QUESTIONS AND ANSWERS

external oscillations and the carrier wave of the telephony.

(2) We are afraid we are unable to identify this station.

(3) It is very exceptional for a bare wire aerial to lose 20 per cent. of its efficiency in a month. We should expect an average loss in this way of about 5 per cent. per annum.

(4) To obtain unspun silk in small quantities write to dealers in scientific apparatus, or try keeping silkworms!

"LAL" (Cardiff).—According to the simple theory you submit, the spark frequency should be 120 and not 240 as you suggest. Your error is due to a mistaken idea of the nature of the secondary transformer current, which is not discontinuous in the way you suggest. The correct curve for this quantity will be approximately obtained by changing the sign of the ordinate in the sections between 90° and 180°, and also between 270° and 360°. See also any text book on A.C. working.

R.W. (Knaphill) describes a crystal set, and asks for criticism and information.

The set is O.K., but owing to the small number of spark stations now working, we doubt whether it will be worth the trouble which its construction will involve. For a wavelength of 3,000 ms., with 0.0005 mfd. for the secondary condenser. Make A.T.I. 5" × 10" of No. 26, and secondary inductance 4" × 8", also of No. 26. Blocking condenser across telephones 0.0015 mfd.

"ALPHA" (London) sends a single valve diagram, with the valve in a circuit coupled to the aerial, and with tuned grid and plate circuits. He asks for criticism, and for condenser constructional details.

A good circuit, very selective, and sensitive, but rather difficult for a beginner to handle. Proportions correct except that anode inductances L and O might be lumped together, as they only total about 17,000 mhs. Res. M in anode circuit may be omitted. If used it should have 0.001 mfd. across it. Aerial circuit max. wavelength 3,500 ms. Closed circuit 4,300 ms. Anode circuit with 0.0005 mfd.—5,000 ms. You should get English telephony; PCGG is doubtful.

(2) Yes, in both cases.

(3) If the L.R. winding is suitable the coil may be used as a telephone transformer, but it will probably be necessary to rewind this winding.

G.B. (Kidderminster) has a 2-valve set which he wishes to make more efficient.

(1) If the A.T.I. and the reaction coil are properly proportioned the set should be quite efficient.

(2) Connect the blocking condenser across the telephones as well as the H.T. battery.

(3) If the anode condenser is about 0.0005 mfd. the set should be suitable for a very wide range.

(4) No great advantage in this.

R.S.W. (Portland) asks (1) gauge of a sample of wire. (2) Proper way to fix stranded wire aerial at free end. (3) Best way to lead in a twin aerial.

(4) Probable results with a certain advertised set.

(1) 7/22 enamelled.

(2) No special method; fix as for a special wire.

(3) Do not use the cable suggested. Join ends near the aerial, and lead down with single similar cable from this point.

(4) Good results should be obtained if the circuits are fairly well proportioned, which we are unable to tell you.

J.A.M. (London) has a 50 watt D.C. trench set, the range of which he wishes to increase to receive PCGG.

This is only a crystal set, and is useless for the purpose. For Dutch telephony at least two valves are required. The best plan will be to dismantle the set and use the parts for a new set of better design.

"MAGNETIC REACTION" (London) asks various questions about an A.T.I. and reaction coil.

A unit made as described is almost useless. It can only be efficiently wound for a short overall wavelength, such as 400-1,000 ms., or say 3,000-5,000 ms. with finer wire. We should advise you to experiment with basket coils. Coils suggested will have very poor tuning. Direction of winding for either coil is immaterial.

Correct sense of connection for the reaction may be found by experiment.

F.R.H. (Barnwood) asks (1) and (2) Particulars of telephone transformers for Sullivan 120 ohm telephones. (3) Gauge and quantity of wire for winding a set of 8 slab coils. (4) Particulars of coils to receive telephony in a 2-valve set.

(1) and (2) Wind primary with 3 oz. of No. 44, and secondary with 6 oz. of No. 30, on a ½" soft iron core, 3" long.

(3) We have no particulars of the windings of the coils advertised, and are afraid that the design of a set of this nature is outside the scope of these columns. You will find it nearly as cheap to buy coils of this type as to make them.

(4) We cannot give the required particulars without a statement of the required wavelength.

E.J.B. (Burton-on-Trent) asks questions with regard to attic aerials.

It is not necessary to open the window when using an attic aerial. There is no need to try to get as much wire as possible under the roof. Run a few wires in parallel spaced as far apart as possible, and do not bend them back on themselves. The results will not be as good as with an outside aerial, and probably little better than a well designed frame a few feet square.

W.R.I. (Falmouth) has a single valve panel with tuning circuit and asks (1) If connections are correct. (2) If he will hear PCGG. (3) Capacity of aerial condenser. (4) If formers shown in a cut are useful for A.T.I. and reaction.

(1) Yes.

(2) No, at least three valves will be required.

(3) 0.0005—0.001 mfd.

(4) We do not think highly of formers of this type; see reply to "MAGNETIC REACTION" above.

"BEGINNER" (Crossmyloof) asks (1) How to convert a crystal set to a single valve set. (2) If PCGG will be heard. (3) What would be the range of the set. (4) If a potentiometer is quite satisfactory.

(1) Arrange the apparatus as in the diagram, Fig. 8.

(2) Probably two valves will be required.

(3) You would hear a good number of European stations, and with careful adjustment a few

Americans under favourable conditions.

(4) Quite satisfactory, when used as a potential divider.

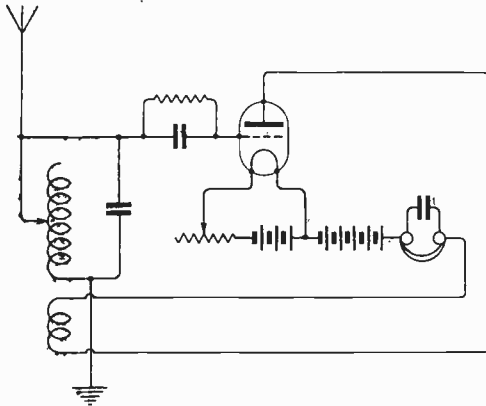


Fig. 8.

“NOTE MAGNIFICATION” (Worksop).—The two-valve L.F. amplifier circuit is correct. There is no need for the condenser across the telephones. You may use the same batteries for both sets.

(—) (Basingstoke) has a crystal set on which he can only receive Paris and Horsea. He asks (1) Why this is. (2) How to improve the set.

(1) You should be able to hear ships with the existing apparatus, otherwise there are now very few spark stations which can be heard on a crystal. Do not use L.R. telephones without a transformer. For transformer see reply to F.R.H. (Barnwood). Improve the earth by connecting to a water pipe.

(2) You might try making the school receiving set described September 17th to October 29th issues.

A.V.D. (Goodmayes).—The No. 2 coil will give the best results on a single wire aerial 100' long. Do not use L.R. telephones without a telephone transformer.

J.B. (Clacton) cannot get telephony and C.W. on a Mark III S.W. tuner and Mark IV amplifier.

The wavelength range of this set is below that of most C.W. stations, and the set is not sufficiently sensitive for good results on telephony. We should recommend dismantling and making up a better set with the parts, increasing the inductance of the windings to give a more useful range. We regret that we do not possess the desired information about the M39 tuner.

A.S. (Wigan) has a crystal set to which he proposes to add a valve as L.F. magnifier. He asks various questions.

(1) The set as at present might receive FL, but not PCGG.

(2) The inductance is suitable for 3,000 ms.

(3) The circuit is suitable for the addition of a L.F. valve, but you would get better results from an H.F. valve with reaction.

(4) Yes, the inductance would be about 6,000 mhys. The wire is No. 28 D.C.C.

R.S.C. (Lancaster Gate) asks for a winding for a single valve set.

For a maximum of 5,000 ms. make the A.T.I. 5" in diameter, and 10" long, wound full of No. 22. For reaction coil, former 4" x 8", wound with No. 28 wire.

P.C. (Watford) is making a single valve set and asks (1) If a 5-plate 0.0001 mfd. variable condenser is suitable for an A.T.C. (2) If 120 ohms telephones will do.

(1) This is rather a small capacity, but it may be used.

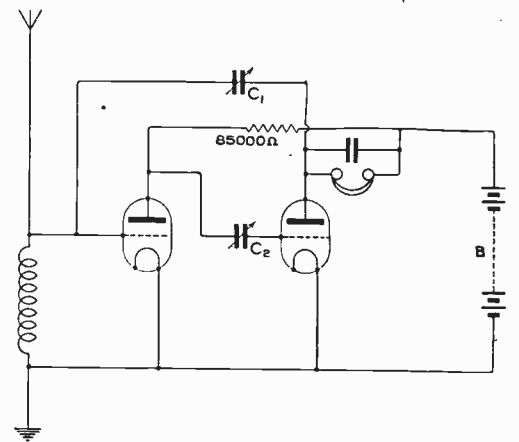
(2) Yes, if a telephone transformer is used. Unless very carefully designed, any forms of banked coils are dangerous for short waves, as their natural wavelength may coincide with the wavelength to be received, in which case reception will be very poor.

2.L.R. (Brighton).—The sample of wire is No. 36. This is not fine enough for winding 4,000 ohm telephones. Frame aerials are quite unsuitable for crystal sets.

CORRECTION.

“Receiving Circuits,” by Crispin C. Redshaw, Associate I.R.E.

The circuit diagram, Fig. 12 in the article published under the above heading in our last issue (Feb. 18th) should have been reproduced as follows:—



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Prices as we go to press, Feb. 24th, are:—

Marconi Ordinary	£1 15 0
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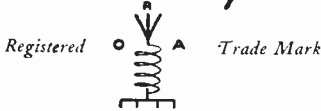
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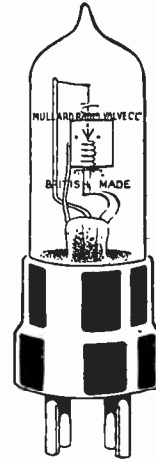
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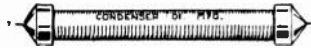


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24	2 8	3 0	5 2	7 0	2 5
26	3 1	3 6	6 3	7 9	2 10
28	3 9	4 2	6 7	8 1	3 2
30	4 8	5 2	7 4	9 1	3 6
32	5 6	7 0	8 9	11 6	3 10
34	6 6	7 9	10 4	12 7	4 2
36	8 3	9 8	12 7	14 4	4 6
38	10 9	12 7	14 2	17 8	5 1
40	14 6	17 6	17 2	21 3	6 3
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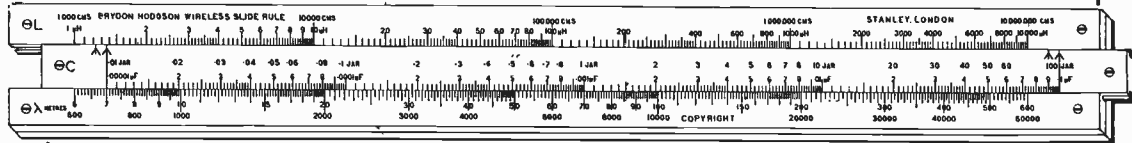
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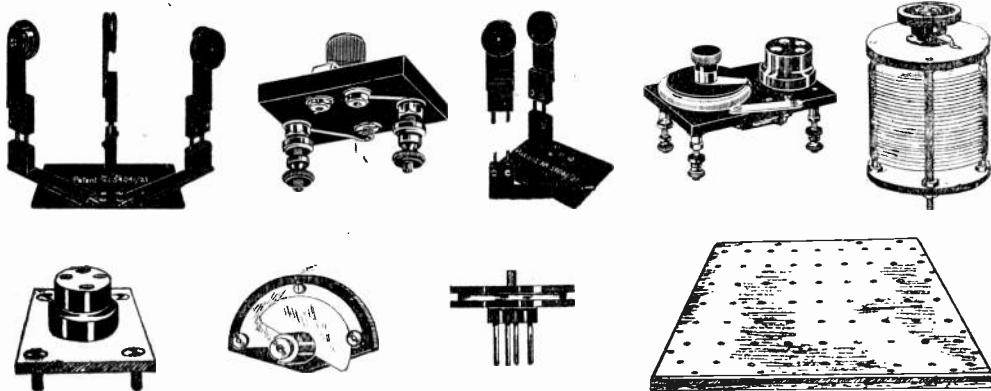
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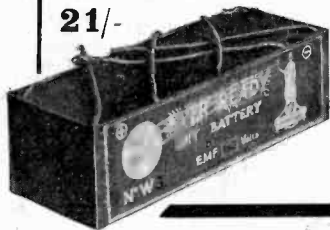
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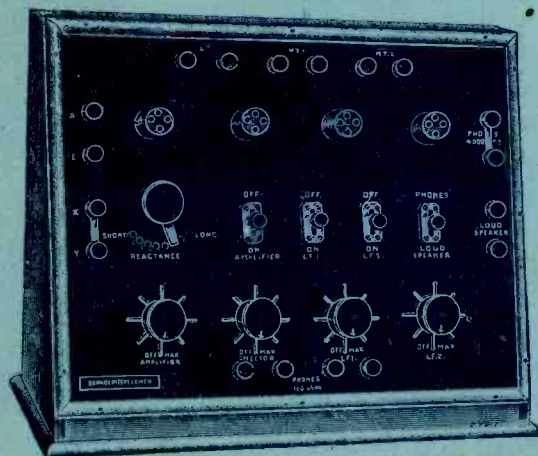
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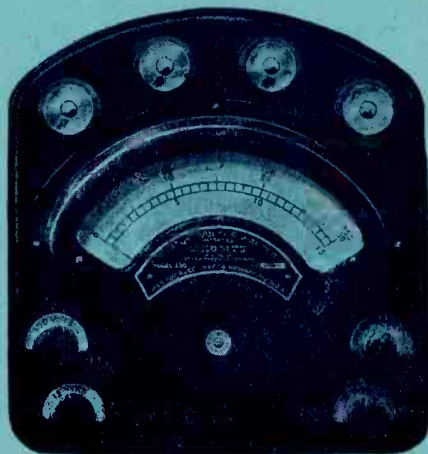
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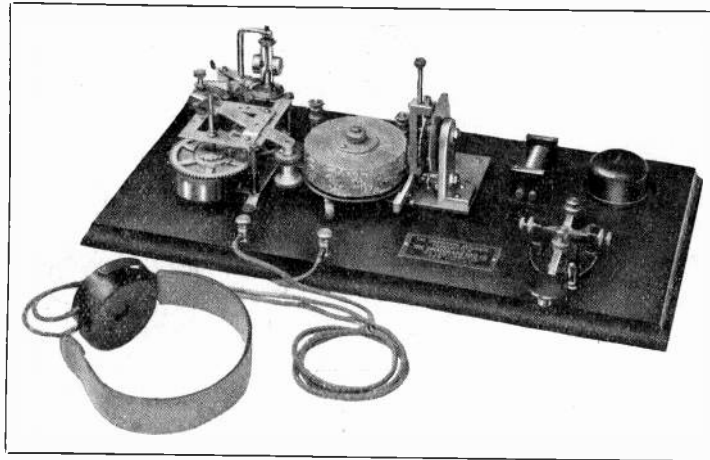
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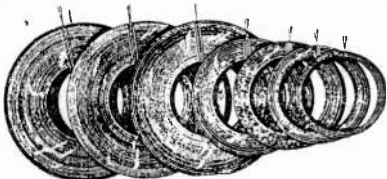
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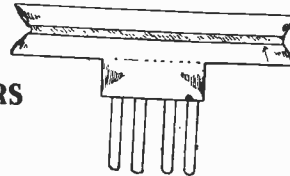
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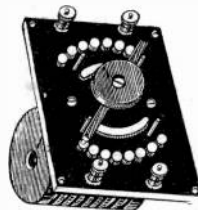
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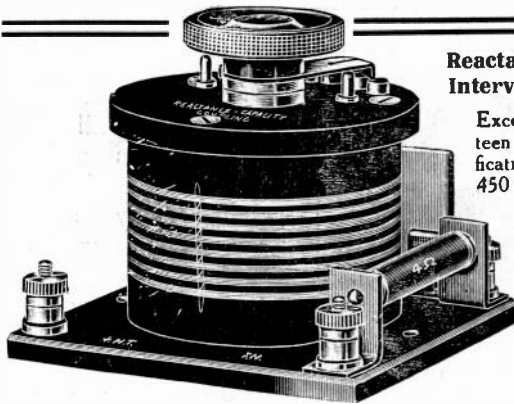
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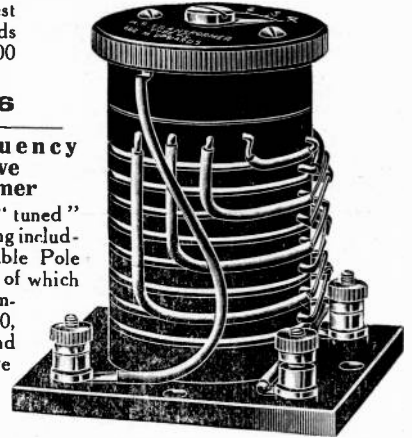
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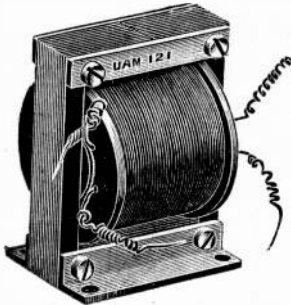
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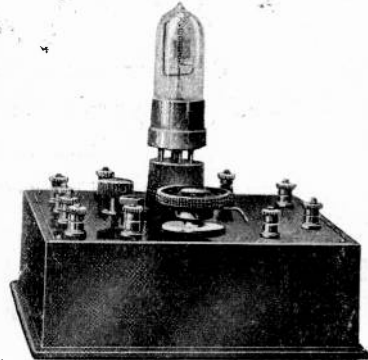
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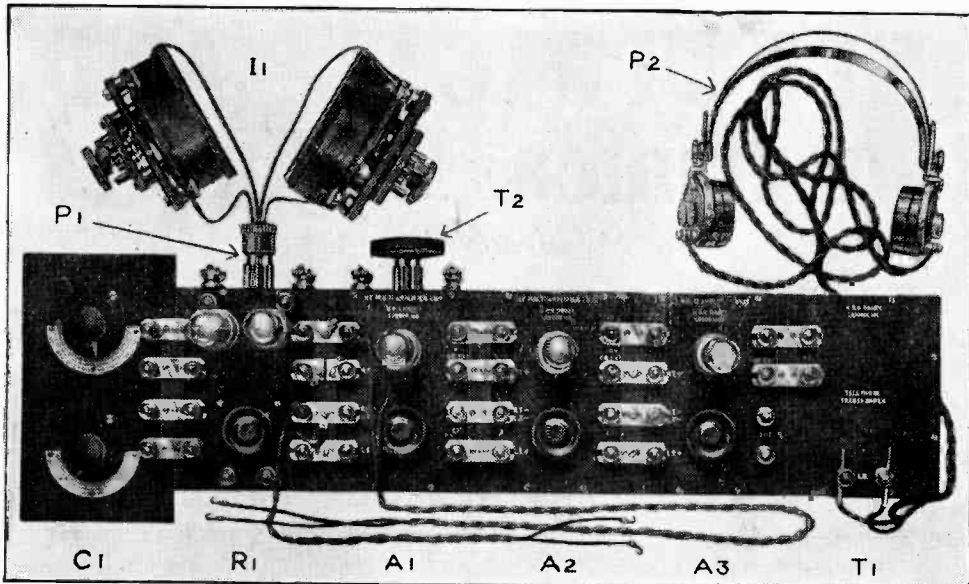
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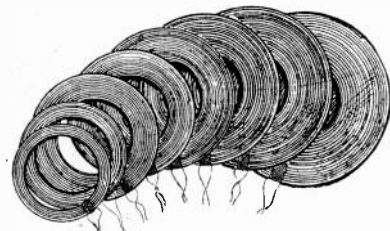
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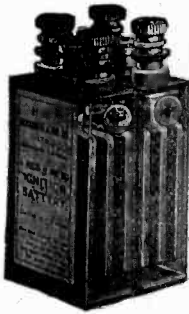
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MARCH 18TH, 1922

FORTNIGHTLY

High Frequency Transformer Amplifier.

(Concluded from p. 512.)

IN the earlier sections of this article, published in *The Wireless World* for October 15th and 29th, and November 12th, 1921, the general principles underlying the action of a high-frequency amplifier were outlined. It remains to be shown how these principles can be applied to practical work, and the construction of a high-frequency amplifier. The space available for the conclusion of this description will not permit of an exhaustive treatment of the subject, with the inclusion of detailed working drawings for building either a number of instruments, or an amplifier that is

suitable for use over a large range of wavelengths; but as an example to illustrate the method of constructing such apparatus, details will be given of a three-valve set, consisting of two high-frequency and one detecting valve, with the necessary inter-valve transformers suitable for a wavelength of about 1,000 metres—thus rendering the apparatus suitable for the reception of amateur 1,000 metre transmissions, 900 metre telephonic transmissions to and from aircraft, and the Dutch concerts on 1,070 metres wavelength. With slight alteration, such as a small reduction in the number of turns

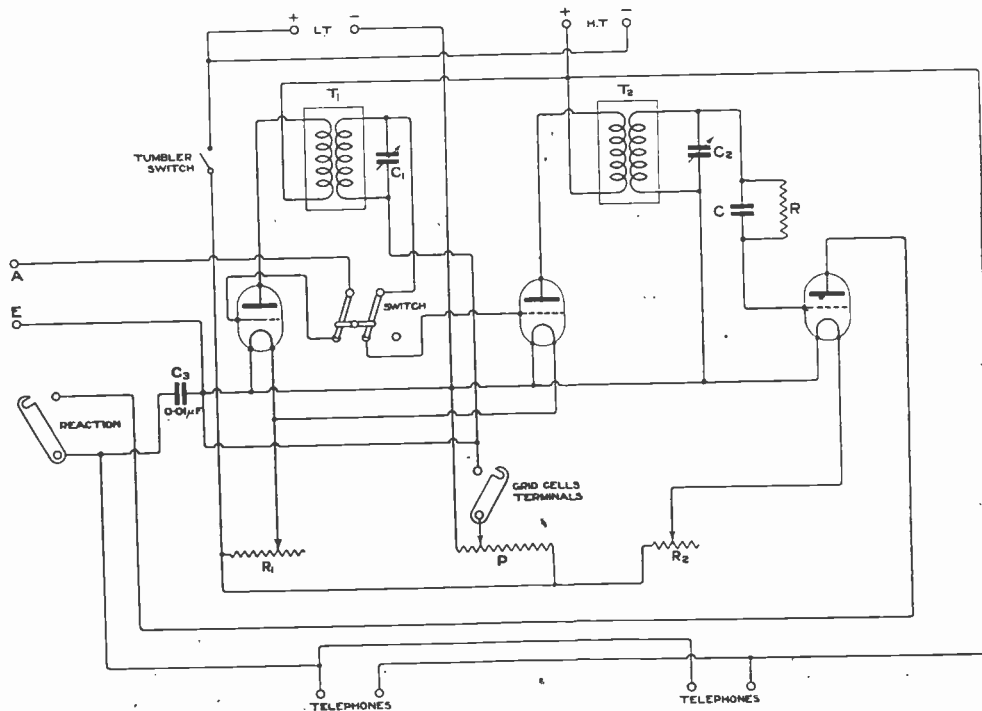


Fig. 6. Connection scheme for 3-valve H.F. Amplifier.

on the transformer windings, the instrument can be adapted to the reception of the telephonic transmissions from Chelmsford sent on 700 metres.

