

The Wireless World

3^D

AND RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, November 7th, 1928.



TO
NE
VOLUME
DISTANCE
PUT NEW LIFE
INTO YOUR RECEIVER

Mullard
THE MASTER VALVE

**—a thousand
aerials at
your command!**

UNIVERSITY OF SOUTHERN CALIFORNIA
METRO-VICK SUPPLY LTD. — LONDON.
RP 121

FEB 1 4 1953

'Whiteline' for Safety



The
WHITELINE
VALVE HOLDER
PRICE 1/9

BOWYER-LOWE
TESTED RADIO APPARATUS

RADIO WORKS. LETCHWORTH, HERTS.

LIBRARY
**IF IT'S
T.C.C.**

**THAT IS ALL YOU
NEED KNOW OF
A CONDENSER**

CA 6991

It isn't the *start* of your Battery that shows its value —

It's
the
finish



Marconiphone Long Life H.T. Batteries give you more for your money . . . because of their remarkable *staying* power. When you discover your Marconiphone Battery seems to be almost inexhaustible ; that power and volume are sustained through hundreds of programmes you know that you have bought wisely. Judge, therefore, the value of your H.T. Battery by how many *radio* hours it will give, not only by its first cost. Start now to cut the cost of good reception . . . you can buy the Marconiphone H.T. Batteries from most wireless dealers.



Marconiphone High Tension Batteries

66-volt, "New Standard" 12/6
81-volt, "Standard" 15/6
108-volt, "New Standard" 21/-

Large Capacity Batteries

60-volt 20/-

Marconiphone "Popular" Batteries

108-volt 15/6
66-volt 9/6

Marconiphone Grid Batteries

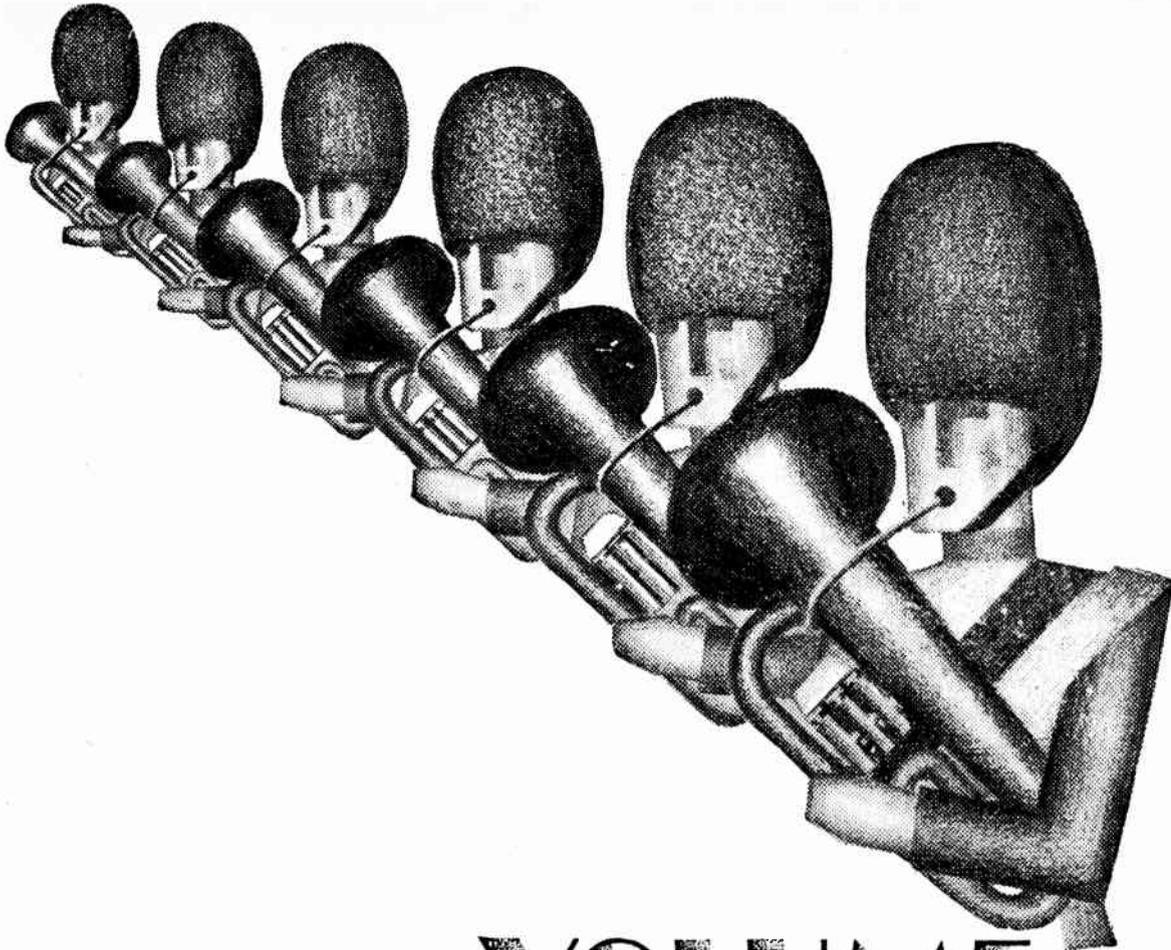
9-volt 1/9
16-volt 3/6



THE MARCONIPHONE COMPANY LIMITED
(Dept. P.), 210-212 Tottenham Court Road, London, W.1

MARCONIPHONE LONG LIFE HIGH TENSION BATTERIES

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention



VOLUME

Tone—Volume—Distance, these are the three essential qualities which Mullard valves impart to radio reception.

The margin of advantage held by those who to-day buy 1929 Mullard P.M. Filament Valves is greater even than the advantage enjoyed by the thousands who changed over to Mullard four years ago.

When the Mullard P.M. Filament was first introduced those who had radio receivers promptly changed to Mullard, and all new-comers to radio automatically buy Mullard valves.

Universal popularity is the soundest guarantee of efficiency. Get Mullard valves—now.

They make an old set modern.
They make a modern set perfect.

Mullard

THE · MASTER · VALVE



STONE
VOLUME
DISTANCE

ADVT. THE MULLARD WIRELESS SERVICE CO. LTD., MULLARD HOUSE, DENMARK STREET, LONDON, W.C.2.

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COALS TO NEWCASTLE!

If you have electric light you are taking "coals to Newcastle" every time you buy an H.T. Battery or L.T. Accumulator.

BATTERIES and Accumulators are expensive to buy and maintain. You are wasting money in using them if you have a switch in your house.

Build your own H.T. and L.T. Eliminators and get your power from the mains. It's cheaper and more reliable.

This free T.C.C. Book shows you how to build Eliminators—H.T. and L.T. The clear concise instructions take you along step by step. Here a simple diagram, there a helpful photograph. You cannot go wrong. You will be amazed to find how simple it is. No expensive tools are needed and no wireless knowledge is necessary. Simply follow the instructions and your H.T. or L.T. Eliminator grows under your hand. You can build either in an evening—and if you use T.C.C. Condensers you will have an instrument that is utterly reliable and safe.

Get this FREE Book—it will save you pounds



BE SURE TO USE
T.C.C.
CONDENSERS

To Telegraph Condenser Co., Ltd., Wales Farm Rd., N. Acton, London, W.3.

I enclose 1d. stamp. Please send me your book showing how to build Eliminators—H.T. or L.T.

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W.W. 7/11/28



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The "EKCO"

Independent Series Anode Feed System

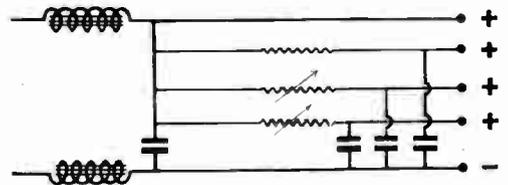
UNIQUE IN MAINS POWER RADIO

This now famous system is fully patented by "Ekco" and has played an important part in the wide success of all "Ekco" Mains Power Radio Devices, the most popular of to-day.