The general connection scheme for such an instrument is given in Fig. 6, from which it will be noted that provision is made for a change-over switch for enabling either one or two high-frequency valves to be employed at will, that terminals are provided for connecting in a reaction coil in the plate circuit of the detector valve, and that separate filament regulators are fitted for the high-frequency and detecting valves. This last feature is particularly important to secure good operation of the set, since it is desirable to use different valves for high-frequency amplification, and for detection.

will fall off fairly rapidly on each side of the maximum, as has already been indicated in the first instalment of this article (*The Wireless World*, October 15th, 1921, p. 448). When the condensers are used the point of maximum amplification can be shifted over a band of wavelengths of about 200 metres or so, beyond which values the amplification will fall off in each direction. The utility of the instrument can be much increased by this means. When the point of maximum amplification is adjusted in this manner so as to coincide with the wavelength of the signals to be received, there is, of course, a gain in selectivity, since signals on other wavelengths will not be amplified to the same extent.

A simple way of constructing the high-frequency

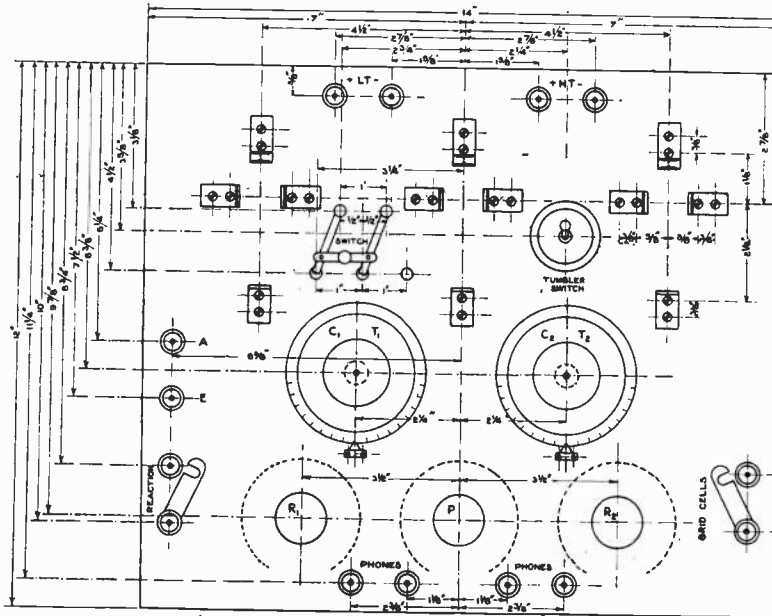


Fig. 7. Layout for front panel of Amplifier.

A suggested scheme for the layout of the panel on which all the parts are mounted with the leading dimensions, is given in Fig. 7. This ebonite panel, size 14" x 12" x 3/8" thick, can either be made to form the top of the instrument, or preferably can be fitted vertically, or sloping slightly backwards, forming the front of the apparatus, Fig. 8. This latter construction is convenient for either mounting of the set on the wall, or for standing it on the table.

It will be noted from the circuit diagram given in Fig. 6, that tuning condensers are shown across one winding of each of the interval transformers. The use of these condensers enables the point of maximum amplification to be shifted over a narrow band of wavelengths. If these condensers are not used, the windings of each transformer must be adjusted accurately to the wavelength for which the instrument is to be used, and the amplification

interval transformers for wavelengths of about 1,000 metres, is to wind them in the form of two superimposed single-layer solenoid windings on a former of suitable dimensions, with the necessary insulation between the two windings. Since a considerable portion of the total energy handled by the transformer is passed on to the secondary winding by reason of the electrostatic capacity between them, especially when the coupling between the two windings is a close one, the comparatively large capacity existing between two such single layer windings as the above is helpful rather than a disadvantage. It has also an effect upon the natural wavelength of the transformer, and hence changes made in the spacing between the two layers of wire will alter the wavelength at which maximum amplification takes place. It is therefore impossible to give winding details which, if followed carefully, will, without question, give any desired

HIGH FREQUENCY TRANSFORMER AMPLIFIER

wavelength for maximum amplification and the final adjustment of the optimum point must be made experimentally.

The cylindrical ebonite cases used to enclose the

formers for the windings and to contain the condenser. Alternatively, of course, ebonite tubing of similar dimensions can be employed for this purpose. These dimensions are given in Fig. 9,

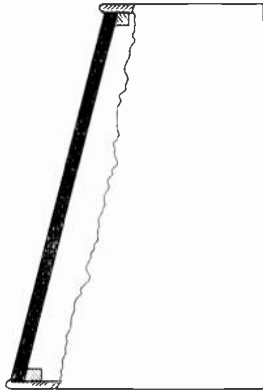


Fig. 8. Side elevation of Apparatus.

two fine-tuning condensers shown in Fig. 7, may conveniently be used as supports for the coil windings if the condensers are fitted with cases longer than merely necessary to enclose the condenser itself. For the tuning condensers, either

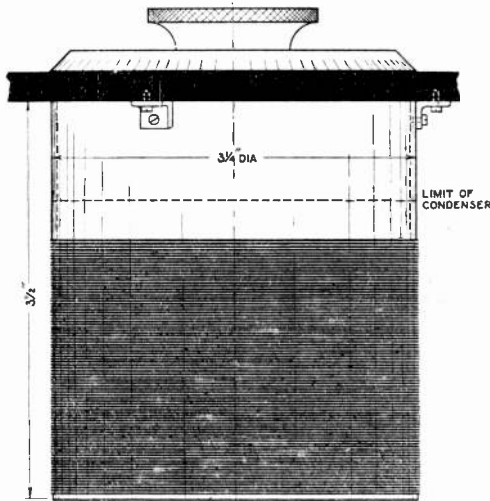


Fig. 9. Arrangement of Condenser Case and Transformer Windings

those of the well-known Service pattern of the type used in the Mark III Tuner and other instruments may be obtained, and most of the plates removed so as to leave only three fixed plates and two moving ones, or fixed and moving plates of the same sizes may be used to build up a new condenser. The ebonite condenser cases used on such Service condensers can be purchased separately and used as

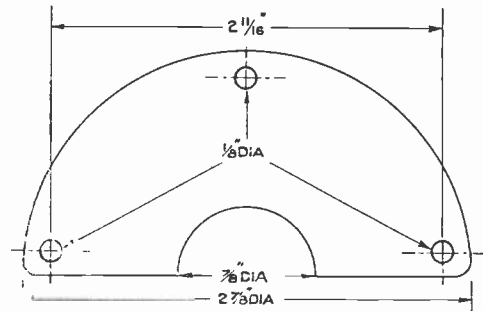


Fig. 10. Fixed plates of Condensers C_1 and C_2 .

which also illustrates the approximate position of the condenser plates at the upper end of the case, and the windings at the lower end.

For the transformer windings for the wavelengths mentioned above, No. 34 double silk covered copper wire can be used, the primary being put on as a single layer coil occupying a length of 2 ins. on the former. The ends of the winding may be

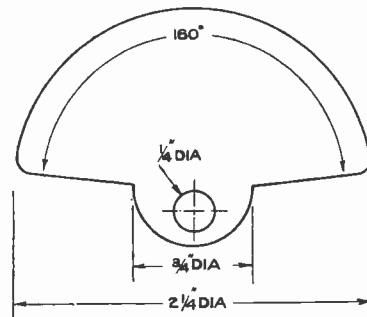


Fig. 11. Movable vanes of Condensers C_1 and C_2 .

secured in position in the usual manner by threading them through very small holes drilled through the ebonite. The ends should be brought outside the tube again for convenience in making the connections, or alternatively four small brass screws and nuts may be passed through the bottom of the condenser case and used as terminals. When completed, this winding should be wrapped with four or five layers of waxed paper or parchment, as a means of separating the two windings. The second winding, using the same wire, should then be put on over the paper, and its ends secured in similar manner to those of the primary. The length of the second, or outer, coil, should be approximately the same as the primary, but a few turns in excess will do no harm, the turns of wire being wound close up to one another as was done for the first coil.

Two transformers of this type should be prepared,

and should be fitted to the back of the panel in the approximate positions indicated in Fig. 7. Details of the dimensions of the condenser plates are set out in Figs. 10 and 11; the condenser scale and knob in Fig. 12, and the bracket carrying the lower bearing of the spindle on which the moving vanes are mounted, in Fig. 13. Three fixed condenser plates, and two moving plates will be

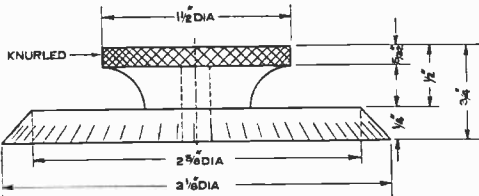


Fig. 12. Knob and scale for Condensers C₁ and C₂.

required for each condenser, to the dimensions shown in the diagrams, the moving plates being cut back from true semicircles in the manner shown, so as to reduce the minimum capacity of the condensers. The plates may be cut out of sheet metal 1/32 in. thick, either brass, aluminium, or zinc. The corners and edges should all be carefully rounded, and all rough burrs removed. Spacing washers 1/16 in. thick, should be used between the plates, those for the fixed plates being 1/4 in. diameter, and for the moving plates 3/8 in. diameter. Twelve of the former will be required and two of the latter, apart from extra ones necessitated for packing. Three brass screws 1/4 in. diameter by 1 in. long (with countersunk heads) will be required for each condenser, making

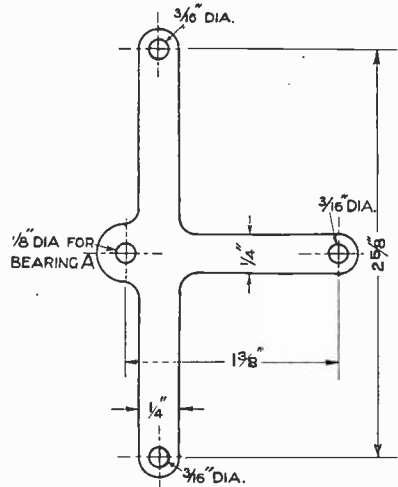


Fig. 13. Bracket for lower end of Condenser spindle.

provided for clamping the moving plates to it. It should be filed square at the upper end to fit the condenser knob.

Details of the bracket to form a bearing for the lower end of this spindle are given in Fig. 13. This should be supported from the ebonite panel by three long 2BA screws, passing through the 3/16 in. holes at the extremities of the arms. The 1/4 in. hole marked A in the centre of this bracket is to take the lower end of the condenser spindle, which should be turned down to 1/8 in. diameter for this

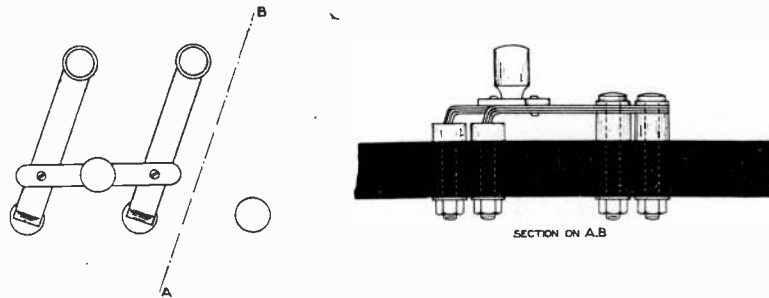


Fig. 14. Details of change-over Switch.

six in all for holding the fixed plates in position, allowing 3/8 in. thickness for the ebonite panel. They should be screwed through the ebonite from the upper side, the heads being sunk in flush, and the holes in the ebonite being tapped to fit. Twelve nuts will be required to clamp and lock the plates in position.

The knob and scale shown in Fig. 12 should be provided with a brass bush on the underside with a square hole to fit the square top of the spindle on which the moving plates are mounted. This spindle is 1/4 in. diameter by 1 1/4 ins. long, nuts being

purpose. This frame can be cut out of 3/32 in. brass sheet. The pointer for the condenser scale is shown in Fig. 18.

The ebonite tube condenser cases carrying the coils can be fixed to the panel, so as to enclose the condensers, by means of three small brass angle brackets screwed to the underside of the ebonite panel, and fastened to the ebonite tube by small screws and nuts as indicated in Fig. 9.

The next item requiring attention is the change-over switch shown in the diagram of connections, Fig. 6, and also on the plan of the front panel of

HIGH FREQUENCY TRANSFORMER AMPLIFIER

the instrument, Fig. 7. This switch is to enable either one or two high-frequency valves to be connected in circuit at will, in front of the detector valve. The switch consists of two pivoted arms running over three fixed contacts, the two arms being linked together by an ebonite link in the manner indicated in greater detail in Fig. 14. The leading dimensions can be obtained from the plan in Fig. 7. The position in which this switch should be mounted on the panel can be seen from Fig. 7, and its connections from Fig. 6.

The valves for which this set is designed, are respectively V 24 for the two amplifying valves and QX for the detector valve. Both these valves have the same dimensions, and require similar

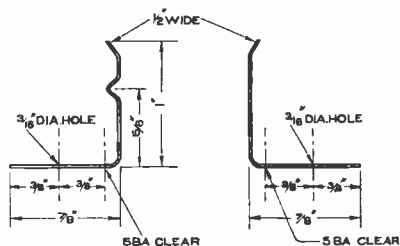


Fig. 15. Springy side-clips for valve.

connection clips. Details of these clips are set out in Figs. 15, 16 and 17, and the spacing of the holes for the fixing screws in the plan Fig. 7. The spring clips should be cut out of thin springy phosphor-bronze strip, which should not exceed 1/64 in. in thickness. The rigid end clips should be cut from brass strip 3/32 in. thick.

As shown both in the circuit diagram Fig. 6, and on the plan in Fig. 7, links are provided for short-circuiting the reaction terminals on the set, should they not be required, and also for short-

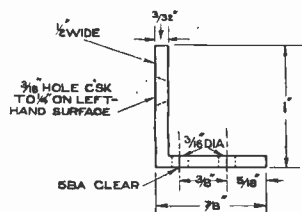


Fig. 16. Rigid end clip for valve.

circuiting the pair of terminals marked on the right-hand side of the panel as for grid cells. The dimensions of these links are given in Fig. 19. These last two terminals, as may be seen from Fig. 6, are joined in the lead from the slider of the potentiometer P, and are provided to enable one or more cells to be joined in the common grid connection of the two amplifying valves, either to make the grids more negative or more positive, as desired. The upper of these two terminals (Figs. 6 and 7) should be lettered G, to indicate that it is connected to the grids. It is then easy to see at a glance in

which direction additional cells should be joined to these terminals in order to make the grids either more positive or more negative. The grid potentiometer alone is only adapted to putting positive potentials on the grids, since it is connected across the L.T. battery. Fine adjustments of the grid

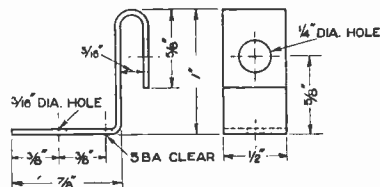


Fig. 17. Springy end clip for valve.

potentials can be made by the grid potentiometer which is shown in the centre of the lower part of the panel, and which is connected across the L.T. battery. No special instructions are here given for building this potentiometer, as in most cases it is preferable to purchase this unit ready made, and merely to mount it in its proper place in the instrument.

There should be room available in the space shown for mounting a potentiometer of the straight slider pattern, if that type is preferred.

The filament rheostats, of which two are required, one for controlling the two high-frequency valves, and the other for the detector valve. Rheostats suitable for panel mounting can be purchased ready made, but if preferred they can be built

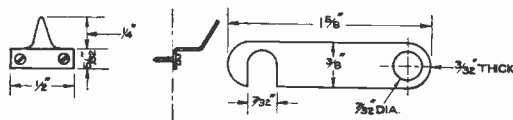


Fig. 18.

Fig. 19.

Pointer for Condenser Scale.

Link for "Reaction" and "Grid Cell" Terminals.

up on the lines shown in Fig. 20, and to the dimensions there given, using No. 22 S.W.G. bare Eureka wire for winding up the spiral. If about 60 turns of this wire are wound up tightly on an ordinary size pencil, a spiral of about the correct size will be obtained, which can be pulled out to fit round the grooved wood block in the manner shown. The two ends of the wire should be secured to two small screws in the block. The sliding contact arm should be cut from a piece of springy brass or phosphor-bronze strip and bent to fit over the wire spiral as shown.

Between the two valves on the right of Fig. 7 is shown a small (miniature) tumbler switch. This should be connected in series with the L.T. circuit, and used for switching the set on and off. If this switch is not fitted, and the valves are turned off by the filament regulators, the current would still be left flowing through the grid potentiometer,

even when the set is not in use. If the filament regulators of the valves are arranged so that they have no "off" position, this will serve as a safeguard to prevent leaving this switch on when the set is not in use

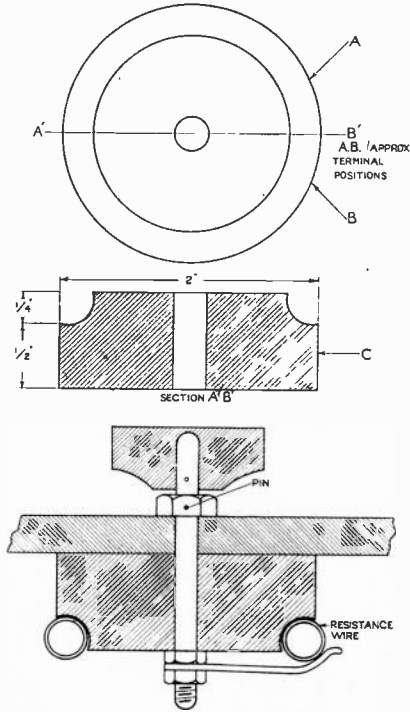


Fig. 20. Details of one pattern of filament regulator.

In Fig. 6, a grid-condenser and leak is shown in the grid circuit of the detector valve. Although the valve recommended for this purpose—viz., the QX—can be used quite well without the condenser and leak, with an anode H.T. voltage of about 35, superior results are usually obtained when they are employed, especially if the H.T. voltage is raised to about 60. This voltage will also be found very suitable with the V24 valves used in the high-frequency stages. The L.T. battery should be a six-volt accumulator. The grid condenser C (Fig. 6) may conveniently be made about 0.0002 microfarad capacity, and the leak about 2 megohms resistance. These units can be mounted on the underside of the ebonite panel in any convenient position as close as possible to the grid terminal of the detector valve.

It is recommended that the grid and anode springs of the valve-holders be marked G and A respectively on the panel to aid in putting the valves in the correct direction. The grid springs should be the left-hand ones in each case.

When the whole instrument has been assembled and wired up as described, it remains to determine the wavelength at which maximum amplification is obtained. This can be done in the way described

in the earlier part of this article (*The Wireless World*, p. 510, November 12th, 1921), and if necessary small adjustments of the windings can then be made to get this wavelength within the band desired, so that the range of maximum amplification can be made to cover 900 to 1,100 metres as already mentioned. If the wavelength comes out too high, a few turns can be removed from the outer windings of the transformers; or if it is too low, a few extra turns can be added. Since the wavelength of maximum amplification is changed by alterations in the thickness of the paper, etc., between the layers, it is usually more satisfactory to make the adjustments after assembly, rather than to attempt to give too detailed dimensions which cannot always be followed accurately.

Some idea of the wavelength of maximum amplification can be obtained by joining up the set in the usual manner with a tuned circuit across A and E, and with a reaction coil, and noting the range of wavelengths over which the set oscillates, or by joining a grid leak of about 1 megohm value across the A and E terminals of the set, and then temporarily to join a very small variable condenser between the A terminal and the upper reaction terminal, the link for these terminals being open, so as to provide electrostatic reaction. Across the reaction terminals join an oscillation circuit made up of a coil in parallel with a variable condenser so as to obtain a circuit that will tune to the desired range of wavelengths. By varying the tuning of this condenser (the extra reaction condenser mentioned above being kept at as small a value as possible) the wavelength at which the set oscillates as a whole can be determined by listening in the telephones joined up to the "phone" terminals. This will give approximately the wavelength at which maximum amplification will be obtained, but for more accurate results it is recommended that the method of plotting out the amplification curve that has already been described in the earlier part of this article, be followed.

One further point may be mentioned with regard to joining up the intervalve transformers. It is generally advantageous to join the wires which go to the grid of the one valve and the anode of the next to the corresponding ends of the secondary and primary windings respectively. They should be joined to the ends of the windings furthest from the condensers.

Double telephone terminals are shown in Figs. 6 and 7, the two pairs being joined in parallel so that two sets of telephones can be used simultaneously. High-resistance telephones should be employed, but if preferred a telephone transformer can be mounted inside the set if low resistance telephones are available. This latter arrangement is preferable.

In the diagram of connections, Fig. 6, a blocking condenser C₃ is shown across the telephones and H.T. battery. This should have a capacity of at least 0.01 microfarad, while a still larger value has some slight advantage.

It is regretted that through unforeseen circumstances the Author was unable to complete this article at an earlier date.

Electric Waves and Wireless Telephony

SELDOM has the theatre of the Royal Institution of Great Britain had so crowded an audience as was present at the lectures for children given by Dr. Fleming during the Christmas Vacation of 1921-22. Dr. Fleming is well known in scientific circles for the lucidity of his expositions and for the success of the ingenious experiments with which they are illustrated. The course which dealt with "Electric Waves and Wireless Telephony," included six lectures on Surface Waves on Liquids, Waves in Air, the Telephone, Electric Oscillations, Electric Waves and Wireless Telephony.