The "Ekco" Anode Feed System definitely eliminates all "hum" and "motorloading." It also assures correct voltage output and lower running costs.

The diagram of this remarkable system is shown below, and it will be observed that although an extra "Ekco" resistance of the finest grade wire is incorporated with each fixed voltage tapping, yet prices of all "Ekco" devices are phenomenally low.

We frankly admit that our low prices are only made possible by reason of a small margin of profit and our very large output.



Circuit Diagram of Model 2 V.60, D.C.

FULLY PROTECTED UNDER PATENT NO 262567.
THE "EKCO" INDEPENDENT SERIES ANODE FEED SYSTEM

SAFE! SILENT! SOUND!

MODELS RANGE FROM 17/6 D.C. AND £2-12-6 A.C. COMPLETE IN HANDSOME DARK BROWN CRYSTALLINE METAL CASES. EVERY DEVICE CARRIES A FIRM GUARANTEE FOR ONE YEAR.

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E.K. COLE LTD "EKCO" WORKS,
(DEPT. W.) LONDON ROAD, LEIGH-ON-SEA.

★ **ALL-ELECTRIC** ★

For working entirely off the Electric Light Supply

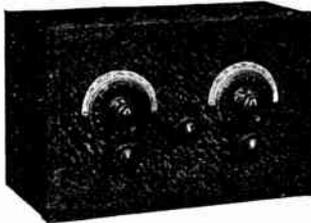
3 valve set complete * for less than £21

4 valve set complete * for less than £26

(* Everything necessary except Loud Speaker)

Low in cost because of their simplified design these two Met-Vick Receivers give a high quality performance comparable with the well known Met-Vick de luxe Five Valve Mains Sets.

They embody Met-Vick A.C. Valves, A.N.P. Coils, and moulded resistances, and employ resistance-capacity couplings.



**MET-VICK
3 VALVE A.N.P. SET**

A delightful little set suitable for Loud Speaker reception from the local station and the two Daventry stations, and also, under favourable conditions from several Continental Stations. An excellent set for the alternative programmes.

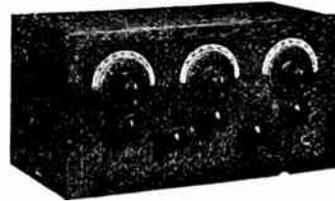
PRICES

with short and long wave coils (including Royalties)

£20 17 0
List MS 4735

£20 10 6
List MS 4742

£13 17 0
List MS 4736



**MET-VICK
4 VALVE A.N.P. SET**

An "All Necessary Performance" Set capable of giving ample volume and good quality, from the local stations and the two Daventry Stations, and Continental Stations at good volume free from interference. A remarkably selective set.

PRICES

with short and long wave coils (including Royalties)

£25 14 6
List MS 4738

£25 10 0
List MS 4742

£18 9 6
List MS 4739

The following specifications include everything necessary except Loud Speaker.

With Met-Vick A.C. Valves (2 or 3 A.C./G and one A.C./R) complete in Fabric Cabinet and with a 'Met-Vick' model 'B' L.T.-H.T. & G.B. Eliminator for A.C. mains operation.

Similar but for D.C. mains operation with "Met-Vick" Model "B" H.T. & G.B. Eliminator and separate L.T. Eliminator.

Similar but with S.P. 2 volt Valves for Battery operation, complete with 2 V. 30 amp. Accumulator, 120 V. H.T. Battery and 9 V. Grid Battery.

For A.C. Mains or Battery operation Kits of component parts are also supplied for home constructors. List 7117/2-3-4-5.

For the Met-Vick Five Valve Sets for D.C. & A.C. Mains operation ask or send for List M. S. 4740.

MET-VICK
Mains Operated Sets for Satisfaction

Ask your dealer for particulars of the Set which interests you, and, if desired, for details of convenient hire purchase terms, or write:-

METRO-VICK SUPPLIES LIMITED
155 Charing Cross Road, London, W.C.2.

For the Met-Vick Five Valve Sets for Battery operation ask or send for List MS 4741

SELECTIVE SETS

must have
Selective Reaction



Ensure this by fitting the **POLAR Q.J. Condenser**

Both fast and slow motion are provided. Fitted with Phosphor Bronze Balls. Supplied either with double knob as illustrated, or with 3" graduated dial and knob. The same knob and dial can also be fitted to the Polar "Ideal" Condenser and a perfect match thus secured.

Q.J. 10/-
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- 00025 - 10/6
- 0002 - 10/4
- 00015 - 10/3

FOR PORTABLE SETS

Polar Reaction Condensers

·00005 or ·000015 7/6

Wingrove & Rogers Ltd.

188 - 189, STRAND, LONDON, W.C.2

NO OTHER SPEAKER IN THE WORLD GIVES BETTER RESULTS OFF A 2-VALVE SET THAN THE NEW M.P.A. DUAL INDUCTANCE

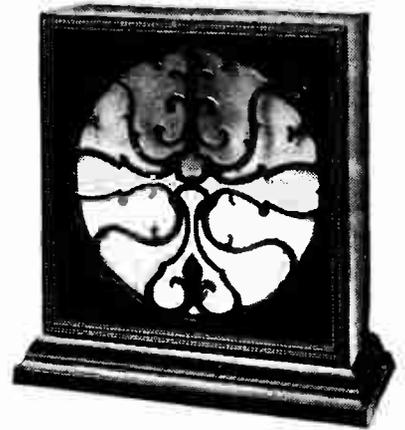
and it is the finest "speaker" value you can possibly buy. A speaker built on the moving coil principle which requires neither accumulators, mains connections, special valves, nor transformers! A self-energising model exclusive to M.P.A. ! More sensitive than a magnetic movement, yet uses no more H.T. voltage than an ordinary loudspeaker! Low notes without a boom! High notes without shrillness! Every part balanced and in perfect unison! Speech excellent! "It gets the best from your set." Ask for the M.P.A. DUAL INDUCTANCE SPEAKER. Price 7 guineas.

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Other M.P.A. Models include the Popular Plaque, 29/6; De Luxe Plaque, 47/6; Table Grand Speaker, 5 guineas; Table Cabinet Speaker, £4/17/6; Moving Coil Speakers, from 10 guineas; and the "Octroda" 8-Electrode Self-Contained Stationary Set, 12 and 17 guineas. For Irish Free State prices write Brown Bros. (Ireland), Lower Abbey St., Dublin, C.8. All Wireless Dealers stock M.P.A. Products.

THE M.P.A. WAY

Products to the value of £5 or over can be obtained on Hire Purchase Terms for £1 down.



DEPT. 2, M.P.A WIRELESS LTD., 62, CONDUIT ST., LONDON, W.1. TEL. GERRARD 6844-8

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WE MAKE ALL THE COMPONENTS NECESSARY TO CONSTRUCT A DRY RECTIFIER

It will be of interest to those who know the **QUALITY** of R.I. and Varley products to learn that we make all the components required for "Westinghouse Metal Rectifier" Eliminators, with, of course, the exception of the Rectifier itself.

The components illustrated include a new Potential Divider, for a special Grid Bias Rectifier.

Our Dry Rectifier Transformers are specially designed for use with Westinghouse Metal Rectifiers which are now popular.

Our Universal Power Transformer—for both *A.C. Valves* and *ordinary Valves*—is far in advance of any other Power Transformer on the market, in that it has a universal application to all Radio Receivers.

Our Heavy Duty Power Transformer is becoming increasingly popular, because it can be relied on to provide the large output necessary for operating Moving Coil Loud Speakers with brilliancy.

All these Transformers conform in every way to the recommendations of the I.E.E. Sub-Committee relative to Eliminator components.



Potential Divider, 18 6.



L.T. Eliminator Rheostat, 12 6.



H.C. Metal Rectifier Transformer 28 6.



Universal Power Transformer, £2, 7 6.



Heavy Duty Power Transformer, £3/10.



Varley LTD

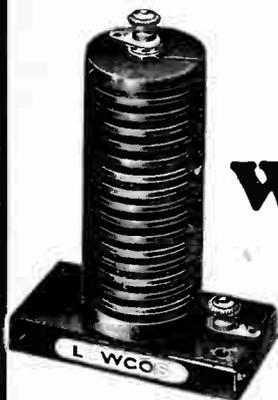
THE MARK OF BETTER RADIO

Kingsway House, 103, Kingsway, London, W.C.2.

Phone: Holborn 5303.

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Commended by "The Wireless World"!



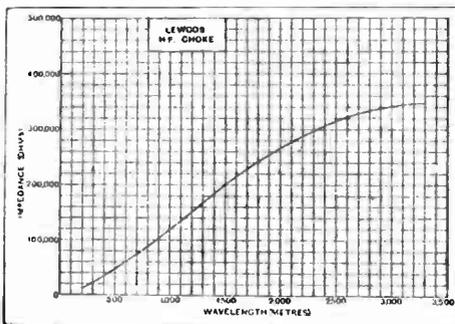
**Definitely
Established
Advantages—**

The massive design—the unusual amount of wire—the careful adjustment of inductance capacity ratios—choke efficiency on all wave-bands are significant factors for the recommendation of this famous Choke by "The Wireless World." The LEWCOS H.F. Choke effects an all-round increase of impedance which definitely establishes it in the front rank of its class.

Write for descriptive leaflet.

LEWCOS (REGD.) High Frequency Choke

Test Curve Published by "The Wireless World," 17 10 28, p. 537.



The LONDON ELECTRIC
WIRE COMPANY
AND SMITHS, LIMITED,
Church Road, Leyton,
London, E. 10.

Trade Counter:

7, Playhouse Yard, Golden
Lane, E.C.1.



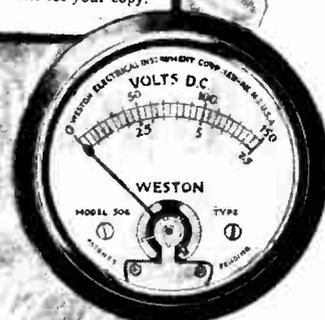
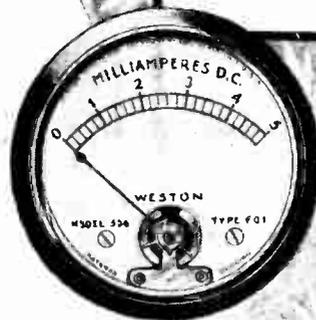
Weston sets the world's standard



Model 506 Pin Jack Voltmeter with High Range Stand, Measures High and Low Tension Voltages.

Price £2.10.0

The Weston free booklet "Radio Control" explains the uses of this and other Weston Radio Instruments. Write for your copy.



Model 506 Mil-Ammeter should be placed in the H.T. circuit of the valve to ensure correct operation and check distortion. Panel mounting type.

Prices

£1.15.0—£2.15.0

Model 506 Panel Voltmeters ensure permanent accuracy. With a high internal resistance of 125 ohms. per volt, they make practically no load on the batteries. Neat and compact.

Prices

£1.15.0—£2.15.0



Model 489 Double Range D.C. Voltmeter is a necessary portable testing instrument for every radio enthusiast. It is of great use

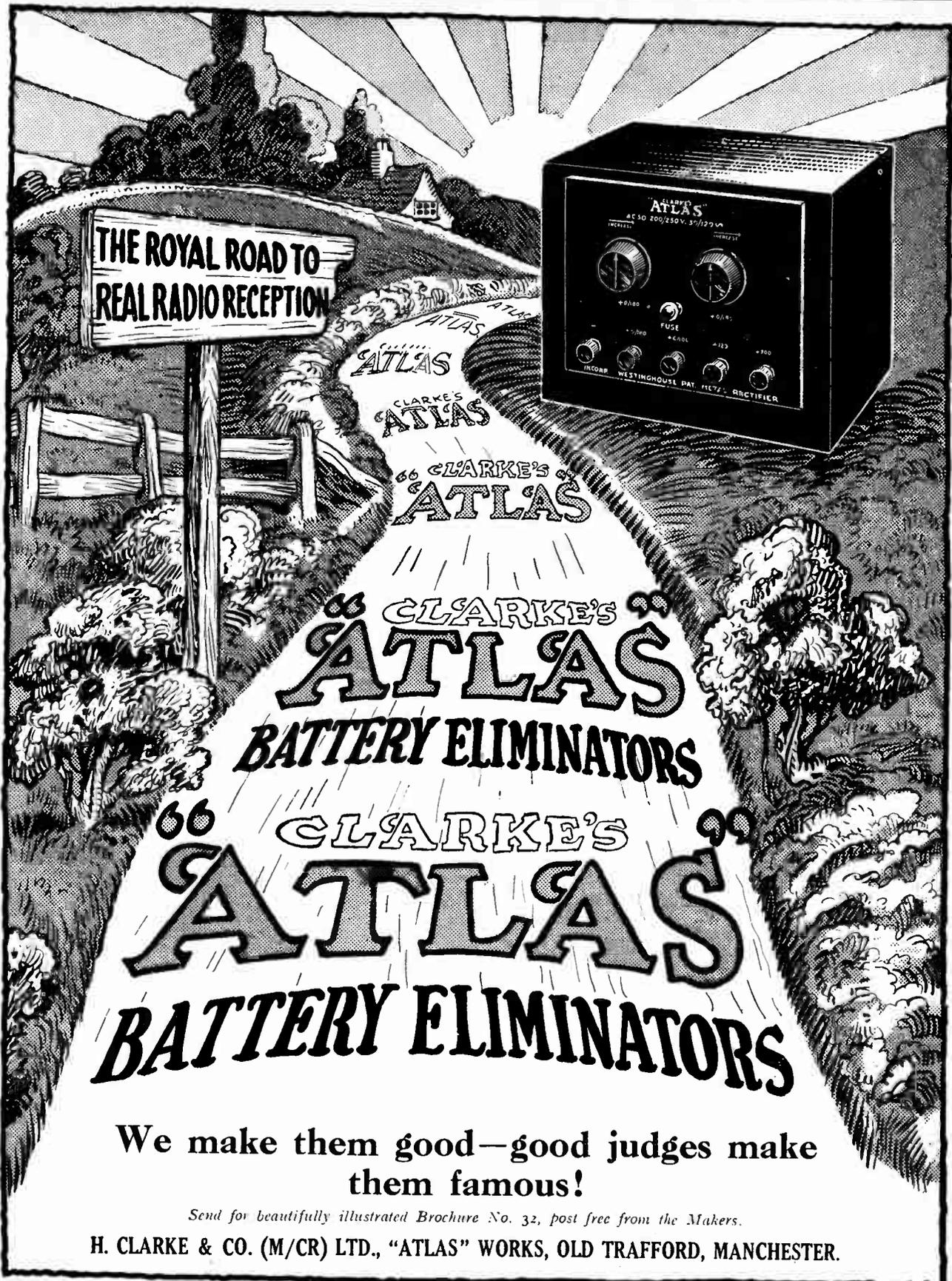
in tracing circuit troubles. Made in various ranges with different sensitivities. Similar instrument for A.C. Model 528.

Prices £4.0.0—£7.15.0

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THE ROYAL ROAD TO
REAL RADIO RECEPTION

CLARKE'S
ATLAS
BATTERY ELIMINATORS

CLARKE'S
ATLAS
BATTERY ELIMINATORS

We make them good—good judges make them famous!

Send for beautifully illustrated Brochure No. 32, post free from the Makers.

H. CLARKE & CO. (M/CR) LTD., "ATLAS" WORKS, OLD TRAFFORD, MANCHESTER.

CONSTANT H.T.



Model W.1a for A.C. Mains
160 v. at 30 m/a.

£7 2 6

Other models available up
to 350 v. at 100 m/a.