Everyone is acquainted with the appearance of the waves of the sea and the ripples produced on the surface of a still pond when a stone is thrown into it, but Dr. Fleming showed by means of a model roller, how a wave is really due to an up-and-down motion of the adjacent particles of the liquid; the apparent forward movement being an optical illusion due to each successive particle attaining its highest altitude at a slightly later time than its neighbour. A similar effect is produced in a line of boys if each one throws his cap into the air one second after his right-hand neighbour. A series of beautiful slides was shown, illustrating exactly what happens when a stone falls on a smooth surface of water. The phenomenon of reflection of waves was shown by allowing waves formed artificially in a tank of water, to impinge on a plate of glass placed in the tank. The waves were turned back from the glass and formed beautiful patterns with the incoming waves.

The existence of surface tension in liquids was illustrated by making a needle float on water, but the *piece de resistance* of the first lecture was the formation of smoke rings. This was accomplished by means of a box one side of which was composed of a piece of stretched rubber, while in the opposite side was a circular orifice. The box was filled with smoke and a sharp blow caused the rubber to eject a ring of smoke through the circular hole. By tapping a similar box filled with air a candle placed in line with it, but some considerable distance away, was extinguished.

In the second lecture Dr. Fleming explained how sound vibrations in the air are conveyed to the eardrum and set it in vibration, thus influencing the sense of sound. Slow vibrations give rise to low notes, and rapid vibrations to higher ones, while those of very high frequency become inaudible. The vibratory movement of musical instruments is not always directly visible to the eye, but can sometimes easily be made so. For instance, Dr. Fleming had a tuning-fork against the side of which was a pith ball hanging by a thin string. Directly the fork was struck and the note given out, the ball darted wildly away from the prong and bounced repeatedly against it until the note died away. A brass plate was sprinkled with sand and then stroked with a violin bow. At once the sand distributed itself into definite geometrical patterns, massing up in places where there was no vibration.

The "sensitive flame" experiments caused much amusement. There were three different gas flames which dipped and nearly went out in response to

various sounds. The first was sensitive to such sounds as "tea," the second to sounds like "ma," while the third jumped excitedly when keys, or coins were jingled.

Perhaps the most interesting experiment was the throwing upon the screen of a picture of speech waves. A ray of light was projected on to the screen from a mirror which was connected with the sound box of a gramophone. Professor Fleming read a passage from "Hamlet" into the gramophone and the point of light travelled along in waves of curious formation. A Pathéphone record of "Comin' thro' the Rye" was played and a record of the wave forms shown in a similar way. Fig. 1 illustrates the type of wave form traced out in this manner.

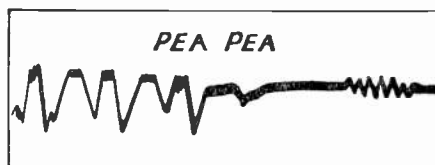


Fig. 1.

The third lecture dealt with that much-abused instrument the telephone and its shortcomings. The house speaking-tube telephone, of course, carries the actual sound waves from one room to another, but this would be useless for distances of more than a few yards.

It was Alexander Graham Bell who in 1870 patented a method of transforming the energy of sound vibration due to speech into the energy of an electric current, and of reconstructing the sound waves from the electric current waves at any required place. In his arrangement speech was made against an iron disc, setting the latter in motion. This motion created an induced current in a coil wound on an adjacent magnet, and this varying current flowed through a wire and strengthened or weakened the magnet pole near the iron disc at the receiving station. Its varying attraction set in motion a diaphragm which reproduced the original speech sounds.

Edison quickly followed Bell's lead with an improved transmitter using a disc of lamp-black behind a diaphragm. A slight variation of pressure altered the electrical resistance of the lamp-black, and so caused variations in the induced current.

The modern telephone includes developments of both these original ideas. The transmitter or microphone as it is now called consists essentially of a diaphragm actuated by the voice, and varying the resistance of carbon granules behind it, thus setting up a current in the microphone circuit conveyed by the wires to the receiver, where the reverse process takes place.

There is, however, still plenty of room for improvement in the telephone, said Dr. Fleming; and the outburst of laughter which greeted this remark seemed to show that the audience was in complete agreement. For instance the letter "s"

cannot be properly transmitted, and often we are only able to understand a telephone conversation by guessing at a number of the words. Another trouble is due to the fact that some waves travel faster than others and die out more quickly, so that if speech is sent over a long distance it becomes distorted beyond recognition. Fig. 2 shows how the waves are distorted by travelling along various lengths of submarine cable. This distortion is partly prevented by "loading coils" placed on the telegraph wires at intervals along their length. Fig. 3 shows a picture of a pole with one of these coils fitted.

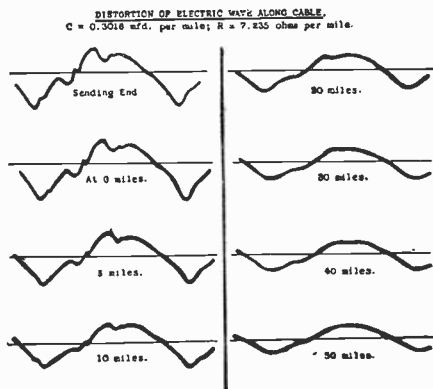


Fig. 2.

Dr. Fleming showed some pictures of the interior of a telephone exchange where operators connect up subscribers with the desired call or say "Number Engaged," as the case may be. A glance at Fig. 4 shows that an occasional mistake is really excusable. However now that automatic exchanges are being introduced this trouble is being eradicated.

The fourth lecture dealt with electric oscillations. Matter is composed of atoms—ininitely minute bodies which seem to be constructed on a sort of solar system plan with a nucleus surrounded by electrons—the ultimate particles of electricity. A current in a wire is caused by a flow of these electrons in the same direction. Although electrons cannot be seen their presence was demonstrated by Dr. Fleming by a wonderful little piece of apparatus known as "Crooke's Electric Mill," which comprises a little windmill-like body set on rails in an exhausted glass tube. On passing a current through the tube the electronic bombardment of the vanes caused the mill to rotate and to travel from end to end of the tube, its direction of motion depending on the direction of the applied current, Fig. 5.

Dr. Fleming pointed out the difference between insulators and conductors and showed the storage of electricity by use of a Leyden jar; and the oscillatory discharge which results when it is discharged by connecting the two metal plates. Such a discharge sends out a train of electric waves in the aether. Similar waves were also produced by applying suitably timed electric impulses to a long helix of closely wound wire, the presence of the stationary waves established along the helix

causing a neon tube to glow a dull red when it was held in the neighbourhood of the coil. By suitable arrangements these waves sent out into the aether

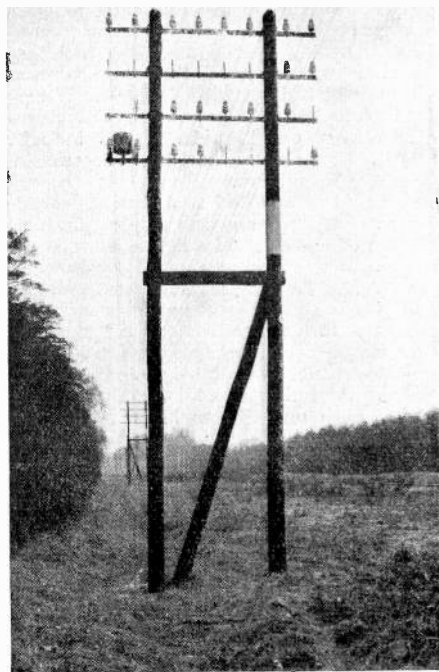


Fig. 3.

can be captured and utilised. This is what happens in wireless telegraphy. Professor Fleming had on the table two little wireless installations, consisting of two tiny frame aerials separated only by a foot or two. The waves sent out by the one caused a little lamp to light in the other. Modern high power wireless telegraphy and telephony is merely a development of the same principle. The most difficult part is, of course, the reception of the waves since their strength is very small compared with the power put in at the transmitter, and delicate instruments are needed to detect their presence. Dr. Fleming showed the action of a coherer, the earliest form of detector, by allowing wireless waves from an induction coil to fall upon it. The operation of the coherer by the current induced in it by the waves caused a lamp to light in a local circuit. The same apparatus was used to show that while some materials such as wood, cork or india-rubber placed between transmitter and receiver, are transparent to electric waves, others—for example a bottle of water, or a boy's head—are quite opaque to them.

The coherer has now been entirely replaced by the valve and crystal detectors, the valve being a remarkably sensitive instrument which was designed in its original form in 1904, and has since been

ELECTRIC WAVES AND WIRELESS TELEPHONY

improved upon until in its present form as the three-electrode or thermionic valve, it is used in all the important commercial stations for reception and in many of them for transmission as well.

Wireless telephony with which Dr. Fleming dealt in his last lecture rests on the same underlying

one at Zandvort, from which it again passes to overland telephone wires connecting Zandvort station with Amsterdam. Each wireless station is in two parts arranged for duplex working. In this arrangement speech in one direction is conveyed on a slightly different wavelength from

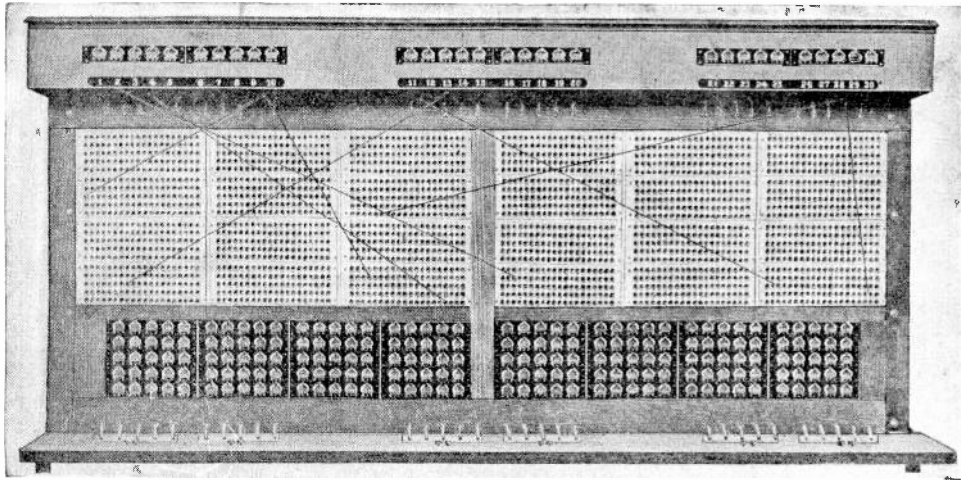


Fig. 4.

principles as wireless telegraphy, and the same instruments are used for its reception. The transmitting apparatus includes a microphone similar

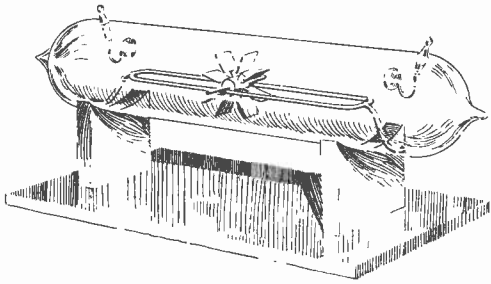


Fig. 5.

to that used in the ordinary telephone. This modulates the aether waves in accordance with the speech waves of the voice. The aether waves are not distorted at all, however far they travel, and herein lies one of the great advantages of wireless over wire telephony. Dr. Fleming referred to the wonderful recent achievement of the Marconi Company, in which through telephonic communication has been established between London and Amsterdam, the communication being effected partly by wire and partly by wireless. Starting from London speech is conveyed over the ordinary Post Office trunk telephone lines to a special wireless station erected near Southwold. Thence it passes *via* a wireless link between that station and a similar

speech in the other, so that through communication in both directions can be established without need for any switching apparatus for changing over from speaking to listening, as is necessary in most wireless telephone equipment. During this lecture a demonstration of wireless telephony was given by the courtesy of the Marconi Company who had erected an aerial in the lecture hall, and who sent a special programme from Marconi House, Strand. They also provided receiving apparatus and an operator to use it. The telephony was timed to start at 3.45 p.m., and as the time drew near intense excitement was manifested by the audience. Promptly at a quarter to four, amidst a breathless silence, the messages were received, and rendered easily audible throughout the hall by means of a Stentorphone. The programme included, besides the customary calling up, selections of gramophone music and the following message from the Duke of Northumberland (President of the Royal Institution):—

“As President of the Royal Institution I take this opportunity of sending my heartiest greetings for the New Year to the audience which is now gathered to listen to Professor Fleming. This message will be a proof of the marvellous progress made in the science of wireless telephony. It is gratifying to know that in the development of this new science the Royal Institution is playing a prominent part, as in every other.”

This lecture closed one of the most interesting as well as instructive courses of Christmas lectures that has been given in this historic home of science.



*ADMIRAL OF THE FLEET SIR HENRY B. JACKSON,
G.C.B., K.C.V.O., D.Sc., LL.D., M.I.E.E.*

Presidential Address*

DIRECTIONAL EFFECTS WITH FRAME AERIALS.

By ADMIRAL OF THE FLEET SIR HENRY B. JACKSON, G.C.B., K.C.V.O., F.R.S., D.Sc., LL.D., M.I.E.E.

FIRSTLY, I should like to express my thanks for the honour you have done me in electing me as your President for the coming year. It is an honour I much appreciate, as I feel I have no particular qualifications for such a post, except the great interest I have always taken in the development of Wireless Telegraphy, and an unshaken belief that its proper use will increase the power of closer communication between the people on this Earth, and thus benefit humanity, and (I hope) help to make goodwill take the place of the existing state of unrest and mutual suspicion that at present seems to be a dominant feeling amongst the Nations.

My association with your Committee, as Acting Vice-President, during the last two years has enabled me to grasp the feeling that first initiated the formation of this Society, and now maintains its high reputation as an earnest, democratic and go ahead Body, with a distinct goal in front of them. That goal is the perfecting of wireless communication by improving all its details, both in personnel and material, and I think this is progressing steadily.

This object is shared, amongst others, by our English-speaking fraternity across the Atlantic, and their carefully organised experiment last month of signalling to us from America with short waves and small power, shows that this same feeling in the United States is a bond between the Amateur Wireless telegraphists of these great Nations and this cannot but help to preserve amity between us.

I have not time to compare the rules and regulations for the use of wireless by amateurs in the two countries, or the differences in them which have led to the development of their receiving apparatus. They in America seem to have to use shorter waves than we do here, and in this respect are as a whole probably ahead of us. This short wave reception problem is an interesting one, requiring much care in the details of circuits and patience in tuning them, and I hope we shall take it up seriously, as the tendency of the Authorities is to reduce wavelengths for our use and amusement, so as not to interfere with the Government Services.

I feel that I am taking over the Presidential duties at a time very favourable to myself.

Firstly, Senatore Marconi has just honoured the Society by joining it as an Honorary Member, and this will add to our status in the world of Wireless Telegraphy.

Secondly, the Government have granted our recent petition, and we shall now have telephony and music included in the weekly programme which the Marconi Company have so generously offered us. We must be grateful to the Post Office for their prompt action in this matter.

It may be observed that one of the wavelengths granted is 180 met. and I hope you will make your circuits and amplifiers efficient for this wave, and not be satisfied with that of 700 metres. In my opinion it is a step in the right direction.

As the Authorities have given further concessions,

we in our turn, must be careful not to abuse them. I will not dwell on this point this evening, but I would point out that a person transmitting is apt to get so wrapt up in his own work as to forget that he may be interfering with the business and pleasure of others, by interference which he himself does not hear. He should remember when he is transmitting, either speech or morse, that he has a "duty towards his neighbour."

I am glad to say that so far as I can judge personally, the appeals from this Chair in the last few months have born good fruit round London, as the interference in the evening, which a few months ago spoilt all one's pleasure at the telephone, has greatly reduced, and consecutive conversations taken the place of the pandemonium that was sometimes audible on 1,000 metres. At the same time the improvement in the articulation and music is as equally pronounced.

The Petition which has just been granted was signed by representatives of nearly all the Wireless Clubs and Societies in these Islands and is a good example of what an organised body can do, and a full justification of our Policy to get all these bodies to affiliate themselves with us. I hope the result will influence the others who hold aloof to also join their forces with ours, for "Union is strength," especially when it comes to bringing pressure on the Government to grant a reasonable request, not in any sense political. The affiliation of all clubs would then, more than ever, make us the representative Society of Wireless enthusiasts in Great Britain.

I have always been an advocate for giving non-professional workers all possible facilities to improve their knowledge in any hobby, such as wireless, in which they take a personal interest. For one reason alone, it may bring out latent inventive genius.

Hobbies have a great educational value. They are incentives to the onlookers, only mildly interested in them, to emulate their more energetic schoolfellows and friends and get as good as they can, and it gradually and automatically disseminates much useful scientific knowledge in the school and home without effort on anyone's part. This has been the case in engineering as evidenced by the motor car. In these days when it is becoming increasingly evident that Electricity is matter and the foundation of the Universe, it is more than ever beneficial that any hobby which spreads this knowledge will be of benefit to mankind, and no one can deny that modern wireless is in itself a wonderful example of the application of some of the most recently discovered laws of Nature, to the rapid spread of intelligence throughout the civilised world.

My association with this Society has also given me the impression that most of its members use their brains and energy in improving the mechanical and electrical details of the apparatus, with the hope of reaching perfection, or of inventing some new method of transmission or reception which may mark an epoch in this rapidly advancing Art.

* Delivered before the Wireless Society of London on Wednesday, 25th January, 1922.

They apply the known laws of current and static electricity in their work. The result of this work is, in many cases, of great value, and will, I trust, bring reward to the inventors. Their success is evidenced by the recent transatlantic tests. May I personally congratulate the successful competitors on their work?

My own work during the last two years has been of a different nature, and I have often wished that I had more time to spare from it, to do a part in experimenting with the interesting electrical details of the modern W/T apparatus, now in general use.

Its sympathetic response to minute energy, properly applied; its obstinacy to large energy unsympathetically or improperly applied; its elusive tricks and vagaries at certain times (but which are only following nature's laws), give it a fascination that appeals to one's imagination, and makes it difficult to tear one's self away from it.

But there is another side of the question, and one, I think, not less interesting, which more nearly concerns the fundamental laws underlying these wonderful but sometimes puzzling phenomena. It is on this side of the question I propose to touch on *lightly* this evening, hoping that some of you may find the time and inclination to assist in unravelling some of these puzzles, and so help to frame basic laws for Radio communication over long as well as short distances, as true as those applied to daily use for commercial electricity.

I think it is as difficult a problem as any in physical science, in that no human nerves are directly affected by it at any but the very shortest distance. We have the eye for light, the ear for sound, the body for heat, the tongue for taste, and even for D.C. electricity iron filings go far towards showing us what we want for study of a magnetic field. All these are useless by themselves for Radio frequencies, and its fields and its effects at great distances must be determined solely by indirect means, and till recently by apparatus possessing inertia in all its parts.

Research is therefore essential, and this is one of the functions of the Radio Research Board, and I therefore propose, as Chairman of the Board and with their full approval, to deal with some of the problems we are now investigating.

A few words as to the formation of this Board and its functions are I think desirable before going into details of its work.

It was formed about two years ago, after careful discussion between the Government Departments which use W.T. and the Department of Scientific and Industrial Research, and the terms of reference to us include "directions to provide for interchange of information between various Government Departments, and their technical Establishments on the work they undertake and the results obtained, so as to prevent any unnecessary duplication of work." "To arrange for communication to outside bodies interested in W.T. such information as is not detrimental to the public Services," and, "in case of researches not otherwise provided for, to make the necessary arrangements to meet the requirements of the Government and others."

The various items of work anticipated were classed under 10 different headings, of which 5 were considered to be primarily the work of the

Board. These did not include what may briefly be termed the work for Operators, the design or development of apparatus required for the different services, the testing and inspection of gear, or any manufacturing details. These items are dealt with by the various Services and by the users and makers of the apparatus.

The items falling to the Board include "Investigations in pure Science for extending human knowledge" even without any definite application. I would remark that we are not doing anything in this category, but that our investigations in pure science are all being conducted with a very definite object in view, and are included in the items for us. Other items are: Quantitative measurements and Standards for Radio, as well as Audible, frequencies, measurement of Radiation, Properties of the materials used in W.T. work, data for technical design, and particularly "Investigations requiring the collation and analysis of the results of transmission and reception at a number of different Stations."

Recently has been added "the present situation and the possibilities of Radio Telephony, in connection with its development and use throughout the Empire." As regards this, a Committee of the Board is now collecting, from all possible sources, information as to its present state and the troubles it introduces at other Stations, and they are much indebted to the Wireless commercial companies for the help they are giving them in this investigation.

We interpret our duty in a broad sense and consider some of the problems perhaps not exactly as they were originally classified.

The names of the Board, and of the sub-committees it formed, have been published. As several changes have been made on the Board recently, I give its present formation, which is as follows:—

Chairman: Admiral of the Fleet, Sir H. B. Jackson, G.C.B., F.R.S.

Captain J. S. C. Salmond, R.N., *Representing the Admiralty.*

Lieut.-Colonel A. G. T. Cusins, C.M.G., R.E., *Representing the War Office.*

Wing Commander J. B. Bowen, O.B.E., R.A.F., *Representing the Air Ministry.*

Mr. E. H. Shaughnessy, O.B.E., *Representing the General Post Office.*

Sir Joseph E. Petavel, K.B.E., *Director National Physical Laboratory.*

Professor Sir Ernest Rutherford, F.R.S., *Cambridge University.*

Professor G. W. Howe, D.Sc., *Glasgow University.*

Technical Officer: Mr. O. F. Brown, B.Sc.
Secretary: Mr. L. G. Bromley, *Department of Scientific and Industrial Research.*

The Board held its first meeting on Feb. 19th, 1920, and has held 24 meetings.

It was seen that a large amount of sifting the mass of information that had been published was first required, and would require help from Sub-Committees, and classification and organisation for future research, and the Sub-Committees were classified broadly under the headings of—

"Radiation, and its measurement, Standards, and Propagation of waves."

"Atmospherics," in the broadest sense of the term.

"Directional Work."

"Valves and their circuits."

PRESIDENTIAL ADDRESS

Service on the Board and the Sub-Committees is entirely voluntary, and I think the wireless community in general owe these busy men their thanks for the valuable thought and time they give to the difficult problems they have to deal with.

It may be noticed that the Board has two distinct functions, one relating to the work of co-ordination between the Government Departments, and which is not of interest to you in any technical sense, and the other that of fundamental research in which I hope you are all more or less interested.

The work of the valve Sub-Committee has been solely with the fundamental physics of the valve up to the present, and several grants have been given to well-known men for their researches, as these may be of great importance in improving its efficiency for wireless work.