All Models Incorporate
Westinghouse Metal
Rectifier.

CONSTANT L.T.



Permanent Charger with
Automatic Coupler.

½ amp. 54/-

1 amp. 70/-

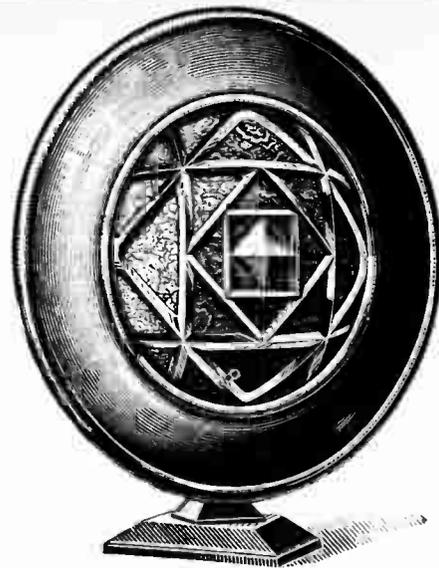
Incorporating Westinghouse
Metal Rectifier.

Send for illustrated descriptive Leaflet.



Advt. of Regent Radio Supply Coy., 21, Hatfield's Hds., E.C.1.

Blue Spot



—the brisk business lines for the season.

Through the coming weeks Blue Spot specialities will become a centre of increasing interest. Constructors busy with their plans for this winter will be relying on the Blue Spot units for the better reception they are seeking.

The family, concerned not at all with constructing but only with the enjoyment which a good speaker can give, are certain to welcome Blue Spot one-o-one. Here is the best cone speaker the season has produced at the price. Moreover, its appearance—the first attraction—is decidedly in its favour. Once seen it will be heard; once heard it will be bought; once bought it will make its own recommendation. That is the way Blue Spot reputation has been made. Ask to see it at your dealers. Price £3 : 13 : 6.

The secret behind the remarkable performance of this Speaker is the new Blue Spot 66K driving unit, adjustable pattern. Constructors can obtain it complete with instructions for building a cone speaker at home: Price 25/-.

The **BLUE SPOT**
101
CONE SPEAKER

"Ideal Blue Spot Cone Speakers are sold under full protection of the patents owned by Standard Telephones & Cables and the Hopkins & Lichtphone Corporations."

F. A. Hughes & Company, Limited
204-6 Great Portland Street - - - London, W.1
MANCHESTER: 185 Princess Street

It's the condenser that counts—



**Not the
Colour
of the
BOX**



DUBILIER CONDENSERS

If unobtainable from your dealer, write direct to us, mentioning your dealer's name and address.

©190

Dubilier Condenser Co., (1925) Ltd.,
Du'on Works, Victoria Road,
North Acton, London, W.3.

**WHENEVER
YOU HEAR
FINE RADIO**

**YOU CAN BET
THE VALVES
ARE**



EDISWAN

After all, it's what the valve does that counts! The remarkable performance of the famous Ediswan R.C. Threesome 1929 Circuits is due to the use of EDISWAN NEW HIGH EFFICIENCY VALVES.

EDISWAN—THE WORLD'S FIRST RADIO VALVE



PERTRIX

—THAT IS THE NAME OF THE BATTERY THAT GIVES 50% BETTER SERVICE THAN ANY OF ITS COMPETITORS. THERE IS NO SAL-AMMONIAC IN A "PERTRIX" BATTERY, AND THAT MEANS LONGER AND BETTER SERVICE. WHY THIS SHOULD BE IS FULLY EXPLAINED IN OUR NEW FREE LIST. PUT THE WORDS "P3 PLEASE" ON A P.O. AND POST IT STRAIGHT AWAY TO:

A.F.A. ACCUMULATORS LTD., PERTRIX DEPT., 120, TOTTENHAM COURT RD., LONDON, W.1

"P3 PLEASE"

WE DO THE REST.

Centralab

CENTRAL RADIO  LABORATORIES

VOLUME CONTROLS FOR THE W.W. MEGAVOX



Centralab volume Controls have a patented rocking disc contact that positively eliminates all wear on resistance material thus ensuring long life and perfectly smooth and noiseless action.

Centralab controls have won favour with all users and are specified for use in the **MEGAVOX RECEIVER** described in this Magazine.

Centralab Modulators and Volume Controls are available in the following resistance ranges:

POTENTIOMETERS.		MODULATORS.	
Type P. 111	2,000 ohms.	Type M. 250	250,000 ohms.
" P. 112	10,000 "	" M. 500	500,000 "
" P. 050	50,000 "	All models 10/6 each.	
" P. 110	100,000 "		

Write for the Centralab Circuit Booklet. Also particulars of Centralab Power Rheostats, Modulator Plugs, etc.

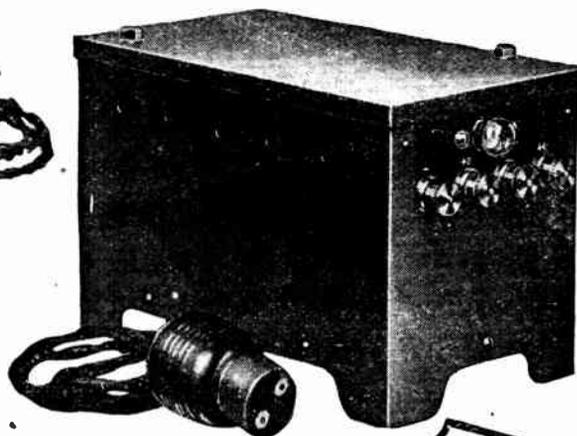
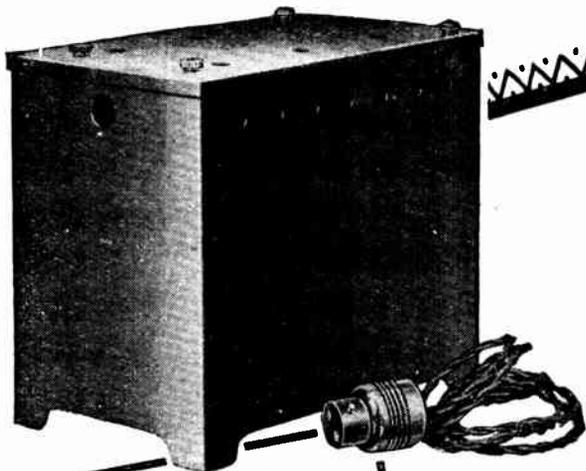
THE ROTHERMEL CORPORATION

24-26, Maddox St., LONDON. LTD.

Telephones: Mayfair 0578-9, 4286. Grams: Rothermel, Wesdo, London.

Economy in Power

IF you have A.C. mains and these BURNDEPT units you will never again be put to inconvenience by batteries that 'give out' just when you want particularly good results from your set. Instead, you will be assured of a constant supply of all the power you need.



BURNDEPT ETHOPOWER.

Supplies all the necessary H.T. and grid bias current—even for an 8-valve set—at a cost of one penny per ten hours.
 No noise. No hum. No attention needed when once set up.
 The "Ethotron" valve being without a filament scarcely ever requires replacing.
 Maximum H.T. 150 volts. Total output 25 milliamperes. Separate tappings provided for screens of screened valves, etc. For A.C. mains 100/240 volts, 40/100 cycles.

Price £6.18.3
(Marconi Royalty 12/6).

These units are absolutely safe and conform to I.E.E. Sub-Committee Regulations.

BURNDEPT Automatic Control.

An optional device which disconnects the Charger and connects the H.T. Eliminator (if any), and vice versa when the set is switched on or off.

Price £1.5.0

BURNDEPT L.T. BATTERY CHARGER.

Charges 2—4 or 6-volt accumulators at half-ampere.
 Cost: 2d per week and your L.T. Battery always fully charged. No acid. No valves. No hum of any kind necessary.
 No upkeep costs. No attention of any kind necessary.
 INCORPORATES WESTINGHOUSE METAL RECTIFIER under Licence
 Universal type for A.C. mains, 100/110 volts, 40/100 cycles.