The Universities and Principal Technical Colleges were asked if they were willing and able to co-operate in our work, and a very satisfactory response was received, and we are getting valuable help from them, especially in D.F. work. We are also helping them with apparatus, which we obtained from the Disposals Board. Individual research workers carrying out special laboratory researches for the Board are on our recommendation given money grants.

We have got in touch with the French, through General Ferrié, and also with several of the leading experts in the U.S.A. and with our Dominions, India, and Egypt, and are organising systematic work in connection with Atmosphericics with some of them.

Before dealing with results, I should like to say that it would not be fair to the individual Observers for me to anticipate in detail the analysis of the results obtained by them, as they will be published under their names when completed, after approval by the Board. I shall therefore, dwell more on the difficulties of the problems than on the elucidation of the results up-to-date.

Quantitative measurements, including accurate determination of wavelength and H.F. Standards, naturally are being dealt with by the N.P. Lab., and good progress is being made in this work: and its close association with the Board is invaluable.

Some preliminary work has already been published in the Annual Report of the N.P.L.

The most important practical problem that we have taken in hand is the systematic investigation of the cause of errors in Direction Finding work; using Frame aerials, at present, as the receiving units.

The great value of D.F. in the navigation of Aircraft is too well known to all of you for it to be necessary for me to dwell upon it. It has been and will be of great use for navigating vessels at sea, and for finding the direction of other vessels. It is of great importance to the Army in War for locating other stations, and of commercial value in reducing interference from other stations not near the line of bearing of the communicating station.

In spite of the value it has been in the War, it has to be admitted that it is not reliable at all times and places, as errors, at times amounting to say forty degrees, are sometimes experienced, and these errors are generally greater near sunset and

sunrise and at night, than when it is daylight at both the sending and receiving stations.

Many careful observations as to the magnitude of the errors have been made by single observers from time to time, and errors due solely to the site of the receiving frame have been discovered. On board ship the error is of a quadrantal type similar, though smaller than that of the ship's Compass due to soft iron.

Thus the locality of the receiver may be one cause of error. The variable and sometimes large errors at night have been attributed almost entirely to the waves being deflected by a non-uniform Heaviside layer, and this may be taken as another cause.

Instrumental and observer's errors certainly cannot be ruled out as negligible.

For accurate work strong clear signals in the telephones are essential, so considerable amplification is necessary compared with an ordinary receiving aerial, the frame aerial of ordinary workable dimensions picks up much less energy in comparison, as the following example shows:—

Ratio of distances at which Signals of equal intensities should be received on a plain earthed Aerial and on a Rectangular Frame Aerial of the same vertical height and Resistance, both systems being tuned to the wave —

$$\frac{\text{Frame}}{\text{Aerial}} = 6.28 \frac{N L}{\lambda}$$

where N = the number of turns in the winding of the frame,
 L = Width of the frame, and is the Wavelength.

Example :

If the Frame and the Aerial are each 6 feet high, and the width of the Frame is also 6 feet, and 50 turns are used in its winding, and the wavelength is 6000 feet (1830 metres), the ratio

$$\frac{\text{Frame}}{\text{Aerial}} = \frac{314}{1000}$$

That is, the receiving distance of the Frame is about one third that of the Aerial.

Our stations are, generally speaking, using a 7 valve amplifier of which the first two H.F. valves are transformer coupled.

In order to differentiate between all sources of error, we considered it necessary, first to take observations over a considerable time, at several different and well separated receiving stations, in different geo-physical surroundings; second, that the same transmitting stations be observed both in light and darkness by the same observers at each; and third, that instrumental and site errors be carefully looked for and if found be allowed for. The Universities and Technical colleges are helping in this, and for the past year we have had 12 stations in the British Isles carrying out the necessary observations daily except on Sundays. We also have stations at Slough and N.P.L. for special observations and test of D.F. gear, etc.

Our observations up to the present have been on the well known spark stations, and we have many thousands of observations obtained from them simultaneously by 8 to 12 stations, now under analysis: we are arranging to continue this work with C.W. stations, having prepared a special

screened heterodyne, by which errors due to radiation from the usual type will be eliminated.

I will first run through the errors at or near the receiving station, which possibly may be eliminated or allowed for.

(a) *Instrumental.* These may be inherent in any mechanical or electrical apparatus, such as faulty orientation of scale, bad connections, etc.

(b) *Reaction* from the amplifier in the proximity of the frame. This may vary with the wavelength and direction of the observed station. Trials with the amplifier in different positions as regards the frame may help to discover this, possibly the best solution is for the amplifier to be mounted on the revolving frame and turn with it. Efficient screening is another cure.

(c) *Conductors* near the frame may have strong inductive effects on the observed direction of the wave. Iron girders in buildings, railway lines, trees, metallic ores, telegraph wires, Aerials, etc., must be kept as far away as possible. Their effects may change with the wavelength and orientation of the frame. The error from this cause may reach 20°.

Errors are also sometimes found to be due to the

We have some striking and some puzzling results, but before dealing further with them I think I had better touch briefly on the effect produced on a coil aerial by a high frequency radiation emitted by a distant transmitting station, for possibly some of you have not yet given much thought to the matter, and it, I hope, will lead up easily to some results I have obtained recently with a coil on two axes.

An electromagnetic wave in space has both an electric and a magnetic field intensity, these are at right angles to each other and to the Direction of propagation of the wave. Either field can be used to describe the effects. I shall deal in my remarks with the Electric field intensity, and designate its direction by the term "Lines of Electric force in the wave." If these lines are perpendicular to conductors as it passes over them it generates no current in the conductors, if the lines are along the conductors or at any other angle than 90, they will induce a current in them.

I have not depicted the lines of E. force in Fig. 1. They are all supposed to lie in the plane of the paper, and at right angles to the arrows, which

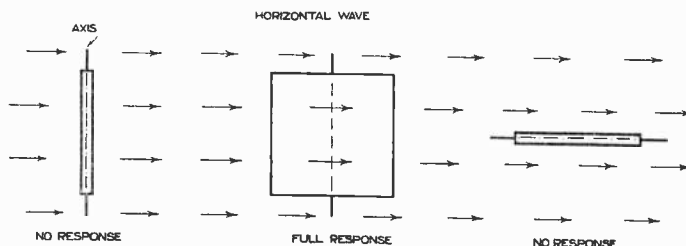


Fig 1.

contour of the land round the frame, and possibly to the state of its surface, *i.e.*, wet, dry or cultivated, and the nature of the surface soil may have some effect, these effects would vary with the orientation of the frame. It is not easy to differentiate between these causes of error, whose results may be cumulative or partly cancel each other, and each station has to be judged on its performances. Calibration in some cases is useful, especially on board ship, where large quadrantal errors are the rule. Observer's errors, however, should be small and not exceed a few degrees. Site errors up to 20 degrees have been recorded: a tree at 10 yards has shown an effect of 5 degrees; radiation errors of 10 degrees may be looked on as not uncommon, till corrected; thus a cumulative error of, say, 30 degrees on some stations may be inherent in the receiving Station when first set up: until these are corrected, accurate D.F. work is out of the question. Even then we have the other cause I have mentioned *viz.*: the deflections which are attributed to the wave being reflected from the so-called Heaviside layer.

Certainly our observations confirm some such action, and possibly an additional one, for errors at short distances, hardly possible to be caused by such a reflection are not uncommon.

indicate the direction of "propagation of the wave" or to speak simply, I call it the "PATH."

Take first the simplest case, shown in Figure 1. This simple case is a wave with a Horizontal path (L to R), moving over the surface of the sea with its lines of E force vertical. It passes over a coil mounted on a vertical axis, supposed to be joined up to a suitable amplifier with telephonic reception. I, also, in all my examples, assume that what is termed its capacity effect to earth is balanced by a condenser, so that true minimum effects should be obtained.

On passing the left hand top coil, at right angles to its path, there will be no response in the telephone, because the E.M.F. produced in the two vertical windings is equal and opposite. Thus they cancel. No E.M.F. is induced in the two hor. windings as they are at right angles to the lines of E. Force. Thus there should be no response.

But, if the plane of the coil is in line with the path of the wave, as in the middle fig., response should be obtained. This is due to a phase difference produced in the two vertical windings, one of which is nearer to the transmitting station than the other. The two hor. windings are still unaffected. This phase difference is caused by, and is proportional to, the time occupied by the wave front

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reaching the more remote winding after it has passed the nearer one.

In this position the response should be at its loudest. If the coil is now rotated on its vertical axis the time interval and phase diff. become smaller varying as the cosine of the angle; thus at 90 degrees where the value of $\text{Cos. } 90$ is NIL, the time difference and phase difference also vanish and no response is obtained, as I mentioned before.

It is interesting to see what the phase difference may amount to in practical working. Using a six foot square coil and a 6,000 ft. wave with the plane of the coil at 89 degrees to the path of the wave, that is very near to the position of no response, it can be calculated that the distance the front of the wave will have to travel between the near and far winding is $1\frac{1}{4}$ inches. The time for this at the velocity of light is about one ten-thousand-millionth part of a second, and the phase difference is $21\frac{1}{2}$ seconds of arc. These dimensions seem almost negligible but the amplifier deals with them very efficiently, and with a good coil will indicate the difference between 89 and 90 degrees clearly, as in the 90 degrees position the response should be zero.

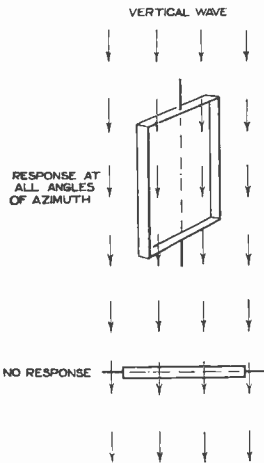


Fig. 2.

Figures 2 to 4 show the path of a wave at other angles such as a vertical path from a lightning flash overhead, and an inclined one which may come from an aeroplane at elevation or from a wave reflected from the so-called Heaviside layer of the upper atmosphere. A wave travelling horizontally with its lines of force bent backwards at the foot, would have the same effect on the coil as regards response, and we could not tell which of the effects was present.

Positions of "response" and of "no response" are noted for each case. No response does not necessarily infer that it is due to the plane of the coil being perpendicular to the lines of E. force of a single wave, as it may be due to the resultant of two or even more waves from the same or from

different sources, with their lines of force vertical, provided that they are of the same wavelength and, as regards their effect on the winding, in the same phase.

I will revert for a moment to the third example

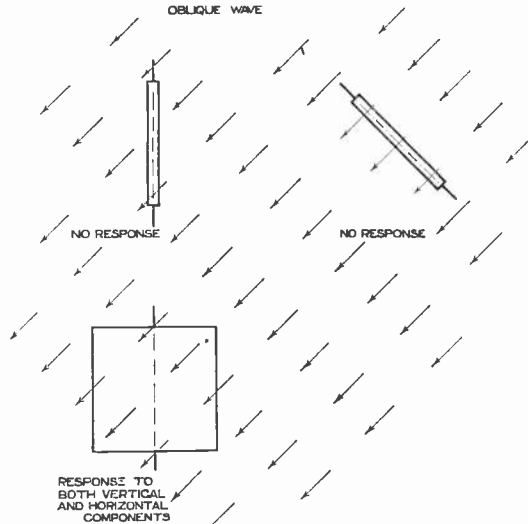


Fig. 3.

of Figure 1, which shows the coil with its plane lying horizontal and its axis in line with the path of a wave. No response should be got in this position. In the left hand figure with the coil upright there is also no response. Consideration of these two positions shows that they are equivalent to the coil having been turned on an axis at right angles to that shown in the figures, and Figures 5 and 6 show the effect of rotating it on this new axis instead of the old one.

I have shown the lines of E force in these figures as dotted lines, and Fig. 5 shows a plan and section of the coil on this axis. Consideration will show clearly that the coil can be rotated on this axis through any angle with no change in the response. I hope my previous explanation will have been enough so that I need not repeat the reasons.

I must, however, add a correction to the statement that no response will be obtained in any of the positions shown in the top line. If the coil were

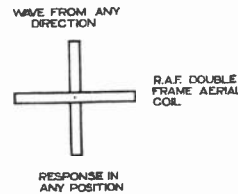


Fig. 4.

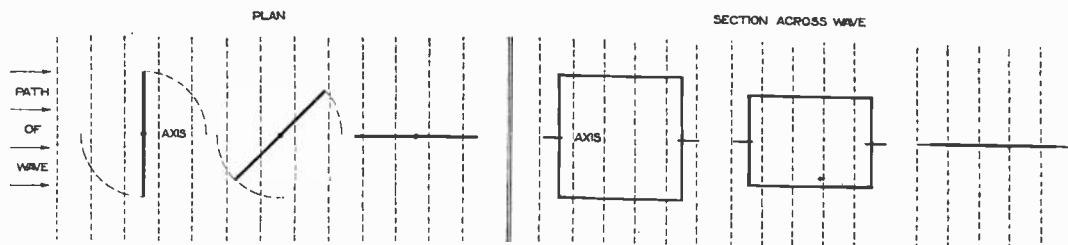


Fig. 5. Results obtained when frame is rotated on an axis not vertical. Lines of E force (shown dotted) vertical. Frame on horizontal axis. No response at any angle, the frame axis being at right angles to the path of the wave and to its lines of E force.

a single wire this would be true, but with a wide coil or frame to hold many windings, the width of the winding must be also taken into account, and in intermediate positions may cause a phase difference in that width or pitch sufficient to cause a slight reponse in the Tel.

The left of Fig. 6 shows the coil as before, but in a wave whose lines of force though still at right angles to the path of the wave, are tilted sideways. Response is now obtained unless the plane of the coil lies in the lines of force. In the right figure I have shown the axis of the coil also tilted to an angle so that it is at right angles to the lines of force, and it can be seen that on this new axis the coil can be rotated to any angle without any marked change in the response.

It will thus, in a plane single wave, give us the angle of its tilt, if there is any.

To do this, however, it must be capable of rotation on two axes, or preferably suspended on a universal joint.

We can now summarise as follows:—

1. A coil on a single axis will indicate the path of a wave, or resultant path of waves of same length and phase on the windings, by giving max. response when its plane lies in its path and min. response when at right angles to it. That is all it will show on any single axis.
2. It will not indicate the difference between a wave with its lines of E. force lagging behind at its foot, and one with perpendicular lines to its path but tilted to an angle sideways.
3. That there is one axis on which no response will be obtained at any angle and that this is the one at right angles to the lines of E force,

and this one may be able to indicate the tilt of the lines of force, if any, provided there is no other wave causing this observed path to be really only the resultant path of two or more waves.

Thus, it does not take us far, *alone*, in elucidating the path and form of wave fronts. It at least requires to be worked in conjunction with an aerial to ensure getting the sense of direction.

I know of little that has been published as to any proof from practical observations that waves are inclined to the vertical, or tilted or bent backwards in cases. The conjecture is mostly based on deduction from the effects on ordinary aerials, depending on the strength of the signals in light and darkness, and on errors in bearings of stations. At first sight, it looks as if a coil so mounted as to be capable of rotation on two axes might give us more definite proof of the effects, and I have been experimenting in this direction, in anticipation of carrying out such tests on a more systematic basis than I can do by the Sub. Com. on D.F. work.

Some of my crude results, however, may be of interest to you. My coil is 3'-7" square, 56 turns, 9" wide, so arranged as to cover wavelengths of 600 to 16,000 metres, with suitable condensers. It is hung on a horizontal axis in a bracket which can be rotated on a vertical axis, and is about 8 ft. from the amplifier. Reaction effects are very small. No reaction coil is fitted; heterodyne for C.W.

My procedure has been. When a Station is being observed, the condenser is tuned to resonance, and the coil then turned on its vertical axis till silence or a minimum response is obtained in the

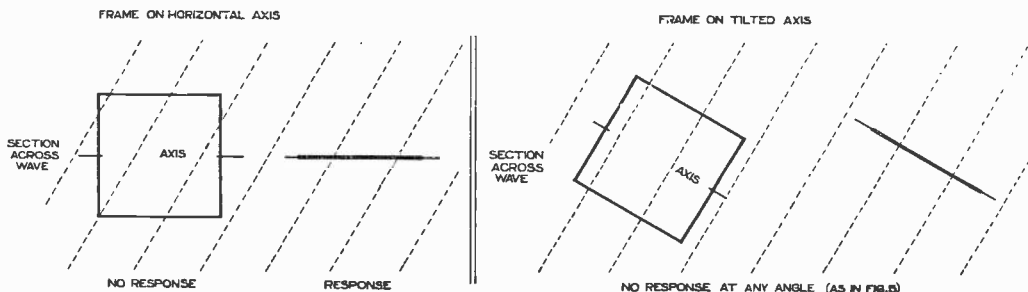


Fig. 6. As in Fig. 5, but lines of E force tilted sideways.

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telephones. If the lines of electric force of the wave are not bent backwards or forwards or tilted sideways the plane of the coil is now facing the path of the wave and the horizontal axis is perpendicular to lines of E. force and the pointer of the instrument indicates their path. The coil is then moved to and fro on its vertical axis to measure the angle before the sound in the telephones increases. I term the sum of the two readings, which should be equal, the "Minimum Angle," and it is found that this varies exceedingly, say from one to thirty degrees, and even more. 3 degrees or less is a sharp min. 10 or more a flat one.

soon found not to be the case, as for any station they may be plus or minus and vary from NIL to as much as 10 degrees for 20 degrees of change of elevation at night; daylight changes are usually very small.

Figure 7 shows Paris reception in daytime and at night.

The effects of changing the elevation of the frame are always small with Paris.

The graphs in the top line indicate the elevation and depression of the frame. Those in the lower line indicate the error observed in the bearing from the true great circle bearing of the transmitting

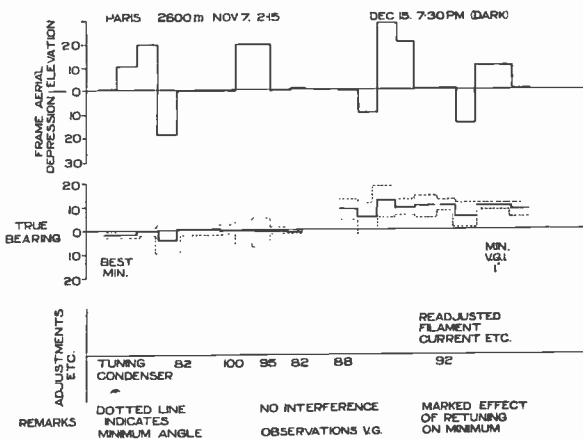


Fig. 7. Effect of Elevation and Depression on observations with Frame Aerial.

When these are satisfactorily noted with the plane of the coil vertical, the coil is elevated and depressed on this bearing and the observation repeated in each position. I generally used about 20 degrees of E. and D. at first. At night I generally again checked the same observation with the coil vertical. The coil can then be reversed 180 degrees and the results repeated, and variations of the procedure carried out as desired.

I have obtained the following results and conclusions.

Depressing the coil more than about 5° towards the transmitting station has without exception increased the angle of minimum, *i.e.*, depressing the coil flattens the min. angle, often this is accompanied by a slight increase in the sound in the telephones at the actual minimum.

Elevating the coil sometimes increases but, at night, more often decreases the min. and enables a more accurate determination of the bearing to be made than with the coil vertical. In fact in a few cases, I have not been able to get any min. without elevating the coil considerably. Depressing and elevating the plane of the coil, sometimes alters the observed bearing of the station, and this is much more common at night than by day. At first I attributed this to errors due to radiation from the amplifier, but if this were the sole cause, they should be consistent for each station observed. This I

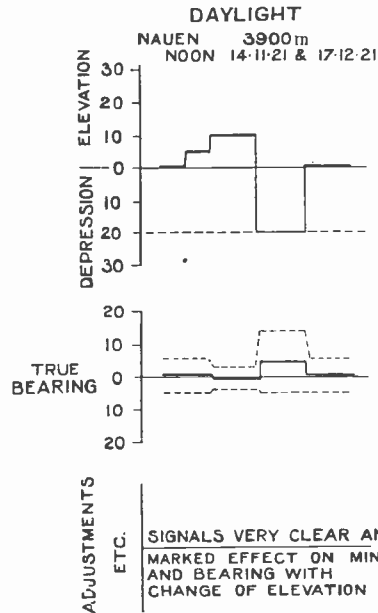


Fig. 8.

station. The dotted lines indicate the angle of minimum.

In this slide the scale of degrees is the same for both graphs. Remarks are inserted in the lower part of the figure.

Take the left one, *daylight*. It will be noticed that a change of elev. of 40 degrees (from 20 plus to 20 minus), only affected the observed bearing about 3 degrees; that the best min. was when the frame was elevated 10 degrees; this is shown by the dotted lines; it was very sharp; then depressing the frame greatly increased the min.

The same general effects are to be seen in the obs. at night, but are greater, and there was an error of about 10 deg. average in the bearing. The effect of sharp tuning on the min. can also be seen, decreasing it from about 5 to 1 degree.

I deduce from these observations that in the daylight the wave was normal with its lines of E force vertical, and in the dark that these lines were tilted sideways slightly, and were also deflected from the true bearing by about 10 degrees.

Nauen, by day (Figure 8) we have somewhat the same as Paris, viz., an appreciable change in the min. and a small change of bearing with change

pitch or breadth of the coil, minute but distinguishable, which may spoil the true min. If the min. is decreased with elevation it indicates that the path of the wave is inclined downwards from the horizontal or that the lines of E force are inclined to the vertical and bent backwards.

If the bearing changes with elevation it indicates that the lines of E force may be tilted sideways, or that two different waves of different phase are being observed.

This simple coil on two axes will not differentiate between these.

There are some more illustrations of Poldhu observations, shown in Figure 11, in which the effects are much intensified. Scale of bearing and elevation are equal. The first one, on the left, shows a case in which, after a few good observations had been taken, with an observation error of 12 in bearing, the minimum flattened suddenly and observations became difficult. A spacing wave was audible in the telephones; after about 5 minutes of this, the signals again became steady, though weaker, the bearing was now correct. Retuning the condenser improved the strength of the signals, but the bearing changed a few degrees.

The figure on the right, taken when no interference was audible, shows the Maximum effect that I have measured of change of bearing due to change of elevation. It reaches 40 degrees or 1 deg. for every 1 degree of elev. The mean bearing was 10 degrees minus in error, the Minimum was flat. The result can possibly be attributed to the lines of E force in the wave being tilted sideways

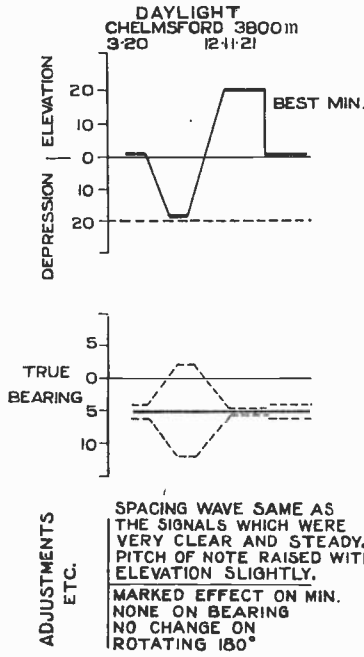


Fig. 9.

of elev. The same remarks apply as in the case of Paris.