Price £2.9.6

BURNDEPT

WIRELESS (1928) LIMITED
 BLACKHEATH, LONDON, S.E.3

Showrooms: 15, Bedford Street, STRAND, W.C.2

A.J.W.

Build a **COMPLETELY SCREENED Set.**

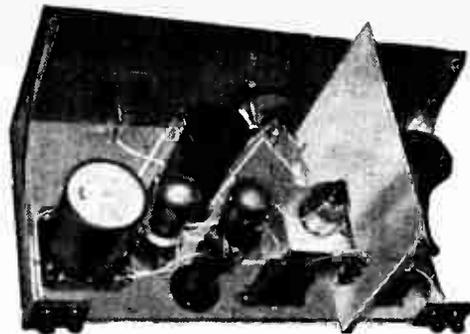


An amazingly simple set to construct and operate.

Obtain a Broadsheet from your dealer and read why you should **COMPLETELY SCREEN THE GRID.**

NO COIL CHANGING

From HIGH WAVE to LOW WAVE on a push-pull switch.



Send postcard for **FREE FULL SIZE LAY-OUT PLAN** and wiring instructions:—
THE FORMO CO., Crown Works, Cricklewood Lane, N.W.2.

VIBROIDER



EXCELLENCE of DESIGN

Look at the base of the Vibroider; study its design from behind the scenes. Note the one-piece springs whose coils form the sockets for the valve leg—the self-aligning contacts; the transparent "window" which excludes all dirt and dust; and next time say Vibroider and be sure of the best.

PRICE **1'6**

1,500,000 Benjamin valve holders are already in use.

BENJAMIN

ELECTRIC LIMITED
Brantwood Works, Tottenham,
London, N.17.



DX

You want a well-made Transformer at a reasonable price, that gives you really first-class performance. You want a D.X. Transformer.

- 3:1 - 8/-
- 2:1 - 8/-
- 1:1 - 10/-
- 25:1 - 12/-

It is laboratory designed; it is wound on our own special machinery and carefully and soundly finished.

Note: The secondary is in two parts, one on either side of the primary.

We invite you to inspect one and to listen to one. You will then agree that for value the D.X. Transformer is unequalled.

May we send you also particulars of the famous D.X. Standard and short wave coils?

D. X. COILS LTD., LONDON, E. 8.

INDOOR AERIALS



GOLTONE

(Regd.)
"ENHANSA"

12 feet long, superior to other indoor aerials of double its length. Stocks held at London Depot, 3 & 5, Edon St., Hampstead Rd., N.W.

PRICE **2/-**

Made up of 96 plated Sylvern wires. Gives better results than a frame aerial. Light, flexible and efficient. Price 2/-. From all best Radio Stores. Refuse substitutes. Full particulars with catalogue on request.

Ward & Goldstone
LONDON



Special demonstration of the New Hegra Magnetic Speaker giving extraordinary response to all audible frequencies. Also call and hear the latest Hegra Moving Coil Speaker and Patent 4 pole balanced armature unit which gives wonderful volume without the slightest chatter.

Daily demonstrations of R.K., MAGNAVOX, MARCONI, BLUE SPOT, MULLARD, etc. Also PICK UPS.

Come and make your own comparisons and choose from the world's finest Speakers.

136-page **FREE** catalogue Radio and Electrical.

Telephone: **ELECTRIC GRAFTON COMPANY** Museum 0241.

Dept. W., 54, Grafton Street, Tottenham Court Road, W.1.

The L.T. Eliminator

has now become a practical and economical proposition, thanks to the



METAL RECTIFIER

This unit has been designed for incorporation in a 6-volt low-tension eliminator using transformer, chokes, and electrolytic condensers:—

Type A-3 Unit. Output 9 volts, 1 amp.



Price 23/6

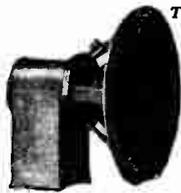
ALL
BRITISH.

HAVE YOU HAD YOUR
COPY OF
"The All Metal Way"

our 24-page book on how to
build H.T. and L.T. eliminators
and chargers?

If not, send rd. stamp with
your name and address.

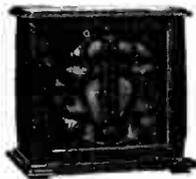
The Westinghouse Brake & Saxby Signal Co., Ltd.,
82 York Road, King's Cross, London, N.1.



Type A1

A kit of moving coil parts complete with cone and transformer. Electro-magnetic type. Supplied for 6 volt accumulator or any mains voltage between 110 and 240. Consumption 6 amp and 30 m/a respectively.

£5:0:0



Type N

Handsome, highly polished mahogany cabinet model incorporating the famous 4-pole balanced armature Type C Unit. Full round volume, magnificent reproduction.

£4:10:0



Hegra Loud Speakers for all

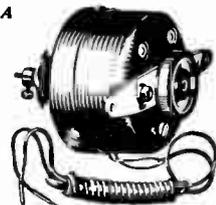
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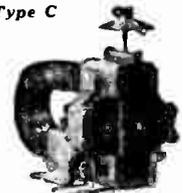