Figures 9 and 10. Scale error double that of Elevation.

Chelmsford (Figure 9) gives a different result. A change of elev. of 40 degrees had no effect on the bearing, but a large effect on the min., it being sharpest at 20 elevation.

I deduce from this that the lines of E force were not tilted sideways, but that they may have been bent backwards at the foot, by passing over East London, or else the wave was reflected from the Heaviside layer down at an angle of about 20 degrees.

Figures 10 and 11 show Poldhu.

The first one was a test of reversing the frame 180 deg., it showed no change. The bearing error being 2 deg. minus.

The second one showed a slight change on reversal, about 1 deg. and a change in the observed bearing of 10 deg. for a change of elev. of 40 deg. A slight tilting sideways of the lines of E force would cause this. The min. was flat and but little changed by elev., the bearing was correct with the plane of the coil vertical.

To deal with these results, if the min. angle increases with a displacement of the coil from the vertical, it indicates that the lines of E force are vertical, and that the displacement causes a phase difference in the horizontal windings due their

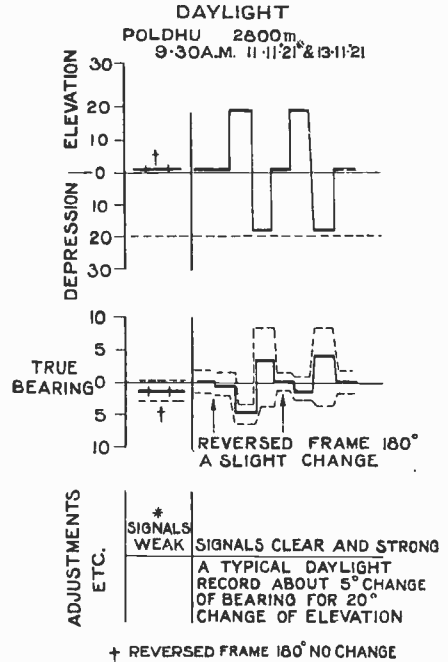


Fig. 10.

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an angle of 45 degrees, and it is difficult to assign any other cause. The tilt or twist would be anti-clockwise from Poldhu. It may be noticed in the other figure that the tilt would be in the opposite sense, or clockwise.

Fig. 12 shows an example in which I used very large angles of elevation and depression, about 65 degrees (the max. I could get both ways). I got good observation before interference set in. In

change of elev. of 130 deg. only caused a change of 7 degrees in the bearing, clockwise.

The results from Poldhu are more inconsistent than from any other station that I have observed.

I will mention other cases, not Poldhu. No figure is required. Three stations on about 4,000 metre wave were heard together, two of them, Nantes was one, could be cut out in turn near their

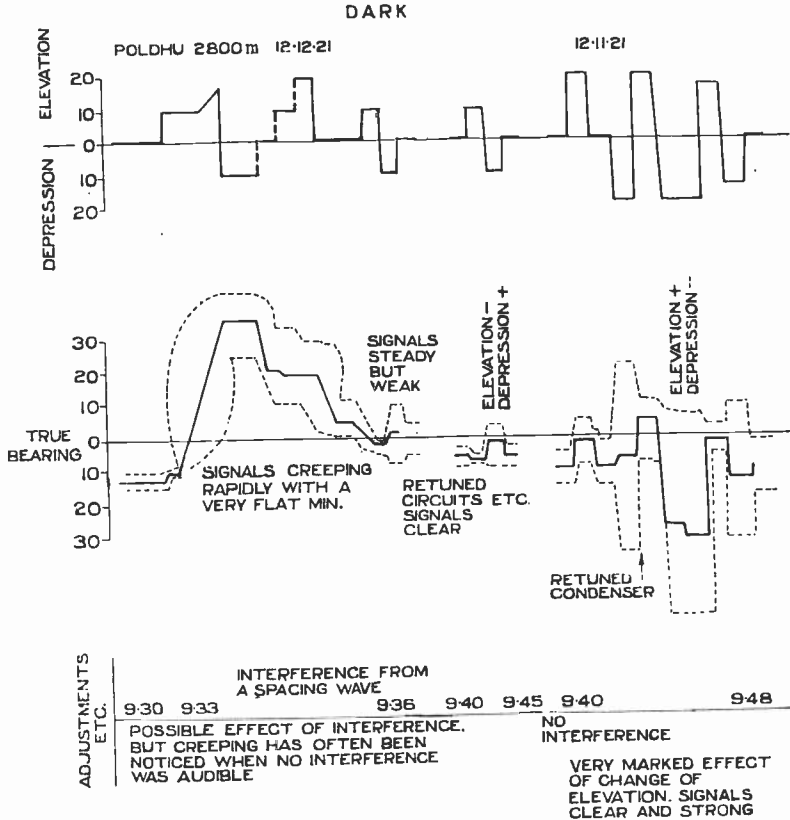


Fig. 11.

this case 130 degrees of change of elevation only brought about 30 degrees change in bearing, clockwise. The best minimum was with 20 degrees of elevation.

These results might be caused by the lines of E force in the foot of the wave lagging or the wave being reflected downwards, accompanied by a slight tilting of the lines.

Interference at an angle of 60 degrees then set in, and apparently it caused a large change in the observed bearing.

When it stopped the observations would have been repeated, but the signals stopped shortly after.

I left everything as it was, and repeated them on the following morning, when it was found that a

true bearing. but no effect whatever was produced on the signals of the third one by rotating the frame to any angle. It is difficult to account for this, unless the lines of E force were tilted about 90 degrees, which seems improbable.

Two Stations 180 degrees apart, Sofia and Leafield, on three different occasions both heard weakly on one min. with the coil hanging vertically. On elev. 20 deg. towards one, Sofia, it was cut out completely, on elev. 20 degrees towards the other, Leafield, that was in turn cut out, so that either could be read at will without interference by the other. Thus a practical use for such a coil was evident.

20 deg. is a common angle for best min. and is

worth investigation. Why should it be best for 2 stations at very different distances ?

Repeated observations day and night of the Air Ministry signals, only 1½ miles from my house, show invariably that the best min. is obtained with considerable elevation 15 to 30°. It is very sharp indeed with elevation, and rather flat with the coil vertical. This can hardly be attributed to reflection from the Heavside layer and I consider it may be due to the foot of the wave being bent back as it passes over the buildings between us. Possibly if these experiments were repeated far from a city, different results might be obtained and I hope we shall be able to do this shortly.

I think that these experiments go far to show that these waves are at times reflected downwards, bent backwards and also tilted sideways, as it is difficult to account for the results on any other

stations for our observers ; but we have records from other departments, of practical trials at sea, which are under analysis with those of longer waves. They, at any rate, indicate that D.F. work is of practical utility, and the percentage of errors over one degree in daylight at sea is small compared with what you might expect after my tale of errors of what may be present.

I fear I have dwelt too long on this subject, but its connection with the form of the wave is so closely connected with the measurement of Radiation from aerials at different distances that it leads one naturally to that problem.

The problem of calculating the electric field intensity at any place on, or near, the Earth's surface, caused by the radiation of E. Magnetic waves from a distant aerial, has been the aim of those interested in mathematical physics and

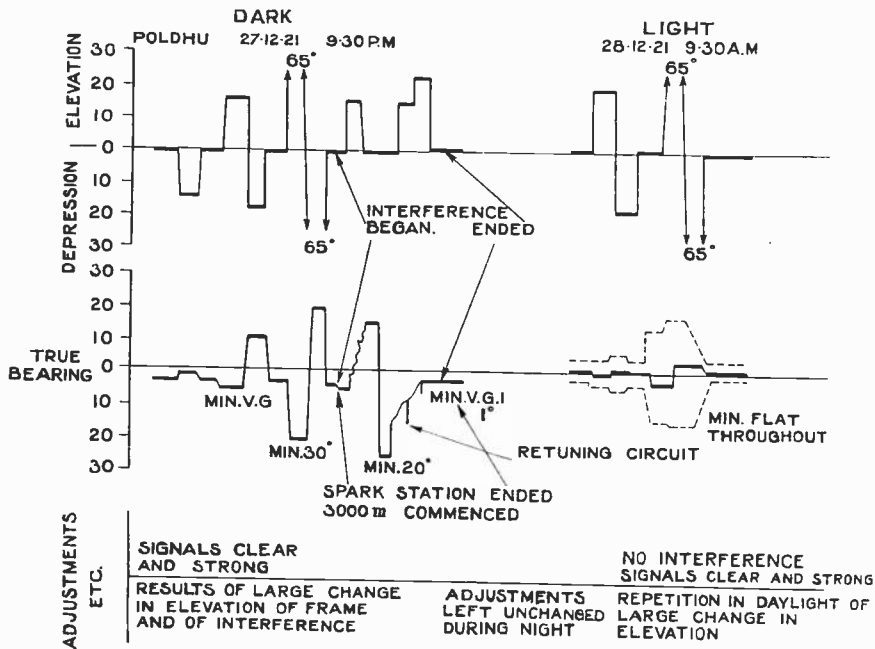


Fig. 12.

theory, and they therefore confirm the general accepted theory on this problem.

We have amongst other experiments carried out trials with a frame aerial in a long metallic tube, to ascertain if direction could be improved by this means. At present it does not appear as if any advantage can be gained in this respect, but the trials are not yet finished, nor are they advanced sufficiently for publication.

Comparative trials with different systems of direction finding are also in progress, and the effect of raising the frame to varying heights above the ground are arranged for shortly.

We are rather handicapped for short wave trials, there being but few powerful transmitting

wireless telegraphy since the first inception of practical long distance W.T. Apart from its great scientific interest, it is essential that the Wireless Engineer should have some reliable data of this kind in order to design his station for any special purpose.

Up to the present the formula originated by Poincaré, and then tested and developed practically by Austin, Cohen and others, has been his data. It is probably well known to all of you, but I will show it on the screen to remind you of its formation. It is known as the Austin-Cohen formula :—

$$I_r \text{ varies as } \frac{I_t H_t H_r}{D \lambda \epsilon''}$$

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assuming the sea to be a Plane conducting Earth and the Atmosphere ideal.

Where I_t = Current in foot of Transmitting Aerial
 I_r = " " Receiving Aerial.
 H_t = Height of Transmitting Aerial.
 H_r = " " Receiving Aerial.
 D = Distance between them.
 λ = Wavelength.

Various values assigned to the Index of ϵ are—

Austin-Cohen .. 0.0015 D/λ^4
Fuller.. .. 0.0045 $D/\lambda^{1.4}$

It has been subjected to many practical tests and also to criticism. Carefully organised trials over long and short distances have shown that it is fairly accurate at moderate distances over sea, and though its general formation seems to agree with the curves obtained under other conditions, it cannot be said that it covers the field, to which we now want to apply such a formula, with sufficient closeness to allow accurate forecasts to be made of the electric field intensities which will be produced by any aerial and power input.

Changing the value of the exponential has hitherto been resorted to in order to reconcile theory with practice.

It may be that the recording apparatus may account for some of the divergencies recorded, as for example the use of the shunted telephone system, which, electrically, is open to criticism, and combined with different human ears is not a combination which can be classed as an instrument of precision.

Direct measurements of the heating effect of the current in the aerial indicated by its thermal effect is not applicable to long distance work or weak fields, though the results obtained at moderate distances have been accepted as reliable, and we must therefore have recourse to some substitution method, in which the strength of an amplified signal is compared with that of one produced locally whose "electric field intensity" can be calculated; the strength is such that equality of the galvanometer readings is approximately obtained, and so the field produced by the distant signal is deduced.

We are developing a system of this type at the N.P.L. and hope it may be proved to be reliable as a standard. The problem will, in this event, be much simplified. By using identical instruments at many different stations, simultaneous readings being taken, we should have much more data to work upon, than is possible with only a few isolated experiments at a single station. We intend to begin with these observations at our well separated directional stations, at which not only the distance but also the direction of the transmitting station will vary.

I have little doubt that at first we shall get some discordant and puzzling results, and it may be found that some of these are mainly due to the same causes that give us discordant results with our D.F. stations.

The reflection, the lagging and the tilting of a wave from the vertical, may well apply to vertical aerials as to frame aerials. In countries such as this, dotted over with fairly powerful transmitting

stations, with a large margin of wavelengths, interference must at times be present, and this will vary at different separated stations, which may be trying to measure the electric field intensity at any moment, in spite of good tuning, rejector circuits, etc. This interference may not be audible to the operator with a telephone, but it may affect the galvanometer readings.

The environment of the station is sure to have some effect, but this it is hoped can be eliminated or allowed for.

However, if we get a satisfactory standard instrument for measuring radiation at a distance it will be a great step towards the fulfilment of an ideal; and we may then hope for an international agreement to have a few days Wireless Holiday for the general operators, whilst the scientists take their place with standard instruments at many well separated stations over the world's surface and measure the intensity of the electric fields produced by a few selected stations transmitting in turn with measured input to their aerials, on various wavelengths. This may be an ideal, and we are not ready for it yet. Let us hope we soon may be.

Hitherto our work has been carried out with no transmitting station under our own control, and we are now feeling the want of this in order to carry out programmes with short waves, quick change from spark to C.W., and various types of Aerials.

It is certainly necessary to investigate the effect of the form of aerial on the form of the wave, to ascertain if any of the errors at D.F. stations can be attributed to the shape of the transmitting aerial, such as plain, vertical or horizontal, umbrella type or inverted L type, etc.

It is also necessary to investigate further the question of buried earths and capacity earths, as the results may be of great importance in Military operations, when stations may have to change their sites almost daily. Questions regarding details of transmission also cannot at present be subjected to independent trials by the Board without such a station.

The question of how best to obtain such a station, after much consideration by the Board, has been decided by arranging for transmission from the N.P.L. at Teddington, and possibly by arrangement for special programmes by our well known W.T. Commercial Firms.

The points I have been dealing with in connection with the form and the energy of these E. Mag. Waves involve careful observation of the transmitted signal of known wavelength over a period which may be reckoned in minutes of our time, and yet they are not easy of solution. How much more difficult, therefore, is the problem of measuring not only the direction, but also the wavelength, intensity and even the duration of those momentary but worrying noises in the telephones we hear at unstated times which are attributed to electrical disturbances in our atmosphere, and are commonly known as X's, strays, or more generally as Atmospherics.

Many observations have been taken and are now being taken of the number of X's audible in various places during day and night, and I will not dwell

on this, except to say we do not think that a record of the numbers will help us much towards a solution as to their elimination, which is, of course, our ultimate object.

The Meteorological Office have been taking systematic records, with a central station at Aldershot, where progress has been made regarding the general direction and seasonal variation and wavelength and persistency of the atmospherics. The results up to date are now being analysed and will I hope shortly be published.

We have taken over this station and are equipping it with apparatus intended to analyse the character and duration of these electrical disturbances, as well as their place of origin, etc.

We have two fine large coil aeriels, wound for waves up to 20,000 metres, one of which revolves continuously by clockwork and records on a tape the reception of X's, near its own wavelength. The other frame is turned by hand at stated times for the same purpose, with aural reception. A large coil aerial with vert. aerial in connection to get sense of direction is also being erected, and a revolving search coil preferably at right angles to the clock-driven one will rotate continuously and record, as in the other clock-driven one.

To study the character of these X's we are developing the slow cathode ray tube as the most promising instrument for this purpose, but it has not passed the experimental stage. If satisfactory for single X's, it will eventually be adopted for automatic recording.

With a standard system of observing, we could extend the number of stations and area over which we could observe simultaneously; it is hoped that other countries would co-operate in this with identical apparatus, we should then be able to find the origin of the X's better than can be hoped for with isolated observers, with no organisation.

Our object is to find out exactly what these X's are, as this knowledge will render the design of counteracting them or reducing their effect less difficult than it is at present. So little is really known of their character, that it is not surprising that so little comparatively has been done to counteract them.

These three subjects—Radiation, Direction Finding and Atmospherics—in the way we are treating them, are closely allied and are a part of Nature's laws which have never been really seriously investigated, their practical effect on our ordinary lives not having been noticed till the advent of W.T. It may be that even if we ascertain the cause of divergencies and interference from X's, we may be no nearer their elimination, and have to fall back on forecasting like the Meteorologist; an Art not very far advanced after all these years of Study. Maybe we shall have to work in close co-operation with that Office, as it is by no means settled definitely that weather has not some effect on the ionisation of the atmosphere. We may have to send out storm signals saying "Ionic clouds are present in such and such areas and D.F. work will be useless." That would be better than nothing, but let us hope we shall be able to do more than that. Patient research will, however, be necessary before we can do even this.

I hope that I have at least convinced you of the necessity for thought and further investigation and research in these problems for determining the true shape of a wave in different cases, and then applying the results to practice. I hope that many others are already working in this field, and, if so, that my crude results may be of some assistance to them. To my pleasure I learn this evening that our past President, Major Erskine-Murray, has been experimenting on the same lines.

I thank you for the attention you have given to my address.

Third Annual Conference of Affiliated Wireless Societies

(Continued from page 764 of previous issue.)

Mr. F. Hope-Jones.

The next item on the agenda is:—

"That the Wireless Society of London form a special organisation or committee to deal with any technical matter of advanced nature from affiliated societies or clubs."

I think you will remember an invitation from our President-elect—Admiral Sir Henry Jackson—in his position as Chairman of the Wireless Research Board, that any points of scientific interest or novelty should be submitted to that Board for discussion. I just remind you of that because it was a definite invitation presented to this Society, and it has an obvious bearing on the subject-matter of this item on the agenda. I should be glad if anyone who champions this proposal will speak to it.

Mr. L. H. C. Crowther (Sheffield and District Wireless Society).

Our Society sent this forward, and I should like to say a few words. We have now had three sessions of papers, and invariably some point crops up in the paper itself or in the discussion upon which one would like technical advice, and although some societies may have experts at their head, we are not in that fortunate position. When such points crop up in the local societies' discussion we thought they might be forwarded to the parent society for their investigation and report. Perhaps the circular letter, which the Secretary has promised us, might include the answer to the point sent up. The text books available do not throw much light on the matters that come up in this way. Then, I think that the results of experimental transmission

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and reception, and research work generally on the part of amateurs, might be submitted to this body, and they could then consider whether the results were of sufficient interest and importance to justify, say, a report being sent in, which could be inserted in this circular letter for the benefit of the whole of the members. I think, also, that advice might be given by that body as to lines for original research which might be carried out by the societies. I do not think I have anything further to say, and I thank the Chairman of the London Wireless Society for reminding us of our President's wish that any point of this nature should be submitted to the Research Board, and that will, no doubt, be made in future.

Mr. A. W. Knight (Wireless and Experimental Association).

May I ask whether this matter has arisen out of some work which the Experimental Wireless Association did, and which has suggested that a Board of Investigation be appointed which members might approach. The one rather seems to clash with the other, because one is information sought and the other is information given. I think that one of our other members might like to say a few words on that, and it seems to me that this item rather clashes with the next one on the agenda, which is No. 7.

Mr. P. Voigt (Wireless and Experimental Association).

I thought the idea of our Club was a good one, viz., that if some Board of Invention was formed it might develop into a very useful body. The idea was that inventions or suggestions should be submitted to it by members of the local societies, and if they thought there was anything in them, they would be examined by experts and criticised, and, if promising, then assistance might be given. We did not think of asking for information on technical matters, although that might be included afterwards. The preliminary purpose was that if any invention turned up it could be sent to this Committee, and perhaps developed, if good, and not lost to the world generally, as might otherwise be the case.

Mr. L. McMichael (Hon. Secretary Wireless Society of London).

This item on the agenda was taken from the Sheffield Wireless Society, but we felt that the suggestion was really dealt with by the Radio-Research Board, as the Chairman has mentioned.

Mr. C. F. Phillips (Wireless Society of London).

With regard to the Radio-Research Board, may I ask whether any publication is entailed in communications sent to the Board. Is publication automatically entailed, technical publication I mean, which would prevent anyone from protecting by patent afterwards.

The President.

Publication is at the discretion of the Board, but we should not stop a patent.

Mr. C. F. Phillips (Wireless Society of London).

One may make a communication to the Research Board without "technically" publishing one's ideas.

The President.

Oh, yes. With regard to the item which is being discussed, we have no machinery or organisation at present for giving criticisms of inventions put forward in the manner suggested, but so far as I can judge by reading *The Wireless World*, the Editor of that journal does a great deal of that. I think the last few pages of *The Wireless World* are extremely interesting reading, and that seems to me almost to cover the point. With regard to our Radio-Research Board, I will tell you more about that this evening, but we do not go for inventions, and we do not go in for details of circuits or improvements in circuits or amplifiers and things of that kind. Ours is very much more fundamental research, which I will tell you about this evening, but if anybody thinks he has got an original idea and will communicate with us we will advise him. We have already given opinions to many people on their ideas, semi-officially, and it goes no farther, but we cannot undertake to do it for the whole of Great Britain in small matters. If everybody sent in every idea which he thought was any good, I think we should be rather swamped, judging from what happened in the war at the Admiralty when we used to get about 2,000 a day. Therefore, we cannot run to that but there is no machinery in the Society to deal with this, and I do not know whether you wish us to consider it. All I can say is that we will see if anything can be arranged in the matter; that is the most I can do at present.

Mr. P. Voigt (Wireless and Experimental Association).

The idea of the club was that ideas could be investigated by the proposed Board of the Wireless Society of London and passed on to the Radio-Research Board if thought worth it.

The President.

That it might go through the Wireless Society of London before the Radio Research Board?

Mr. P. Voigt.

Yes.

The President.

As Chairman of the Radio-Research Board I should welcome that, but I do not think the Wireless Society of London has any arrangements for doing that at present, and so you had better communicate direct with the Radio-Research Board.

Mr. E. H. Shaughnessy (General Post Office).

That raises a very delicate point with regard to Patent Law for anybody having an invention and sending it on to the Board. I do not know how far that embodies publication and renders the possibility of taking out a patent subsequently very, very small indeed.

The President.

I should think so.

Mr. E. H. Shaughnessy (General Post Office).

Yes, I think so. I think the idea of submitting ideas to a Board of the Wireless Society of London is rather like submitting an invention to a patent agent, to get advice. That is how it strikes me, and it seems to me an impracticable proposition.