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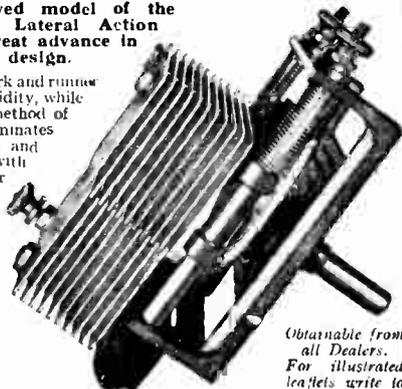
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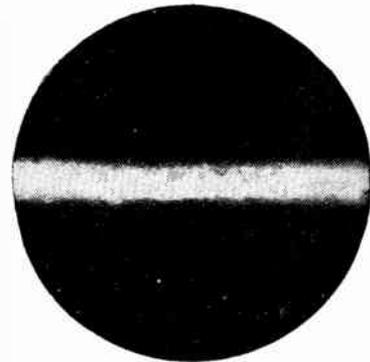
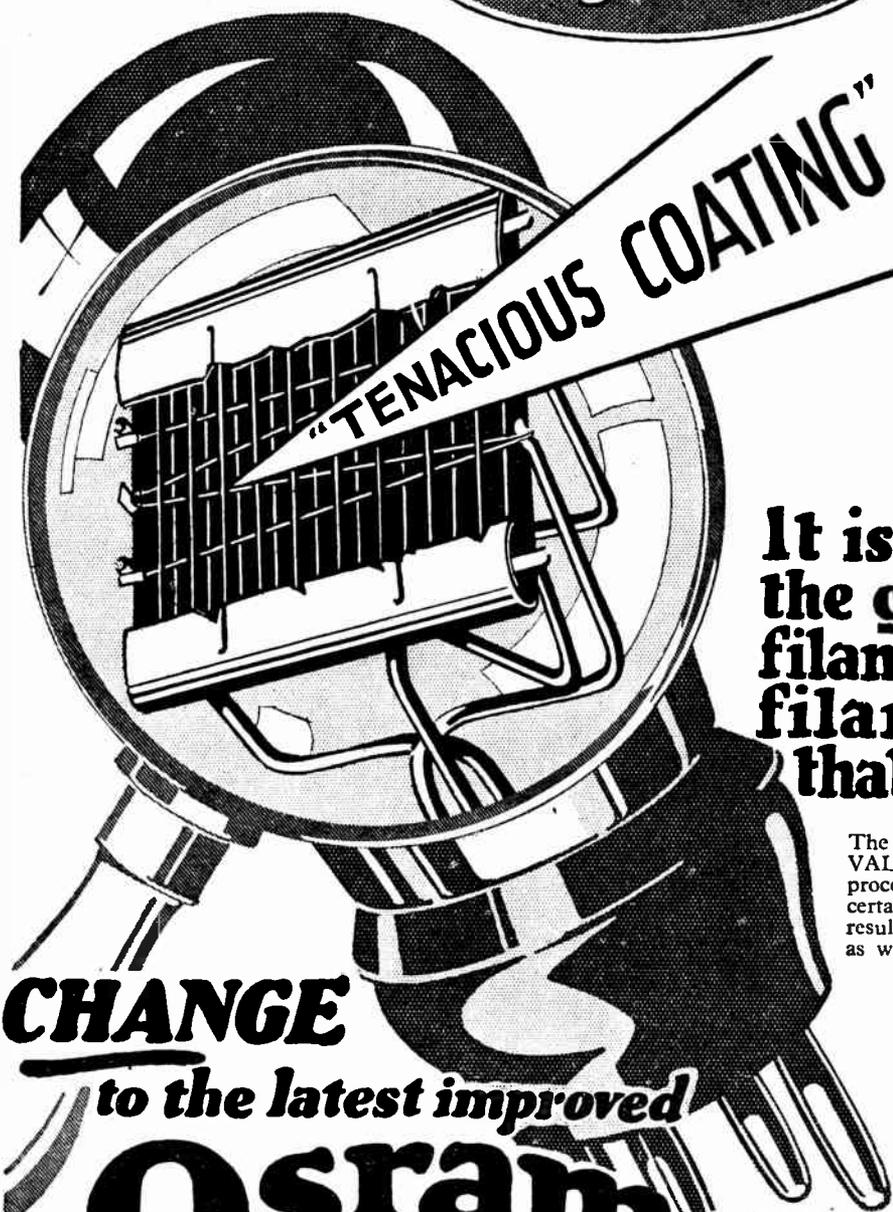
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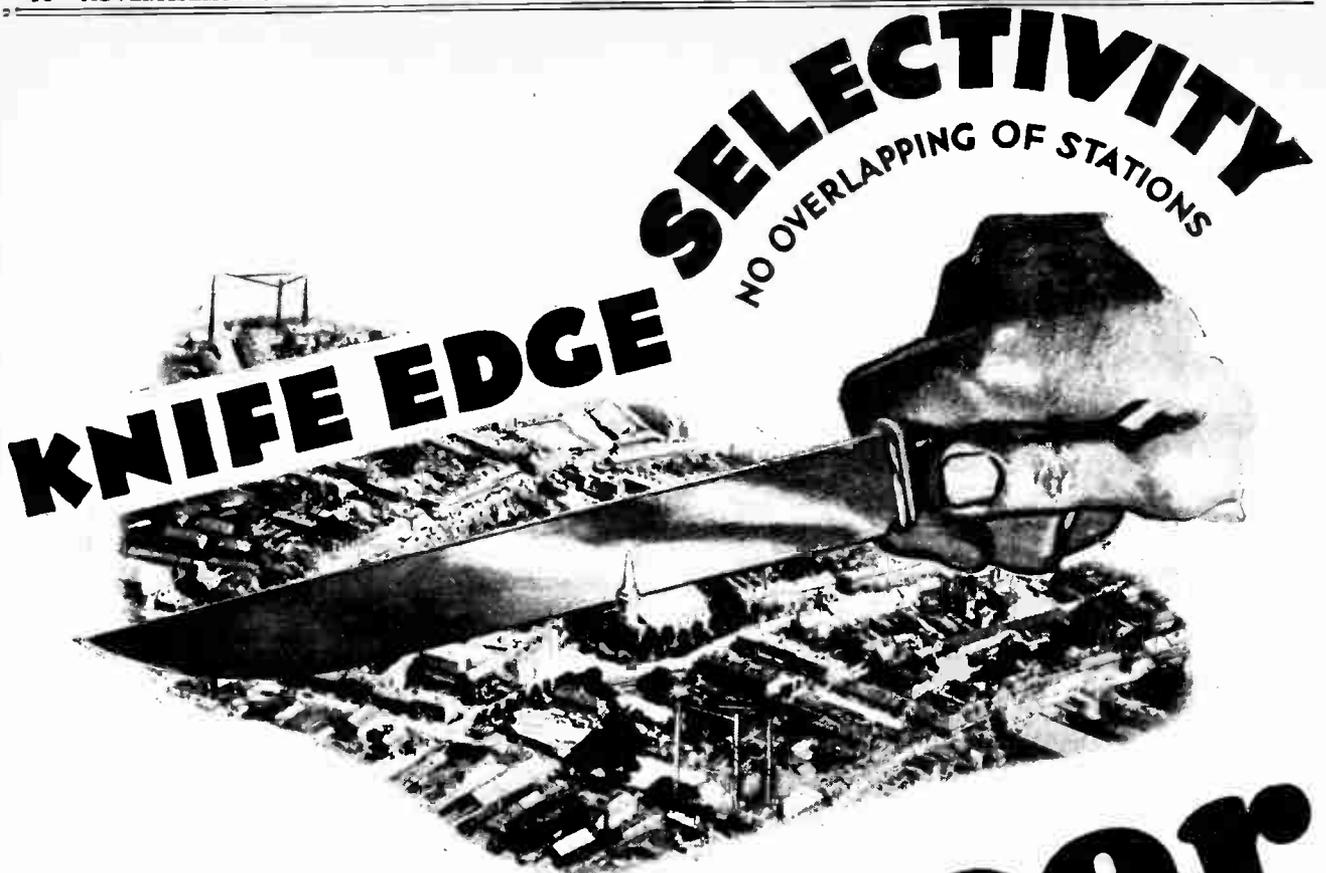
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AND
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OLYMPIA SHOW COMPETITION.

As promised last week, we give details in this issue of the results of the Competition organised by *The Wireless World* in connection with the recent Olympia Radio Show, the results indicating the choice made of apparatus in each of a number of classes into which we divided the exhibits.

In the first position, as the outstanding feature of the Show, we have the new Amplion "Lion" loud speaker, and this instrument also wins first place in the loud speaker class. In multi-valve sets, the Marconiphone Portable Receiver, Type 53, comes first, and in sets of four valves and less first place is gained by the Gecophone "Victor Three," manufactured by the General Electric Co., Ltd. Metropolitan Vickers are successful in two classes, gaining first place amongst mains eliminators with their Type B All Mains Unit, which supplies H.T., L.T., and G.B., whilst their Elastic Aerial unit gains the highest number of votes in the components class. Amongst accumulators and batteries the Chloride Electrical Storage Company win with their H.T. accumulator batteries, type W.T.10, and in valves

the Mullard Pentode has a large majority of votes.

The names of the readers who are successful in gaining the prizes offered are also given elsewhere in this issue, and each of the winners has now been advised of his success.

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MAINS SUPPLY UNITS.

WE have recently seen an announcement to the effect that the Middlesbrough Electricity Supply Corporation has undertaken to supply consumers of current from their station with mains eliminators for use with wireless sets on the hire system. It is enterprising of the Corporation to undertake this service, and it sets a good example to other electricity supply authorities, but we very much regret to see that the Corporation has encroached upon what we consider to be the legitimate activities of another industry. The Corporation, it is announced, has designed and is manufacturing its own battery eliminator for the purpose, and in view of the fact that there are so many entirely satisfactory eliminators on the market which have been designed and produced by wireless manufacturers, we think that this action on the part of the Middlesbrough Corporation is not only unnecessary but unreasonable. Moreover, if the attitude should be extended to the point of requiring that a consumer should use their eliminator and no other, then it would seem that this would be verging upon abuse of the Corporation's monopoly.

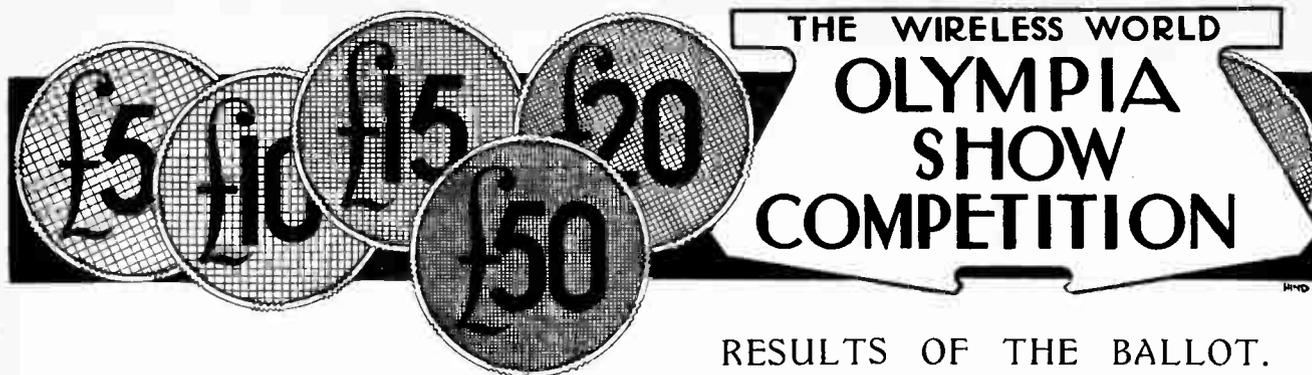
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PARIS RADIO SHOW.

IN this issue we publish a review of the Radio Show held at the Grand Palais in Paris, which opened on October 25th. The Exhibition is the equivalent of our annual Olympia Show, and in point of importance in France is no doubt equal to it.

One or two points of special interest show up in reporting upon the exhibits; in particular, the extent to which French designers have concentrated on the super-heterodyne almost to the exclusion of every other type of receiver. Unfortunately, the quality of reproduction from the majority of the receivers leaves much to be desired by comparison with British equivalents. There are, however, as one would naturally expect, some notable exceptions.

More attention appears to be given to external appearance and cabinet work in the French receivers than in the British. There are signs that interest in wireless generally in France is expanding, and this impression is confirmed by the very large attendance at the Paris Show.



RESULTS OF THE BALLOT.

AS announced in our last issue, we are now able to publish the results of the Ballot in *The Wireless World* Competition arranged in conjunction with the recent Olympia Radio Show. It will be remembered that the purpose of the Competition was to ascertain what, in the general opinion of our readers, were the best products in various classes exhibited at the Olympia Show.

How Apparatus was Classified.

In order to facilitate the voting, we asked for competitors to enter on the Ballot Form what they considered to be the outstanding feature of the Show, and then to enter what they regarded as the best exhibit in each of the following classes:—

(1) Complete receivers of five valves or more; that is to say, receivers exclusive of loud speaker and batteries, unless these should happen to be incorporated as a part of the receiver.

(2) Complete receivers or amplifiers of four valves or less, similarly defined.

(3) Batteries of all kinds, including accumulators for both high tension and low tension.

(4) Mains supply units, both D.C. and A.C., and including those which provide filament-heating circuits.

(5) Loud speakers of all types.

(6) Valves.

(7) Other component parts, including transformers, fixed and variable condensers, tuning coils, valveholders, resistances, aerial equipment, etc., etc.

We believed that it would be of very great interest to our readers to have such a means of contributing their views to a general vote, whilst

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Class 2.

"Victor Three" Receiver.
The General Electric Co., Ltd.

Class 3.

New Exide H.T. Accumulator,
Type W.T.10.
The Chloride Electrical Storage Co., Ltd.

Class 4.

Combined Eliminator for H.T., L.T and
G.B., Type B.
Metro-Vick Supplies, Ltd.

Class 5.

Amplion "Lion" Loud Speaker.
Graham Amplion, Ltd.

Class 6.

P.M. Pentode Valve.
The Mullard Wireless Service Co., Ltd.

Class 7.

Met-Vick Elastic Aerial Unit.
The Metro-Vick Supplies, Ltd.

WINNING COMPETITORS.

1st PRIZE.—£50. MR. GEORGE RITCHIE, Townhead Place, Kilmacolin, Renfrewshire.

2nd PRIZE.— Apparatus of the winner's selection to the value of £20. MR. JOHN MACUIRE, 16, Flora Street, Lower Broughton, Manchester.

3rd PRIZE.— Apparatus of the winner's selection to the value of £15. MR. S. K. DORAN, 3, Junction Road, Romford, Essex.

4th & 5th PRIZES.—These two competitors having tied, the 4th and 5th prizes of apparatus to the value of £10 and £5 respectively, are divided equally. MR. W. MUSSELWHITE, Charlton Marshall, Blandford, Dorset, and MR. JOHN J. GROVER, 84, Clough Road, Rothorham, Yorks.

it was also thought that the result would be of general utility, and that it would provide valuable information for the help and guidance of manufacturers themselves. We think it will be agreed that the views expressed by our readers in the Ballot have justified our anticipations.

We take this opportunity of explaining that the nature of the Competition, and the fact that every entrant could make a choice from amongst every article exhibited at Olympia, is the reason for a delay in arriving at the results.

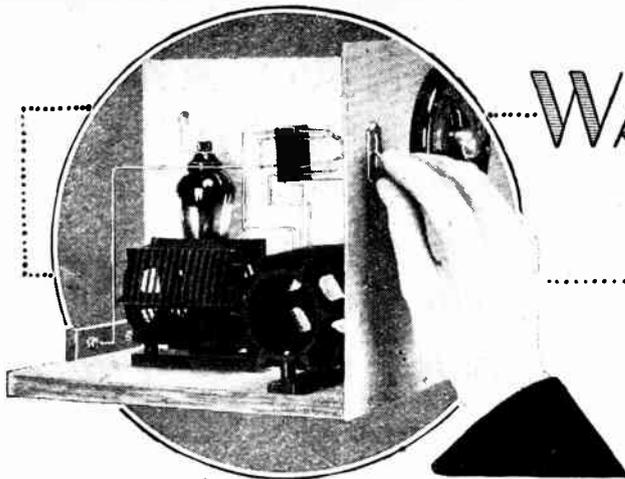
On this page we set forth the names of the manufacturers and the apparatus in each class which have gained first position, and the names of the winners in the Competition, with a note of the prizes which they receive.

Prize Awards.

A cheque for the sum of £50 has been forwarded to Mr. George Ritchie, as the winner of the first prize, whilst the winners of second, third, fourth, and fifth prizes have been invited to forward to us a note of the apparatus which they select to the value of their prize-money, in order that we may arrange for the despatch of the apparatus to them direct.

We propose to illustrate and describe the winning apparatus in the various classes and to give, in addition, one or two illustrations and some descriptive details of the works where the apparatus is produced, as we think that it will be of interest to our readers to have some information as to the organisation behind the production of the apparatus which they have selected as of special merit.

WAVEBAND SWITCHING



From Short to Long Waves
without Changing Coils.

By H. F. SMITH.

THE present-day tendency towards the abolition of plug-in coils in favour of wave-changing by switches may be attributed largely to an increased reliance on radio-frequency measuring instruments on the part of those responsible for the design of receiving gear. At one time it was considered impossible to obtain efficiency except by inserting suitable inductances for the wave range to be covered; this erroneous impression was perhaps due, in part, to the fact that unsuitable components and circuit arrangements were used. We now know that a well-thought-out scheme of switching will introduce a loss so small that it can with difficulty be measured; it will certainly not be audible on a comparative test. Even if it becomes necessary to introduce a compromise between ideal conditions and the requirements of economy and compactness, the resultant falling-off in efficiency need not be too serious; and, most important of all, it can be measured.

It is impossible in a short article to treat all the problems which may puzzle those who wish to include switching in a new receiver or to adapt it to one already built;

indeed, bare circuit diagrams of the application of switching to all the more popular types of receivers would occupy many pages. However, an attempt will be made to indicate how this up-to-date aid to easy operation may be applied to typical circuits; changes of more than two wavebands will not be discussed. In all the diagrams given, long- and short-wave coils are denoted, respectively, as L_1 and L_2 .