Mr. P. Voigt (Wireless and Experimental Association).

The idea was to take out a provisional patent first, and if you thought it was worth while going on with it, pass it on to the Central Body.

Mr. L. F. Fogarty (Hon. Treasurer, Wireless Society of London).

That would be all right as long as there were not too many of them. If there were, I am afraid that the number of investigators or examiners and their qualifications, scientific, technical and commercial, would have to be such as might involve the Society in an expenditure of many thousands of pounds per annum.

Mr. J. Scott-Taggart (Wireless Society of London).

Perhaps the best way would be to file a provisional specification and submit the idea to one or other of the different wireless companies, who would be only too pleased to consider any new ideas.

The President.

I think we shall not be able to do much to meet the wishes of the meeting in that respect, so I think we will pass on to the next item, which is "Any Other Suggestions?"

Mr. F. Hope-Jones.

With regard to this item, Mr. President, I think you have given me the most difficult job of the whole Conference, when you ask me to make comments regarding the number of suggestions we have been unable to put on the agenda. Quite frankly, some of these suggestions that are the residuum of the whole correspondence with the affiliated societies were not serious, and I do not think they were ever intended to be discussed at all this afternoon. Of course, it is a difficult thing to arrange a programme for a conference of this kind, and it seemed to me on the face of it almost impossible that every suggestion made from the north could be the subject of discussion this afternoon. It is quite likely that there are some societies whose representatives here feel a little aggrieved that some subject that has been suggested by their secretary to our secretary here for discussion this afternoon has not been dealt with, and I would rather, with your permission, Mr. President, just ask anyone who feels there has been a serious omission in that respect if he would be good enough to raise the question now.

Mr. A. J. Dixon (North Middlesex Wireless Club).

Our society sent in a suggestion, that when matters pertaining to affiliated societies are to be discussed at the Wireless Society of London's committee meetings, opportunity should be given to a fully accredited member of the affiliated society to attend such Committee meeting, if he so desires. I consider that when our clubs and societies are under discussion by the Committee of the London Society—matters which are vital to their well-being—an opportunity should be given to a properly accredited member of that affiliated society to be present and explain any points which may arise during the course of that meeting.

Mr. F. Hope-Jones.

I think it may help if I just answer that now.

Of course, it is simply this. The Committee of the London Society meets once a month, and sometimes more frequently, except in the summer months of June, July and August. It is a very rare thing for an item to appear on our agenda which seriously affects the well-being of any one of the affiliated societies or the body of them. I cannot remember an occasion when an item on our agenda seriously affected the well-being of the affiliated societies. I think that is what the last speaker had in view when he suggested that at future meetings, when there was such an item, a representative of the affiliated society concerned should be present. I can only tell you that, as regards the societies as a whole, we look upon this Conference, at the end of January, as being the one opportunity of getting into touch with you, and you expressing, by word of mouth, what your wishes are. Apart from that, we rely upon correspondence.

Mr. A. J. Dixon (North Middlesex Wireless Club).

I think you have rather missed the point. It is not a question of whether you are discussing one particular society. The object is to get the affiliated societies and the parent society closer together more often. If a point crops up we can, of course, discuss it by correspondence; but if we were there at your committee meetings, giving your committee the benefit or otherwise of our advice, on the spot, I think it would be very much better. The idea is to get into closer co-operation with the parent society, instead of having to wait a year before we can say anything.

Mr. M. Child (Wireless Society of London).

That difficulty would be got over if the secretary of the affiliated society, or some member of it, were to write to a member of the committee of the London Society, bringing any particular matter to his notice. I feel sure I am voicing the views of the members of the London committee by saying that if any one of us received a letter from a member of one of the affiliated societies, we should be only too pleased to discuss the matter with him at a suitable opportunity, and then to bring it forward before our own committee and assist them in the matter. Of course, there is the other alternative—of writing to the Secretary of the London Society. I think this meets the case.

Mr. L. F. Fogarty (Wireless Society of London).

We ought to take into consideration in this matter that there are some fifty provincial societies and I am afraid that if one member from each of these attended the meetings of our London committee they would form a rather large body of people, and discussion would be rather prolonged. Another thing is, that it would be rather impracticable for the provincial societies in the North of England to attend. I do not think the objects suggested would really be fulfilled, because many of the societies could not send members.

Mr. C. F. Phillips (Wireless Society of London).

Would not the proposer's object be met in this way? In these rare cases that when an affiliated society brings a matter forward for the consideration of the London committee, a member of that society should be asked to attend the London

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committee meeting to discuss the point. It would very rarely occur, and it would really meet the view of the proposer.

The President.

Is that what you would like ?

Mr. A. J. Dixon (North Middlesex Wireless Club).

The principle is the thing.

Mr. F. Hope-Jones.

I think we shall be agreeable to that, accepting that as a resolution proposed by Mr. Dixon, of the North Middlesex Society: "That in the event of any matter affecting an affiliated society being on the agenda of a meeting of the Committee of the Wireless Society of London, a representative of that Society should be invited to attend."

The Resolution was seconded and carried.

Mr. F. Hope-Jones.

I want to remind you that this Conference has to choose a day for the weekly transmission of the Marconi Company, from Chelmsford. We have heard the details, and it is for us to say what day would be most convenient. It is from 7 to 7.30, the last fifteen minutes being telephony.

Mr. E. H. Shaughnessy (General Post Office).

There are just one or two little things I would like to mention. In the first place, I am very much struck at this first Conference I have attended, at the unanimity of opinion and the serious manner in which experimental work in wireless telegraphy, or, as I prefer to call it, radiotelegraphy, is pursued. I notice that there are many clubs and societies affiliated with the Wireless Society of London, and there has been a proposal on the paper to make a British Association of wireless societies. I think that idea should sink into our minds and ultimately develop. I would suggest, as a first means of doing that, that all the provincial bodies calling themselves clubs should call themselves societies instead. "Club" somehow or other does not seem to be quite so dignified as "Society." It sounds more of the order of "our harmonic club" and that sort of thing, although I know we get harmonics. I do not know whether there is any reference to that, when they call themselves "clubs," but I would suggest seriously that you should consider calling the clubs societies. That would pave the way to a British Society. I would further recommend that instead of calling this the Wireless Society of London, it should be called the Radio Society of London. At the inter-Allied Conference in Paris this year, the various nations dealt with nomenclature, and they preferred to accept the terms radiotelegraphy and radiotelephony to wireless telegraphy and wireless telephony. We could then get a British Radio Society or Association. With regard to the wavelengths which have been discussed, there seems to be a sort of impression that anything below 180 metres is not used, or is not likely to be used. Very great distances, however, commercially, can be got with as low as 30 metres or something of that nature, and certainly very much below 150 metres, and when it is recollected that a 1 per cent. change of wavelength down at these low values represents very many kilocycles, it will be realised that good

work can be done at these short wavelengths. It would therefore be undesirable to fill up these available bands by too many breadths being allocated even to experimental purposes. It is likely to hinder rather than develop the art. The 1,000 metre wave ought to be quite clear of the 900 metre wave. Taking a 5 per cent. difference, the wavelengths ought to be 1,000 and 950, and if C.W. telegraphy were done exactly on the 1,000 metres wavelength, it would not interfere with telephony. 1,000 metres is 300 kilocycles allowing 2 per cent. width of band or 6 kilocycles that is from 990 to 1,010 metres. Wireless telephony transmission should not interfere with any signalling on 950 metres.

Mr. F. Hope-Jones.

If you have no particular wish to express with regard to the day of the week for this weekly programme of calibration waves and telephony, you will presumably leave it to us to settle.

This was agreed to.

Mr. L. F. Fogarty (Wireless Society of London).

I should like to trespass for a few minutes on the time devoted to this Conference to ask the delegates of affiliated societies to consult with their committees with a view to adopting a postal address which would remain permanent for at least six months or a year. As Treasurer of the London Society it is my duty to keep records of such addresses and to instruct the publishers of the proceedings when any change takes place. Despite every care possible in a voluntary institution of this kind, I find, together with the secretary, that complaints reach us from time to time of non-delivery of notices and publications. In a good many instances these are traced to be due to the fact that we were in ignorance, still sending correspondence to the address of former officials no longer in office. I should like to be allowed to explain that every member and each affiliated society has a separate page in my ledger at the top of which appears the address and the secretary's name, but as this does not provide much space for the changes during the past few years, we have now adopted a card filing system to keep track of such things, and to pass them round with as little delay as possible. It will be understood, however, that the notices and proceedings can only be issued promptly and economically by means of an addressograph machine, which the proprietors of *The Wireless World* very kindly placed at our disposal, but the economy resulting from the use of such devices depends in a large measure on the extended use of each plate over a considerable period before requiring to be replaced. Sometimes delays are introduced by Mr. McMichael's or my own absence from London, and the exigencies of our business affairs, and it is reasonable to assume that the hard-worked secretaries of affiliated societies find themselves in a similar position. It has, therefore, been impressed on me that in regard to routine matters of this kind we ought to make things as automatic as possible so that the ordinary notices and proceedings can be sent out and delivered without too much detailed personal attention on the part of busy treasurers and secretaries. I feel that this admirable result would

in great measure be attained if our affiliated societies arranged with the Post Office, or an officer, to allow such letters to be addressed to his care. It is fully recognised that at the best, changes of address will be necessary from time to time, and if on such occasions the secretaries will notify me at Dene Cottage, Ruislip, I will undertake to have the records amended and transmitted to the Secretary and publishers of *The Wireless World* with a minimum of delay. I think in this connection we ought to realise, as individuals and societies, the debt we owe to *The Wireless World* for their assistance and help in many directions. I should be very much obliged if all secretaries and members would note that in addition to the foregoing, I deal with all matters of finance on behalf of the London Society, and that much time and labour will be saved by addressing communications on that subject direct to me.

The President.

That concludes the Conference, and I thank you for your attendance. We hope you are satisfied that we have done something definite, and we will do our best to meet your views. Our thanks are due to the Post Office officials for their attendance and we have appreciated very much, indeed, the remarks of Captain Loring and Mr. Shaughnessy.

The proceedings then closed.

Corrections to Report appearing in last issue :—

P. 759 left-hand column. For Mr. A. W. Knight read Mr. W. C. Gosheron.

P. 761 left-hand column. For Mr. S. S. Angel read Mr. G. F. Auckland, and for Mr. G. F. Auckland read Mr. C. T. Atkinson (Leicestershire Radio Society).

P. 762. For Mr. G. F. Auckland read Mr. C. T. Atkinson (Leicestershire Radio Society).

Glevum (Gloucester) Radio and Scientific Society



AN Exhibition was recently held at the Gloucester Baths, by the Associated Societies of Gloucester. The accompanying photograph of our stall was taken by the courtesy of Messrs. Debenham & Co., Gloucester. Our members had three days' strenuous work, answering questions and obtaining signals for the crowds which besieged their stall. By arrangement with one of our members we were able to give some good telephony each day. The enthusiasm of the schoolboys and their intelligent enquiries promised well for

the future development of wireless. With a four-valve Burnham set in conjunction with a six-valve amplifier and loud speaker, much interest was taken in the signals by the uninitiated. When Paris was tapping out her signals it rather suggested the notes of a cornet. The Exhibition was a decided success; our contribution was one of the principal attractions.

The Wireless World was displayed on one of the tables, together with other literature of instruction in wireless study.

Wireless Club Reports

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter in the exact form in which they are to appear and as concise as possible, the Editor reserving the right to edit and curtail the reports if necessary. The Editor will be pleased to consider for publication papers of unusual or special interest read before Societies. An Asterisk denotes affiliation with the Wireless Society of London.

The Leeds and District Amateur Wireless Society.*

Hon. Secretary, Mr. D. E. Pettigrew, 37, Mexborough Avenue, Chapeltown Road, Leeds.

A General Meeting was held at the Leeds University on Friday, February 10th. The Morse class was held as usual under the direction of Mr. P. Cockroft.

At 8 p.m. Mr. A. M. Bage (Vice-President) took the Chair, and announced that it was proposed to initiate an "Exchange and Mart" in connection with the Society, particulars of which were being drawn up.

The Chairman then called upon Mr. H. F. Yardley to deliver a paper on "Valve Transmitting Apparatus." Mr. Yardley (who operates 2NA and 2NB) commenced by explaining the method of transmission of damped and undamped waves, mentioning some of the relative advantages and disadvantages of such transmissions. He then explained very clearly and concisely, how continuous waves may be modulated by audio frequency currents for the transmission of telephony. With the aid of diagrams numerous types of valve transmitters were described. Characteristic curves, reaction principles, and the H.T. anode supply were considered. The lecturer then proceeded to describe his transmitter of telegraphy and telephony, the principal components of the set being on view. The very neat and compact set was greatly admired, and undoubtedly inspired some of those persons present to apply to the P.M.G. at once for a licence for transmission. Mr. Yardley dwelt upon the method he had adopted for obtaining 2,000 volts D.C. from the 220 volt 50 cycle lighting mains. By means of a transformer with centre tap to secondary, and two Cossor rectifying valves in parallel, full wave rectification is attained. The pulsating D.C. is "smoothed out" with chokes and condensers before being applied to the anodes of the transmitting valves. Filament current is obtained from another secondary winding of the transformer at 8 to 10 volts 50 cycles. The transmitting valves are Marconi-Osram and Mullard types. The A.T.I. is of the variometer pattern, duo-lateral coils being used in series, and mounted upon a holder as often used for receiving. Reaction is obtained from a third duo-lateral coil.

At the close of Mr. Yardley's address, the Chairman declared the discussion open. Many interesting points were raised as the discussion proceeded, the subject of modulation transformers being very thoroughly analysed. At the cessation of the discussion a hearty vote of thanks was accorded to Mr. Yardley. The proceedings then terminated.

Cambridge University Wireless Society.*

On Monday, January 25th, a meeting of the Society was held when Mr. F. S. Thompson (Peterhouse) delivered a lecture entitled "A 120-Watt Valve Transmitter" in which he ably described the Army 120-watt continuous wave

set and gave some account of his experiences in handling it. A number of questions were asked at the end of the lecture, and the meeting concluded with a vote of thanks to the lecturer proposed by the President.

On Wednesday, February 8th, Professor R. Whiddington, of Leeds University, read a paper before the Society entitled "Wireless Circuits in Minute Physical Measurements." In the unavoidable absence of the President, Mr. N. C. B. Carrick presided. The lecturer with the aid of lantern slides described his ultra-micrometer which makes use of the change of frequency in an oscillatory circuit due to minute movements of the flakes of a condenser. By this means movements up to one two-hundred millionths of an inch could be detected.

He then proceeded to point out how this instrument might be applied to measure physical quantities hitherto undeterminable to such a degree of accuracy. At the conclusion of his paper, Professor Whiddington answered a number of questions put to him by members, and the meeting concluded with a vote of thanks proposed by Mr. Turner (Vice-President).

On Monday, February 13th, Mr. L. B. Turner delivered a lecture before the Society entitled "Reception Experiences, Cairo, September, '21" in which he described some of the experiments he had carried out in connection with the Cairo station of the Imperial Wireless Chain. These experiments, which were primarily carried out with a view to the elimination of atmospheric disturbances, had led him to the conclusion that the use of short waves in this case was justified and that the solution of the problem of atmospheric lay not so much in the type of aerial employed, but rather in the introduction of some limiting device in the receiving circuit. He described some interesting experiments for cutting out atmospheric by direction-finding methods.

At the conclusion, Mr. E. B. Moullin proposed a vote of thanks to Mr. Turner for his interesting and instructive lecture and pointed out the need for research in determining the intensities of wireless signals at a distance from a station.

The Society now has a membership of approximately 80.

Hon. Secretary, Mr. D. A. L. Wade, 16, Trumpington Street, Cambridge.

Newcastle and District Amateur Wireless Association.*

Hon. Secretary, Mr. Colin Bain, 51, Grainger Street, Newcastle-on-Tyne.

On Thursday, February 16th, the members of the Society paid a visit to the offices of the Radio Communication Co., in response to an invitation given by the agents (Messrs. Marley and White). Everyone was highly delighted with the apparatus which was demonstrated, and fully described to them, by the company engineers.

The arrangements have been completed for

purchase, and fitting up of a cabinet to contain the Club's permanent receiving set. This should be completely installed within the next fortnight.

The Club meetings continue every Monday evening as previously. A special Morse class will be arranged for Thursday evenings if sufficient names are sent in to the Secretary.

Burton-on-Trent Wireless Club.*

A very interesting lecture was given at a meeting of the Burton Wireless Club, held on Tuesday, February 14th, at the "Burton Daily Mail" Offices by Mr. T. W. Parkin, B.Sc., who dealt with the construction, action, and maintenance of an accumulator.

The Secretary, Mr. A. J. Selby, reported that he had received intimation from the Wireless Society of London that the Marconi Scientific Instrument Co., had arranged to transmit each Tuesday evening telephony and music from a station near Chelmsford.

The next lecture will take place on Friday, the 24th inst., at the "Mail" Office, when Mr. A. J. Selby will lecture on how wireless waves are made to encircle the globe, and the application of the spectroscopy in science. Demonstrations will be given on the apparatus to be provided.

Hon. Secretary, Mr. A. J. Selby, 68, Edward Street, Burton-on-Trent.

Sunderland Wireless and Scientific Association.*

At a meeting held at the Technical College on February 18th, Mr. Sayce gave a short explanation of the theory underlying electrostatic phenomena, and illustrated some of the more striking features of wave motion. An interesting series of slides were exhibited showing details of various large stations fitted with modern thermionic valves, and having shown the uses of wireless in transmitting time signals and for determination of ship's bearings, he concluded with a slide showing the historic message sent out from Eiffel Tower and picked up at the Marconi House, announcing the armistice. Mr. Sayce advised amateurs not to make a toy of wireless, but to treat it seriously and to examine and try to understand the working of every piece of apparatus they used.

Mr. W. T. Maccall proposed a vote of thanks, which was seconded by Mr. G. T. Ferguson. Mr. Sayce in replying, thanked the Marconi Company for the loan of slides and the staff of the Physics Department for their assistance in preparing the demonstrations. The President, having thanked the education authorities for the use of the room, announced that subject to the approval of the committee the next meeting would be held on Saturday, March 4th.

The following officers have been elected:—President, Mr. G. Nelson, B.Sc., A.R.C.S.; Vice-Presidents, Principal Mundella, M.A., B.Sc., Mr. W. T. Maccall, M.Sc., M.I.E.E., Mr. J. A. Wilken, C.E., Ph.D.; Secretary, Mr. H. G. MacColl; Treasurer, Mr. R. S. Allan; Committee, Messrs. E. R. Verity, B.Sc., A.R.C.S., W. J. Atkinson, D. McIntosh, L. A. Sayce, E. Forster, R. Baker, and Mr. Jeffrey.

Hon. Secretary, Mr. H. G. MacColl, North Elms, Sunderland.

North Middlesex Wireless Club.*

The Club held its Annual Social Evening on Wednesday, February 22nd, at the Headquarters, Shaftesbury Hall, Bowes Park.

The Hall was well filled by members and their friends, and an excellent programme of vocal and instrumental items had been drawn up by the Committee. Refreshments were served during the interval, after which Mr. L. C. Holton called up Mr. Midworth's station and after some preliminary tests Mr. Midworth's voice was heard calling. He then gave a pianoforte solo by wireless, which was clearly heard all over the Hall. After answering some questions put to him by Mr. Holton, he reported "closing down," and the remainder of the musical programme was proceeded with. The demonstration appeared to create great astonishment among those of the audience who were unacquainted with the marvels of this latest science, although if the atmospheric conditions had been better the results would have been better still.

The Chairman, Mr. A. G. Arthur, moved a vote of thanks to the artists who had so kindly given their services, and to the lady helpers who by their assistance in the matter of catering had so materially contributed to the success of the evening. This was carried with enthusiasm.

The Club holds its Annual General Meeting on March 22nd. It is hoped that all members will make a note of this, and put in appearance, so that the election of the Officers and Committee for the ensuing year will be as representative as possible.

Full particulars of the Club may be obtained from the Hon. Secretary, Mr. E. M. Savage, Nithsdale, Eversley Park Road, Winchmore Hill, N.21.

Sussex Wireless Research Society.*

Hon. Secretary, Mr. Edward Hughes, B.Sc., A.M.I.E.E., The Technical College, Brighton.

On February 15th, a lecture on "Electrons and X-Rays" was delivered by the President, Capt. Hoghton. Electrical discharges through tubes exhausted to different degrees were fully discussed, and the bearing of these upon the development of the modern theory of the constitution of matter was explained. The lecturer concluded by demonstrating discharges through a large number of different types of bulbs whereby the effects of different degrees of exhaustion and the characteristics of an electronic stream were most vividly illustrated.

Another meeting of the Society was held at the Technical College, on February 22nd, when the Secretary gave a lecture illustrated by a number of experiments indicating the various characteristics of magnetic fields produced by single-phase and three-phase currents, and their applications in the construction of various A.C. apparatus and machines. A singing arc was also demonstrated, and the paralleling of two alternators was shown with an oscillograph, the waves on the latter indicating how the machines vary in phase relationship from instant to instant.

Wireless and Experimental Association.*

At the meeting of the Wireless and Experimental Association at the Central Hall, Peckham, on Wednesday, February 16th, the first transmission

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for amateurs by Messrs. Marconi under the sanction of the Postmaster-General was a topic for discussion. Nearly everybody had succeeded in tuning in the calibrating messages and speech and music and many regrets were expressed that jamming interfered so much with the results. Mr. Knight then proceeded to deliver his promised lecture on design and construction of switchboards, having special reference to wireless requirements, and showed how much more advantageous it is to have everything neatly arranged than to have to trip over loose leads, to say nothing of the inconvenience of getting a bad shock oneself or "busting up" some cherished piece of apparatus by an inadvertent short circuit. The man who has arrived at finality in the arrangement and wiring of his apparatus has yet to be found amongst ardent wireless men, but there is little excuse for the untidy appearance of the apparatus boards of most of us.

Members in addition to being good listeners when there is something good to listen to, are also, almost to a man, good talkers, and this, it must be admitted, is a somewhat rare combination.

Mr. N. G. Hersey has been sitting in our midst for some months, joining in debates occasionally, and showing that he had a keen appreciation of things wireless, but it was not till he gave us a lecture on February 22nd that we knew what an indomitable experimenter he was.

He wanted to install a high frequency amplifying valve in front of his detector in order to receive the Dutch Concerts and weak telephone signals, and naturally turned to the standard text-books for information. This was forthcoming in quantity but upon being put to the test of performance it was found to be sadly lacking in productiveness of the desired results. Mr. Hersey applied himself to the task of building up and destroying again and again, each failure teaching him something, until he had completed a range of high frequency transformers which led him up, by gradations, from 180 metres to a point at about 5,000 metres, where he found that capacity resistance coupling was as efficient and more manageable.

Mr. Voigt followed with his system of dual amplification, that is, he made one valve do the work of two by first amplifying the signals and then rectifying the signals it had amplified.

There was no time left for questions so they were perforce held over until next meeting.

Hon. Secretary, Mr. Geo. Sutton. A.M.I.E.E., 18, Melford Road, S.E.22.

Bradford Wireless Society.*

Hon. Secretary, Mr. J. Bever, 85, Emm Lane, Bradford.

A meeting was held in the Clubroom at 7.45 p.m. on February 24th, with the President in the Chair. After the business of the meeting, during which four new members were elected, the Chairman called upon Mr. J. Bever to give his lecture on the Principles of Wireless Reception by means of the Valve. Commencing with a dissertation on Matter and the Electron Theory, the lecturer led his discourse in a very able manner through the theory of the valve and the new members very much appreciated the manner in which the subject

was explained. This lecture is to be continued on March 10th, when the various forms of valve circuits will be described. The meeting closed with a general discussion.

Will members please note that there is to be a special lecture by Mr. T. Brown Thompson, Messrs. Burnham's Leeds Manager, entitled "Types of Valves," at 7.45 p.m. on March 24th. It is hoped that on this occasion there will be an exceptionally good attendance.

Willesden Wireless Society.*

Secretary, Mr. F. A. Tuck, 87, Mayo Road, Willesden, London, N.W.10.

The public lecture and demonstration at the Harlesden Public Library, on February 17th, was quite a success. Capt. W. R. H. Tingey was our lecturer and despite the very bad QRM from the Local Power Station the voices of radio stations were heard anywhere in the hall. Capt. Tingey explained in his usual lucid manner the elementary principles of wireless. He demonstrated the reception of Lyons on a chain aerial composed of eight men and then a four-foot frame, and was accorded a hearty vote of thanks. Mr. W. Gregory, a local gentleman, kindly acted as Chairman. Mr. C. Dunham made a very nice speech welcoming one and all to our meetings and Mr. W. Corsham helped in the demonstrating. The weather report from Poldhu was received and the meeting closed with the FL time signals at 11.45 p.m. The library authorities were greatly pleased with the lecture's success, and are pressing for an encore. Our membership is now nearing 60, but, like Oliver Twist, we have still room for more, and if our headquarters becomes too small there is still the Crystal Palace. We know that there are a number of local amateurs who are not members.

On Tuesday Mr. Wyatt delivered a lantern lecture entitled the Poulsen Arc, and made feeling remarks about G.B.L., all of which were heartily endorsed by his audience. The lecturer was thanked and suitably replied.

Edinburgh and District Radio Society.*

Hon. Secretary and Treasurer, Mr. W. Winkler, 9, Ettrick Road, Edinburgh.

On Wednesday, February 15th, a meeting of this Society was held in the Philosophical Institute at 8 p.m. The Vice-President in the Chair.

Mr. Hugh Martin, Radiographer to the Royal Infirmary, Edinburgh, delivered his lecture on the development of X-Rays, illustrating his remarks with lantern slides, and tubes showing the various stages in the progress which has been achieved during the last 25 years.

In a very clear and lucid manner he explained the discovery of those extremely short electromagnetic waves produced by the bombardment of a metal "Target" by cathode rays. He described the many difficulties which had to be overcome before the present state of perfection was evolved in the shape of the "Coolidge" tube.

Several pictures showed the humorous as well as the more serious side of medical X-Ray work, denoting incidents which occurred in the daily hospital routine.

Before closing his discourse, Mr. Martin showed how X-Rays were being used to a very large extent commercially to assist in manufactures.

The Chairman then proposed a vote of thanks to the lecturer which was very heartily accorded and members had an opportunity of making a closer inspection of the various interesting pictures and apparatus which were produced for the occasion and receiving personal explanations on any points of doubt.

Woolwich Radio Society.*

Hon. Secretary, Mr. H. J. South, 42, Greenvale Road, Eltham, S.E.9.

A special meeting of the above Society was convened on February 8th, at 7.45, to consider the moving of our headquarters to the Y.M.C.A., Thomas Street, Woolwich. It was resolved:—
(a) That the Y.M.C.A. be made our practical headquarters, and that the apparatus be removed there from the Old Mill, Plumstead, and re-erected at the Y.M.C.A. (b) That the night of the weekly meeting be changed to Wednesday, 7.30 p.m. (c) That buzzer classes be re-established, 7.30 to 8 p.m. (d) That the apparatus Sub-Committee make up a set which will receive on any wavelength, and with any stage of amplification necessary. All these proposals are being or have been carried out.

On February 24th, at 8 p.m. we held our usual monthly meeting at the Woolwich Polytechnic. Captain C. T. Hughes, R.E., was in the Chair. Mr. McPherson, B.Sc., our worthy Chairman, took for the subject of his paper, "Simple Wireless Calculations." He prefaced his remarks by saying that none of the calculations to be given involved anything more difficult than square roots. He began with the aerial, and showed how to work out the capacity, inductance, and natural wavelength of P.M.G. aerials. Next he dealt with coils: cylindrical, pile wound, pancake and basket, showing us how the wavelength could be found for various coils by using Nagaoka's well-known formula.

Captain Hughes, in bringing the meeting to a close, explained why wireless engineers go bald prematurely. He offered to the Club a set of blue print curves embodying Mr. McPherson's figures and formulae, an offer that was gratefully accepted.

The evening ended with a very hearty vote of thanks, both to Mr. McPherson and to Captain Hughes, which was carried with acclamation.

On Friday evening, March 31st, 1922, we are to have a lecture and demonstration on X-rays by Mr. A. C. Beeson.

All interested are invited, as well as to the weekly meetings of the Society at the Y.M.C.A., Thomas Street, Woolwich, on every Wednesday, except the last in the month, at 7.30 p.m.

Radio 'Scientific Society, Manchester.*

An ordinary meeting of this Society was held on Wednesday, February 1st, at 61, High Street, Mr. G. G. Boullen in the Chair. One new member was elected.

Before the lecture of the evening the delegates to the Conference of Wireless Societies in London gave full and interesting details of the proceedings.

Mr. Holmes then gave his paper on Radio-frequency amplification, which was of more than usual

interest, and caused much exchange of views between the lecturer and members present.

The evening closed with a hearty vote of thanks to Mr. Holmes.

An ordinary meeting of the Society was held at 61, High Street, on February 15th, Mr. G. G. Boullen in the Chair.

There was no business of a special nature.

Mr. A. L. Megson was then called upon to give his paper on "Workshop Hints in the making of Wireless Apparatus," and presented many interesting ideas which were much appreciated by the members present on account of the fact that any apparatus Mr. Megson brings to meetings is always of a very high standard of workmanship.

Mr. Megson was heartily thanked for his paper. The Secretary, Mr. Whitehouse, 16, Todd Street, Manchester, will be very pleased to give intending members full details of the Societies' activities.

Luton Wireless Society.*

Hon. Secretary, Mr. W. F. Neal, Hitchin Road Boys' School, Luton.

The Society is becoming still more popular and more receiving licences are being granted. Members meet every Thursday at 8 p.m., and Morse practice is given under the direction of Mr. R. H. Cox. A series of lectures, primarily for beginners, are given at alternate meetings. The Society has purchased a Morse Inker and Synchroniser, and a 4-valve experimental receiving set is being constructed under the direction of Mr. F. W. Pellant.

Arrangements are being made for the Second Annual Exhibition to be held on Saturday, April 29th, and it is hoped to make it even more successful than the previous one.

On Thursday, January 19th, a popular demonstration was given by members, and Messrs. Tingey and Burnham kindly transmitted telephony.

On January 26th, the first instruction lecture for beginners was given by the Hon. Secretary on "Tuners and Tuning," and on February 2nd he followed with a lecture on Tuning Coils. A free and instructive discussion followed.

On February 9th, Mr. J. Bird gave an interesting lecture on "Toy Wireless." With a coherer receiver and induction coil transmitter the principles of spark transmission were explained and illustrated.

On February 16th, Mr. A. E. Sparrow, the local G.P.O. Telephone Inspector gave a most interesting and excellent lecture on the "Development of the Telephone," from Reis' experiments to the latest improvements, using numerous exhibits as his illustrations. A good attendance marked one of the most successful lectures.

On February 23rd, the Hon. Librarian, Mr. E. Porter, lectured on condensers. Experiments with a Wimshurst machine concluded an instructive and interesting lecture.

Cercle D'Etudes Radiotelegraphiques.

We are informed that the above Club intends to organise an International Congress of Wireless Amateurs to take place some time during this summer. The Wireless Society of London is in possession of full particulars.

CORRESPONDENCE

THE YEAR-BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY. 1922.*

THE 1922 Edition of "The Year-Book of Wireless Telegraphy and Telephony," which is appearing this month, gives evidence of many improvements over its predecessors, largely the result of the very valuable criticisms and suggestions which readers have contributed.

The Special Articles again form a valuable contribution to wireless literature. Dr. Meissner writes on "The Earthing Resistance of Antennae"; Dr. Abraham contributes an article on "Recording of Wireless Signals," a subject on which he is so well qualified to write. Other articles are of equal importance, one of great interest at the present time being a record of "The Birth and History of Long Distance Wireless."

The Land and Ship Stations section is brought up to date, and gives the call letters and particulars of wireless stations and ships throughout the world.

In a section of the "Year-Book" devoted to Amateur and Experimental wireless, an up-to-date list of experimental transmitting licences in this country appears, and also a universal Directory of Amateur Clubs.

An entirely new feature, which is incorporated in this edition, is a specially prepared map of the world drawn to a scale of one inch to a thousand miles. This map gives at a glance the correct distance and direction from London of any point in the world, a result which could otherwise only be obtained from complicated mathematical calculations or measurements made on a globe.

A study of this map will correct many preconceived ideas as to the distance of various far-off stations.

A number of the principal wireless stations of the world are included on the map to serve as a guide to positions.

Correspondence

To the Editor of THE WIRELESS WORLD.

SIR,—With reference to the interesting descriptions of apparatus used in the Transatlantic tests, surely it would be of great interest to us English amateurs for it to be pointed out that in addition to the different aerial design, etc., used by Mr. Godley, his type of receiver is quite incapable of receiving either spark (on a pure note) or telephony. The designs used by the rather despised English amateurs who did use direct high frequency amplification are equally capable of receiving spark (pure note) and telephony on any wave selected.

* "The Year-Book of Wireless Telegraphy and Telephony, 1922" (The Wireless Press, Ltd., 12/13, Henrietta Street, W.C.2. Price 15s. net, or post free 16s. inland, 16s. 3d. abroad).

His set is not capable of doing so until he gets to his resistance coupled amplifier which he says does not occur till 2000 metres, and it would then be "done to a frazzle" by the transformer coupled receivers as used by our winners, and which Mr. Godley affects to despise. It would appear that we in England are as far advanced as the States after all. We do not require 850 feet of aerial *Nor 9 valves* to receive their signals.

Mr. Burne is much to be congratulated on his results, and for so effectively showing that it can be done.

H. W. BURBURY,
Lieutenant R.N.

February 2nd, 1922.

To the Editor of THE WIRELESS WORLD.

SIR,—With reference to Mr. G. F. M. Wynne's letter of November 1st, 1921, printed in your issue of 18th inst., I do not think the last part of my article condemns wooden masts to the extent to which he seems to indicate. The last two paragraphs were meant merely to show that, for the amateur, the steel mast is better than the wooden, owing to certain disadvantages, which I laid at the door of the latter. The particular wooden masts I had in mind when writing were the lattice variety, and I still maintain the views expressed in my article, though, I think, perhaps, it would have been better if I had credited the steel mast with the corresponding advantages. As regards Mr. Wynne's mast, I consider that, in being able to bolt his mast to the wall of an outhouse, he has gained a greater advantage than he thinks, and it is my opinion from his description that with this great help he might add a further section to (the bottom of) his mast (by gradually raising it vertically or by some other suitable means), and so increase his height to 60 or even 65 feet, according to the height of his outbuilding. In conclusion I may state that my present mast (the one away from the house—the house end is a steel mast, as in my article, and on the top of the house), is a wooden one, not of the lattice variety; but at Felsted I had three steel masts, previously to which I had erected a wooden lattice mast which may be described as a distinct failure. It was sixty feet high and "crashed" the day after its erection while it was undergoing the operation of straightening. I still have photos of it before, during, and after the crash, which I keep in memory of an interesting but unsuccessful experiment. The position as Felsted was in the open at the top of a hill where there are almost incessant winds of all varieties. In view of such experiences I consider that, of the three types of mast, the steel one is far the most efficient, for, at least, all the requirements of an amateur.

BRIAN H. COLQUHOUN.

To the Editor of THE WIRELESS WORLD.

SIR,—It is very interesting to note that, in spite of the very sarcastic remarks passed by "WENO," it was the experimenters, with "glorified junk heaps," who turned out most successful in the tests. Perhaps the other fellow's station was a little off colour on that occasion.

"UDONTNO."

To the Editor of THE WIRELESS WORLD.

SIR,—Wallasey is not a very large place, but it now has a Wireless Society of its own and a very go-ahead Society it is, too. I refer to the new Wallasey Wireless and Experimental Society, with its headquarters at 106, Albion Street, New Brighton, Cheshire.

The Society has a membership of twenty-five, and is increasing daily, but still has room for many more new members.

The Committee of the Society will be more than grateful to you if you could find room in the columns of your most valuable journal for this letter.

C. DOUGLAS M. HAMILTON,
Hon. Secretary.

Wallasey Wireless & Experimental Society.
24, Vaughan Road,
New Brighton, Cheshire.
February 15th, 1922.

Wireless and Aviation

AT the Air Conference held on February 7th, 1922, Lieut.-Colonel W. A. Bristow, M.I.E.E., M.I.A.E., F.R.Ae.S., referring to the use of wireless telegraphy for aircraft purposes, said: "experience shows these two services to be the twin guardians of safety in the highest possible degree. Times innumerable machines have been saved from danger by timely warning by wireless telephone of sudden changes in the weather conditions, apart from which in a very large number of cases it would not be possible to undertake the journeys at all if it were not for the meteorological information transmitted by wireless beforehand. During the past year the departments responsible for this work have made rapid strides towards perfecting their organisation and in enlarging its ambit and I think I shall be voicing the views of many in the audience in returning thanks for all the help and friendly co-operation received from these two very important departments.

"The services also of the Marconi Company and the constant work of their able staff on the development of wireless telephony has been of the very greatest value and the improvements that have been made are of a most substantial and gratifying nature.

"Any suggestions that have been made for the improvement of these two departments are generally concerned with a possible sub-division of the work in the wireless department. At present there is no wireless operator acting solely as watcher and guide to the machines in the air. At one moment an operator may be talking to a machine and then for fifteen minutes or more he may be engaged on transmitting or receiving weather reports or writing out messages. It is considered that the work should be divided and one or two operators should do nothing but talk to machines in the air keeping them posted all the time on weather conditions and other necessary information, giving them a bearing even in fine weather and in effect helping the machines with all the meteorological and other information that becomes available as their journeys

proceed. In view of the expected increase in traffic next year this question assumes a very real importance.

"In the Meteorological Department one could sometimes wish for a little greater promptitude in the reports, and especially with the Reports from French Stations. Delays in these are probably due to some defect in the organisation on the other side but whatever the cause the resultant position is often very unsatisfactory.

"On many occasions machines have had to leave this side only very scantily informed of the weather conditions existing over long stretches of the route in France, and in some cases with no information except some several hours old. As a result passengers have been landed in all sorts of out of the way places. It is considered by the author that the safest policy is not to send passengers off unless and until complete reports are available, showing a safe route for navigation along its entire length, but this obvious desideratum cannot of course be obtained unless the meteorological and wireless departments on both sides of the Channel are working at 100 per cent. efficiency."

Lord Gorell, C.B.E., M.C., who contributed a paper entitled "Civil Aviation," said:—

"The developments in wireless telegraphy and other signal work are worthy of mention; direction-finding stations, working in conjunction, have been established at Croydon and Fulham, and the combination of bearings from the two stations enables pilots to ascertain their exact position; improvements have been made in the system of ground signals at Biggin Hill and Croydon for indicating weather conditions, and the names of a considerable number of additional places have been marked in white chalk letters for the assistance of aviators; important steps have also been taken to facilitate night flying, and although regular night services have not been maintained, night flying has not been uncommon."

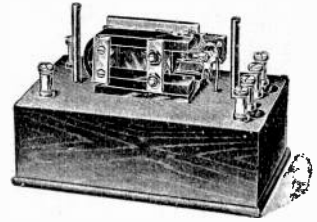
Major Fred M. Green, O.B.E., M.I.C.E., F.R.Ae.S., who read a paper on "Research from the Designer's, Constructor's and User's Points of View," referred to the importance of wireless in the following terms:—

"There are many ways in which wireless telegraphy and telephony can help, but it is essential that the gear carried on the aeroplane shall be as light and as simple to use as possible. There seems to be no reason why a pilot should not be able to fly from place to place blindfold with as great a certainty as he now does keeping in sight of the ground. The important thing to do is to convince the pilot himself that the gear with which he is provided is absolutely reliable. Until he is confident of this, he will always be chary about losing sight of the ground.

"Wireless control of the aeroplane itself from the ground is certainly a possibility of the future, and it may be that the pilot of an air liner will give up the control of the aeroplane when within certain distance of his landing place to a ground pilot who will bring the aeroplane into port. It is permissible to look forward to a time when this method of control will be developed so that aeroplanes can be landed in their aerodromes with certainty at night or in dense fogs."

THE "BROWN" MICROPHONE AMPLIFIER

This Amplifier magnifies signals, or music, without distortion, and is of considerable interest to amateurs and scientific investigators. The Magnification is much greater than that obtained from two valves, and the current consumption is about 50 milliamps. In construction, this instrument is simple, and it is much more robust than other sensitive relays of this class. This instrument satisfies the urgent demand for a reliable, inexpensive amplifier, which the most inexperienced amateur can use, and which the most experienced requires. It is much cheaper, ultimately, than a multi-valve amplifier, and the operator is relieved from many of the varied causes of breakdown. It includes a transformer suitable for low resistance telephones or loud speakers. The price of the "Brown" Microphone Amplifier is £8 for low resistance (120 ohms) input and £8 2s. 6d. for high resistance (2,000 ohms) input.



THE "BROWN" LOUD SPEAKER

With an Amplifier signals or telephony may be so magnified as to cause discomfort to wearers of head-phones, yet not be loud enough to be audible at any appreciable distance from the head. Every wireless experimenter sometimes wishes to let his friends hear, which would involve the use of several pairs of telephones simultaneously with consequent loss of signal strength, as well as considerable expense. The "Brown" Loud Speaker was designed to meet this need efficiently and economically, and is used in all up-to-date receiving stations. The sound is intensified by means of a horn.

The "Brown" Loud Speaker (120 ohms), Standard Pattern with Upright Funnel £5 10 0
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These Telephones are unquestionably the clearest and most sensitive made, and, consequently, increase the distance over which the wireless can be heard.

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SIEMENS DRY BATTERIES FOR OPERATING WIRELESS VALVES.

THE illustration depicts a Siemens standard type of "15 volts" Dry Battery which is largely employed. If a battery of greater capacity is required size No. 789 "15 volts" 11 cells, should be specified. The latter battery measures approximately 14½ in. × 1¾ in. × 3¾ in. high.



The Company manufactures all types of Leclanché cells and batteries, fluid and dry, and can usually supply these to meet special requirements.

Manufactured by:
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"15 volt" Siemens Dry Battery No. 643.
 Dimensions 9½ in. × ¾ in. × 2¾ in. high.

— Obtainable from all Dealers. —

Questions and Answers

NOTE.—This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules.—(1) Each question should be numbered and written on a separate sheet on one side of the paper only. (2) Queries should be clear and concise. (3) Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before. (4) The Editor cannot undertake to reply to queries by post. (5) All queries must be accompanied by the full name and address of the sender, which is for reference, not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (6) Readers desirous of knowing the conditions of service, etc., for wireless operators will save time by writing direct to the various firms employing operators. (7) Four questions is the maximum which will be accepted at a time.

L.C.B. (Harpenden).—The diagram is correct for a simple crystal set, but the circuit is not sufficiently sensitive for telephony. Galena should give good results without a battery. Make the aerial as high as you can—not less than 20 ft.

G.B. (Ilkeston) has converted an "Amateur Mechanic" set into a single valve set with good results, and asks (1) For name of a station sending music in the morning. (2) Station which sends time signals at 10 a.m. (3) If condenser could be improved to bring in the Dutch concert. (4) For criticism of the set.

- (1) We are afraid we cannot say.
- (2) Eiffel Tower.
- (3) You will require one or two more valves for this.
- (4) O.K., except that you will not be able to get the best out of the secondary owing to the method of coupling to the aerial.

SPARKS (Tottingham) has a collection of ex-Army apparatus and wishes to make a receiving set.

The Mark III amplifier is a low-frequency or note magnifier. (See Fig. 1 for circuit diagram.)

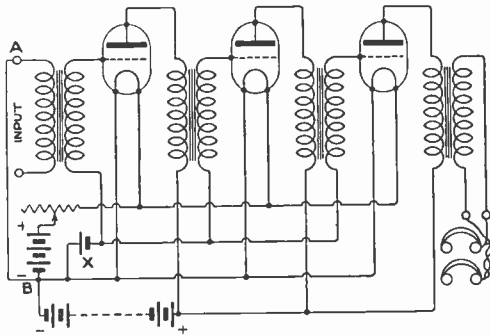


Fig. 1.

Trace out connections for yourself. We cannot arrange a circuit without knowing details of the amplifier. The first valve can probably be used as a rectifier with grid condenser and with a reaction coil in the anode circuit. We have no information regarding Type 10 variometers.

TENZASAPIENZA (Leeds) asks (1) Which is better for general practice, H.F. or L.F. mag. (2) For a suitable circuit to use with his gear. (3) Approx.

wavelengths which his gear will give. (4) For additional apparatus to receive long wave C.W. signals.

(1) High-frequency magnification, because it magnifies the signals before rectification, thus increasing the rectification efficiency, because all rectifiers are not very efficient with weak signals.

(2) and (3) With the inductance connected to a P.M.G. aerial the maximum wavelength would be 4,500 metres. (See *The Wireless World*, August 21st, 1920). To receive long wave C.W. signals it will be necessary to have an oscillating receiver.

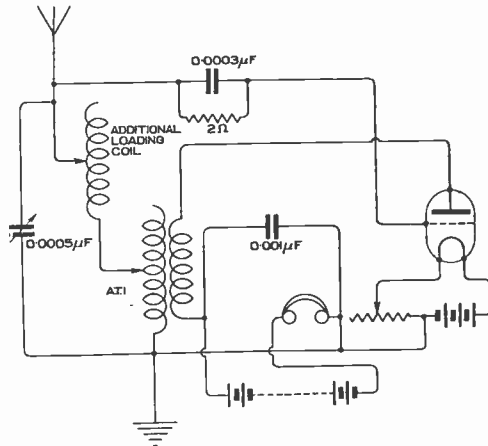


Fig. 2.

(4) Try a single valve circuit as shown in Fig. 2, from which you will see the additional apparatus required. For a reaction coil use a 4" diam. former to slide in and out of A.T.I., and wind it with 10" of No. 30 D.W.S. The loading coil may be similar to A.T.I. 15" of No. 28 on a 5" former. The maximum wavelength will then be 12,500 metres.

D.G. (Birchington) submits a barely decipherable diagram, and asks (1) If circuit will work. (2) Capacity of aerial condenser. (3) How to insert a reaction coil. (4) Particulars of photographic plate condensers.

- (1) As far as we can see—no. Arrange circuit as in Fig. 3.
- (2) 0.0005 to 0.001 mfd.
- (3) The reaction coil as shown at X. It is so-called because through it the anode circuit oscillating

QUESTIONS AND ANSWERS

currents react upon the currents in the grid circuit, building them up and causing bigger potential changes on the grid of the valve. If the reaction

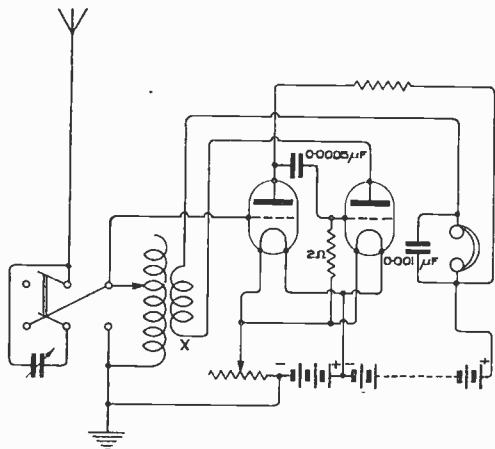


Fig. 3.

coupling is sufficiently tight the set may be made to generate continuous oscillations.

(4) See an article in the August 7th, 1920, issue.

2PD (Willenhall) (1) The set will be satisfactory but not very sensitive at your distance for PCGG. We should prefer at least one stage of H.F. amplification.

(2) See *The Wireless World*, page 443, September 18th, 1920, for further reference.

(3) We do not know what particular make of oscillograph this was taken on, but you will find descriptions of one or other of the better types in nearly all good text-books of applied electricity, or enquire of firms making such apparatus, such as the Cambridge & Paul Instrument Co., Cambridge. (The price of a good oscillograph outfit will run into some hundreds of pounds.)

(4) See June 25th, 1921, issue.

F.R.S. (Harrigay) asks for instructions for using a Marconi Type 16 receiver with two valves without dismantling the set.

This receiver is not suitable for use in this way, as the only method of using the valves would be as L.F. amplifiers after crystal rectification. This is very inefficient and would not enable you to receive C.W. For good work you should use the valves as H.F. amplifier and rectifier, with reaction. This would necessitate extensive alteration. We should strongly advise partial dismantlement, scrapping the crystal and one potentiometer and rearranging the interior to give room for the reaction. Failing this, sell the receiver and get something more suitable for valve work.

"KHIRGI" (Kingston) asks (1) The number of plates for a condenser of 0.0001 and 0.0002 mfd, the fixed plates being 2 $\frac{3}{8}$ " and the moving plates 2 $\frac{1}{4}$ ". Spacing washers, $\frac{1}{8}$ ". (2) How to convert a Type 16 (Marconi) receiver for valve detection.

(1) Presuming that dimensions given are the

diameters of the plates, 11 plates for the smaller and 21 plates for the larger condenser.

(2) Connect the filament and grid of the valve across the crystal clip, removing both crystals. Arrange the valve connections as for any valve set. Earth the negative end of the filament battery.

"BEGINNER" (Reading) asks (1) For a single valve circuit for telephony. (2) If a wrong value of the grid leak matters much. (3) How to convert a set illustrated for telephony. (4) For a simple book on theory.

(1) See Fig. 2, page 618, December 24th issue.

(2) The best value is not critical, but results will not be so good if the value in use is widely different from the correct.

(3) Set shown will be satisfactory if you put a condenser across the primary of the first intervalve transformer. Also if possible use a potentiometer to the first grid.

(4) Bangay's "First Principles" and his "Oscillation Valve" are as good as any we know.

S.T.B. (Willington) has a 20,000 volt A.C. power line 50 yards from his house. He asks if this will interfere with reception and, if so, how the difficulty can be got over.

We are afraid that the interference will be very considerable unless the frequency is very low, and we do not know of any way of getting over the difficulty in a case such as this. If possible, run the aerial at right angles to the power line and in a direction directly away from it.

J.M. (Blackburn) asks for a set to receive PCGG easily at Blackburn.

We are afraid you will have difficulty in getting this station easily every time with any set, especially if you have amateurs near who leave their sets permanently oscillating. However, a circuit on the lines of that described by Mr. Campbell Swinton on page 199, June 25th issue, should give you a very good chance.

K.R. (Heywood) asks (1) For an alteration of a circuit diagram for a frame aerial. (2) If it will receive PCGG. (3) If not, why not.

(1) Put the frame in series with the A.T.I. and remove the aerial and earth leads. No other alteration is necessary.

(2) Doubtful.

(3) Owing to the large distance and small power, and to the fact that you have only three valves in the receiver.

D.R.M. (Drumalin) asks for a criticism of a set.

The set is quite correct in design and arrangement. A potentiometer to the L.F. valve is not strictly necessary. Keep the A.T.C. setting as small as possible.

C.W.P. (Battersea) asks (1) Whether basket coils in an A.T.I. should be connected in series or in parallel. (2) Why he cannot get FL. (3) What is necessary to convert a set for valve work. (4) For a valve and crystal set.

(1) In series.

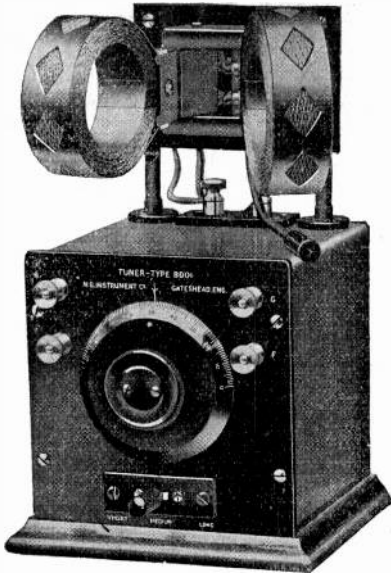
(2) Probably your coils and condensers have entirely unsuitable values. In any case you will get very poor results with L.R. telephones without a transformer.



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(AS ILLUSTRATED)

The 'Britwire' coil is a duolaterally wound coil having the lowest capacity of any coil on the market. By using these coils you can increase the strength of your signals anything from 10 per cent. to 50 per cent. The finish is extremely good, and the price low.

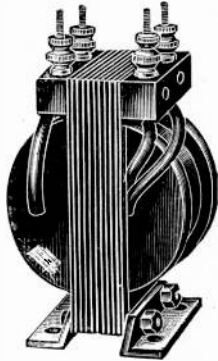
Coil No.	PRICES UNMOUNTED.		Price.
	Wave Range	1001 Mfd. Condenser	
1	130-250	in parl.	2/-
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6	600-2,500		4/6
7	1,000-3,000		4/8
8	1,200-4,500		5/-
9	1,500-5,500		6/6
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Mounted 3/6 each extra.
Three Coil Holder on Mahogany base ... 20/-

UNIT TUNER	£6 15 0
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All same style and size.

This Amplifier gives results equal to any two-valve amplifier.



"Britwire" L.F. Transformer 22/6

Using two Transformers supplied by us, Mr. T. Cutler, of 24, Floating Bridge Rd., Southampton, heard the Transatlantic Signals on three valves without a H.F. Magnifier. (See *Wireless World*, Feb. 18th).

Rotary Switch Arms each 2/9

Also Terminals of all kinds as previously advertised.

SEND FOR LIST FREE.

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Telephone Plug and Cord	1/-
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P.O. Lever Switches	4/-
Mounted Condensers, with Knob and Scale, new	'001, 32/6; '0005, 27/6
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TELEPHONE 360

33, High Street,
SOUTHAMPTON.

TELEPHONE 403

QUESTIONS AND ANSWERS

(3) See Fig. 2, page 613, December 24th issue. (If you do not possess this copy you can get it from the publishers for 8d. Post free.)

(4) See diagram. (Fig. 4.)

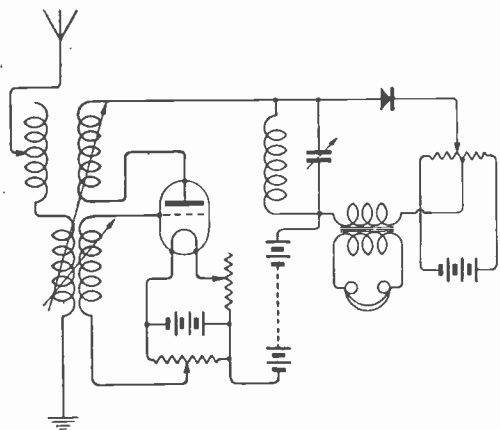


Fig. 4.

H.F. (Chiswick).—(1) We cannot give you a detailed drawing without a sketch of your own circuit. However, see Fig. 3, page 617, December 24th issue, for the general method, in which the third valve is a note magnifier. It is not essential to have a separate rheostat to each valve, as shown in the diagram.

(2) We do not know of a relay of this name. Perhaps you mean the Brown relay, made by S. G. Brown, Ltd., of Victoria Road, Acton, who will furnish you with information.

L.C. (Bradford).—We cannot think that the cinema alternator is tuned for 1,000 ms. You are probably picking up induction from the lighting mains, which you find difficult to eliminate. It should only be a very low hum, which should not give very much interference. Possibly you had a break in the grid circuit.

(Herne Hill) asks, *re the article by P. Voigt, in the December 10th issue, if sets may be used for C.W., telephony or spark.* (2) If the coil in the crystal circuit, Fig. 1, is a loose coupler. (3) Where are the arrows spoken of in the article. (4) What are the capacities of the condensers.

(1) Yes.

(2) This is a tightly-coupled transformer, probably 1/1.

(3) These appear to have been omitted.

(4) The aerial condenser 0.0005 to 0.001 mfd., anode oscillating circuit 0.0005 mfd., telephone condenser 0.001 mfd., reaction condenser 0.0001 mfd., filament earthing condenser about 0.005 mfd. On such circuits the correct windings and capacities are best determined experimentally.

H.S. (Uruguay).—(1) Connect the telephone terminals straight to the input terminals of the amplifier if the amplifier has a transformer between its input terminals and the first valve. If

not, use a step-up iron-cored transformer between the two instruments.

(2) We do not know the power employed, but this set is not likely to be sensitive enough to detect it at 100 miles without more amplification.

"V" (South Shields).—The circuit arrangement appears correct, but the secondary inductance does not give sufficient coupling for reaction. The set as it stands is only useful for wavelengths up to 700 m., *i.e.*, for a few ship sets. There are few C.W. stations working on such short waves. Dismantle the set and use the parts for a straight-forward single valve set.

J.F.S. (Highgate) asks questions regarding a Mark III tuner.

(1) Ships off the East Coast and also North Foreland should be audible.

(2) Connecting the A.T.I. and A.T.C. in parallel would increase the aerial wavelength, but would leave the closed circuit unaltered.

(3) This coupling is hardly sufficient for reaction.

(4) Either H.R. telephones or L.R. with a transformer may be used for this set.

(It may again be pointed out that these tuners are only useful for the purpose for which they were designed, *i.e.*, short wave, short distance reception. For amateurs they are chiefly useful for the variable condensers, switches and terminals which they contain and which may be incorporated in a more useful circuit.)

G.H.V. (Shrewsbury) asks questions relative to a H.F. transformer wound in eight slots on a 1½" diameter ebonite rod.

(1) Fill up the slots with silk-covered No. 40 S.W.G. wire. This will certainly not give the very big range you require, and will be fairly efficient for long wave stations, though nearly useless for short waves.

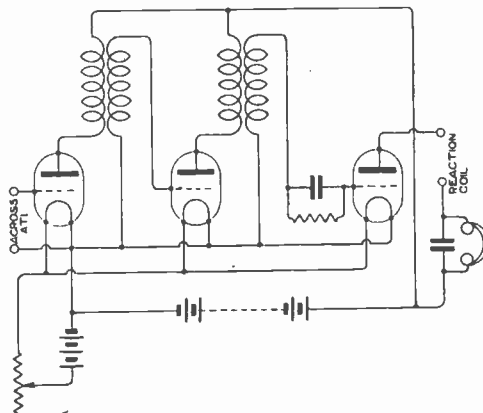


Fig. 5.

(2) A circuit for two H.F. and one rectifying valve is given in the diagram. (Fig. 5.)

(3) If a condenser is used across one side of the H.F. transformer it should have very small capacity, say, about 0.0002 mfd.

W.A.P. (Eastbourne).—(1) We regret that we

are not at present at liberty to publish this information.

(2) and (3) We have no practical experience with this set, but believe it is only designed for work on very short wavelengths. We should certainly advise you to dismantle it and use the parts for another set.

A.H.R. (Yorkshire) asks for code of groups of figures following MPD Weather Reports.

These may be Admiralty figures, the code of which we do not possess.

W.J. (Colwyn Bay) asks (1) If FL Time Signals will be received on a one-valve frame aerial set. (2) For criticism of a proposed addition to a set.

(1) Probably not; with one valve at your distance FL will require an outdoor aerial.

(2) With the exception of one detail—a 0.001 mfd. condenser across the transformer winding in the reaction circuit—the arrangement is correct.

With four L.F. magnifiers you will probably experience trouble due to howling, and we should not recommend using more than two valves in this way.

W.T.H. (Stroud) cannot make a single valve set oscillate, and asks for advice.

The reason is obvious. Your circuit is all out of proportion. The aerial is tuned to a very long wavelength, while the grid is tuned to a short wavelength. Also the anode has not sufficient inductance to oscillate, even at short waves. The reaction coil inductance for a single valve set should be at least equal to half the main inductance. Try a circuit similar to that in Fig. 2, page 639, January 7th issue.

A.R.N. (Harringay) asks for information with regard to a Morse inker circuit which he proposes to use.

The crystal rectifier you show will probably not give enough current for the relay. If the relay is wound to a fairly high resistance and of sensitive type, insert it in the high resistance side of the telephone transformer. If the relay is of L.R., you will probably have to rewind it to at least 1,000 ohms to get good results.

———— **(Tunbridge Wells)**.—(1) The secondary condenser should be connected across the inductance with the crystal, etc., also across the inductance.

(2) About three volts; dry cells will do.

(3) Yes, if your telephones are low resistance, 150 ohms. If H.R., 4,000 to 8,000 ohms. No transformer is needed.

(4) Approximately 1,500 m.

R.G.E. (Edmonton) asks questions relative to a single valve set.

(1) Yes, if the inductances are correctly proportioned. A.T.C. should be connected in the aerial side of the circuit, so that the negative side of the filament battery is connected directly to earth.

(2) With most types of valve the grid condenser and leak improve rectification. They should be placed in series between the A.T.I. and the grid.

(3) Not much.

(4) A condenser across the H.T. battery is desirable. A resistance in series with it prevents damage from an accidental short circuit, but is wasteful of power and is not often used.

D.F. (Grimsby).—The inductance of the basket coil is about 700 mhys. Its natural wavelength will be less than 100 m. The natural wavelength cannot be calculated. The inductance can be calculated from Nagaoka's formula for single layer solenoids, if the mean diameter of the basket coil is taken as the diameter and the depth of winding as the winding length of the solenoid. The formula has been frequently given in these columns and can be found in most textbooks.

J.F.N. (Broadstone).—(1) To increase signal strength very much it will be necessary to increase the height of the aerial considerably. Also if possible try an additional valve.

(2) Make the earth lead shorter and more direct.

(3) Connect the present telephone terminals through a 1/1 transformer to the grid and filament of the note magnifier valve. Put telephones in the anode circuit. The same batteries may be used. Put 0.001 mfd. across the reaction coil side of the 1/1 transformer.

(4) Yes, with an additional valve.

"BWIE" (Cheltenham).—As you do not give the height or length of the aerial, we can only assume its capacity to be about 0.0002 mfd.

(2) and (3) In order to calculate the wavelengths with a condenser set at a given point, first of all in series and then in parallel with the A.T.I., we must know the capacity of the condenser at the actual setting as well as that of the aerial. The calculated results even with this information will not agree with actual fact very closely.

"TRANSMITTER" (Penarth).—We are sorry that we have no information regarding the transmitter you mention, and are therefore unable to answer the query.

We are sorry that we have no information regarding this circuit beyond that given in the article in question. Chokes of this sort are best determined by experiment.

COMPANY MEETING.

The 43rd Ordinary General Meeting of W. T. Henley's Telegraph Works Company, Ltd., was held on March 3rd, when the payment of a final dividend on the Ordinary Shares of 2s. per share, less Income Tax, making 3s. for the year, was declared.

A CORRECTION.

In the diagram on page 686 of our issue of February 4th, 1922, describing Mr. Corsham's apparatus used during the Transatlantic Tests, there should be shown a bypass condenser between the upper terminal of the reaction coil and the negative terminal of the L.T. battery.

SHARE MARKET REPORT.

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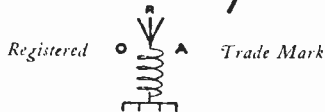
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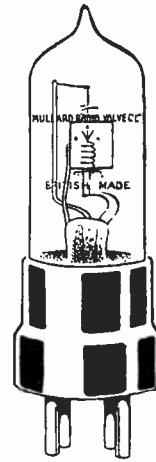
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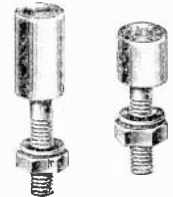


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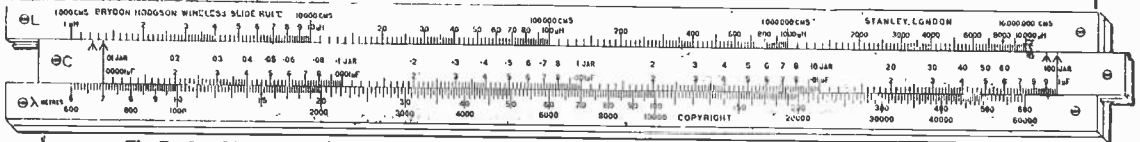
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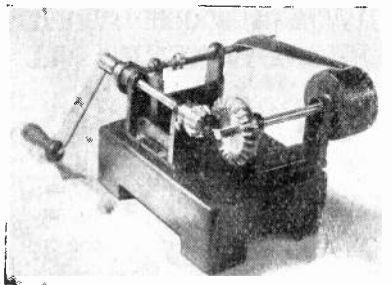
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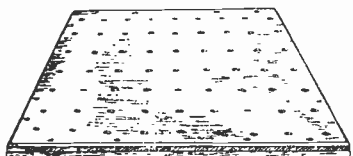


Fig. 1



Fig. 2

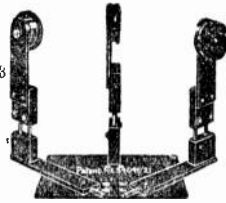


Fig. 3

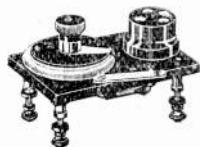


Fig. 4



Fig. 5

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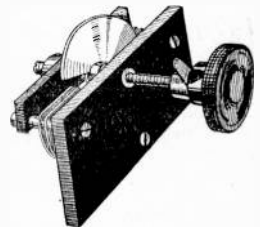
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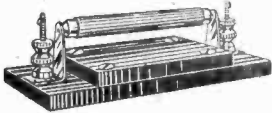
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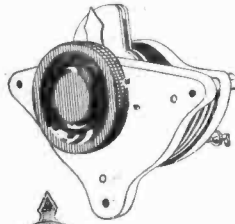
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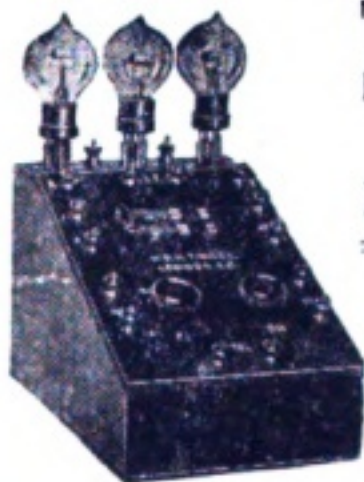
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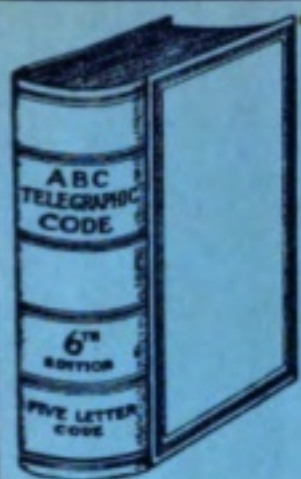
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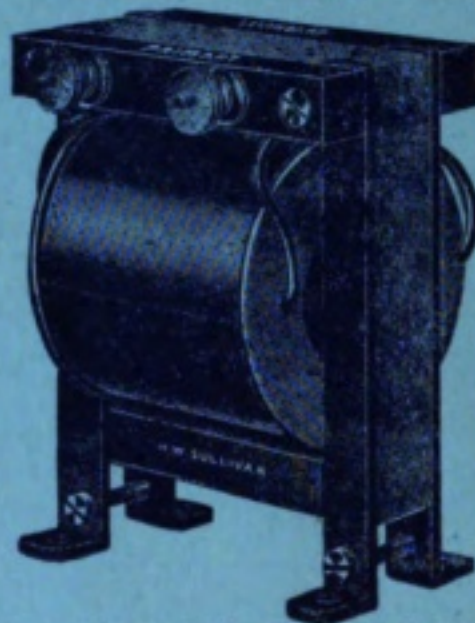
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