Labour-saving Devices.

The problem, viewed in its simplest aspect, is not a difficult one. Let us consider the tuning arrangements of a simple receiver in which an anode bend detector (which will generally be followed by L.F. amplification) is directly coupled to a tuned aerial coil. The essentials of this arrangement are shown in Fig. 1 (a). Instead of changing plug-in tuning coils, how can an equivalent operation be performed by a switch? This is really the fundamental problem, and the solution is given in Fig. 1 (b), which shows that the two external circuit connections which remain unchanged are connected to the

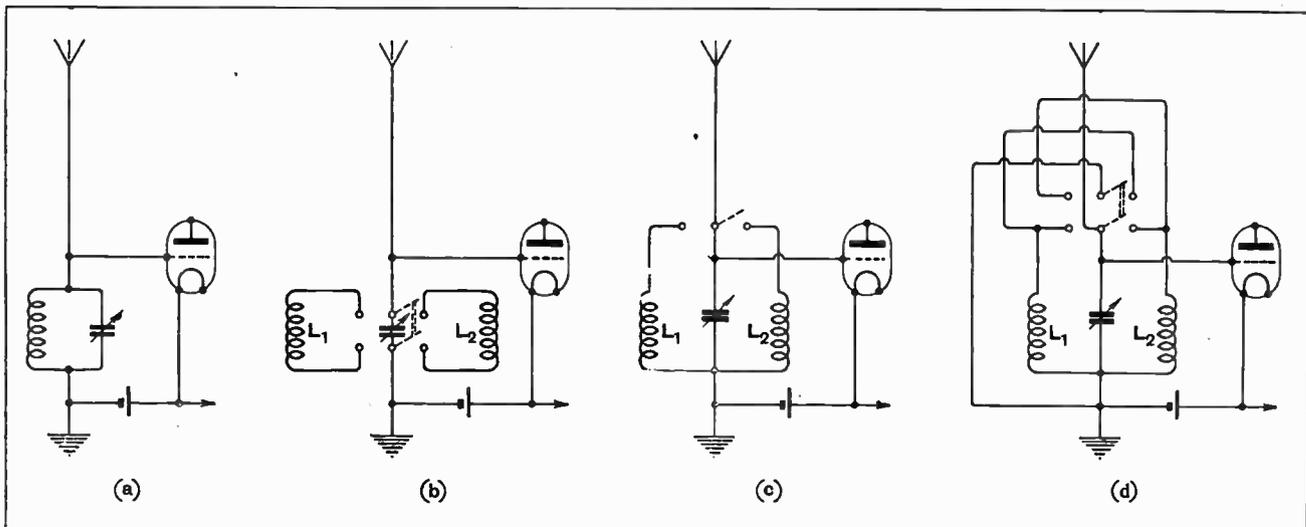


Fig. 1.—An anode bend rectifier directly coupled to a tuned aerial circuit (diagram (a)). Various methods of introducing waveband switching are shown.

Waveband Switching.

centre contacts—and so to the blades—of a double-pole change-over switch, the coils which are to be connected being joined to the outer contacts. It is not difficult to see that coil L_1 will be thrown in circuit when the switch blades are moved to the left, and that L_2 will be completely isolated; the state of affairs will be reversed when the switch arms are moved to the right.

General Considerations.

Although this is not unduly complicated, it is possible still further to simplify matters by using a switch with but a single pole, and permanently connecting together one end of each coil. It is important that the ends so joined together should be those which are connected to earth, either directly or as far as high-frequency voltages are concerned. This arrangement is shown in Fig. 1 (c).

inconvenient, or even impossible, and as an alternative we can arrange our switch to short-circuit the winding not in use. The diagram (Fig. 1 (d)) showing this scheme may appear complicated at first sight, but the circuits can be easily traced. It will be observed that a switch with an extra pole is required. Again, the spacing between the nearest points of the coils should not be appreciably less than $1\frac{1}{2}$ in. We can thus formulate a rough-and-ready rule that when "idle" coils are not short-circuited they must be mounted at right angles.

It should be pointed out that interaction between windings increases with their diameter, and there is now a tendency to use smaller coils; unfortunately these are bound to have a somewhat higher H.F. resistance, but this disadvantage can be partially overcome by careful design. If it is desired to effect a compromise in this matter of size it will generally be best to concentrate on maximum efficiency in medium-wave transformers, etc.,

and to use smaller coils for the long waves. This plan is recommended because losses can more readily be tolerated when receiving on the higher wavelengths.

As to the switches themselves, it must be admitted that the market is by no means flooded with types entirely suitable for insertion in high-frequency circuits. Apart from the obvious requirements of high insulation and small dielectric losses, low self-capacity between the metal parts is almost essential. It should be noted that it is of little advantage to fit small and well-spaced outer contacts if a mass of ironmongery is connected, either metallicly or through an appreciable

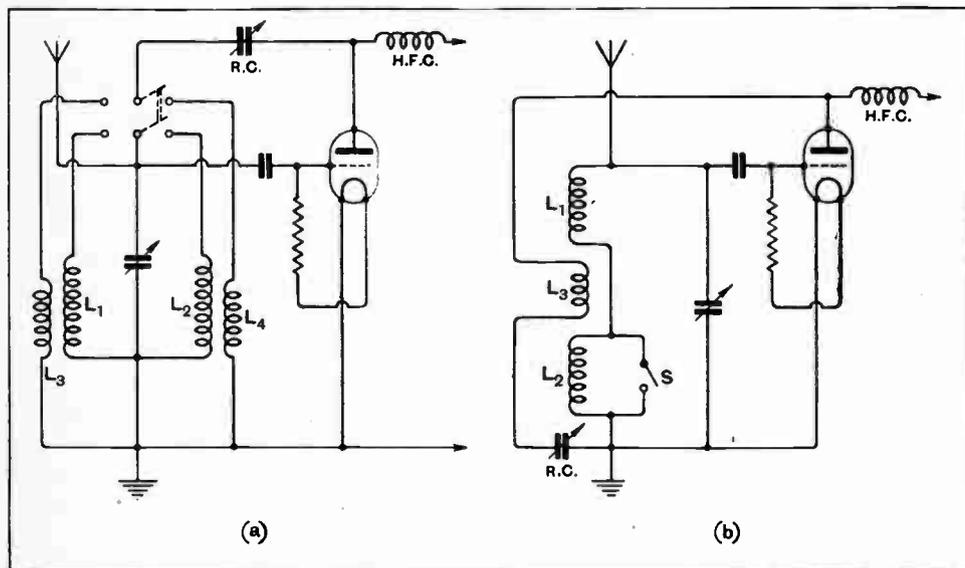


Fig. 2.—Alternative methods of changing wave-ranges in a circuit with regenerative detector.

Before discussing specialised cases, it would appear best to consider some of the general principles involved, and in particular to deal with the relative positions of the coils. It is well known that an inductance can induce energy into another, particularly if they are close together and mounted co-axially, or nearly so; it is therefore a matter of the greatest importance that coils should be suitably disposed, particularly in view of the fact that an inductance designed for covering the longer broadcasting waveband, in conjunction with stray capacities of the values which commonly exist across its ends, has a most unfortunate habit of resonating at a wavelength in the lower band, with the result that it acts as a kind of absorption circuit. The possibility of trouble of this kind can be minimised by arranging the axes of the coils to be at right angles, and also by allowing reasonable spacing between them. As to the exact distance, no hard and fast rule can be laid down, as a good deal depends on the physical size of the coils, etc., but it is generally safe to allow $1\frac{1}{2}$ in. between the nearest points.

In some cases this right-angle positioning of coils is

capacity to the moving blades of the switch.

With regard to the actual wiring, it is well to adhere to the old rule as to short leads with adequate spacing; some thought may with advantage be devoted to arranging the relative positions of coils and switch so that this end may be attained. In any case, and in spite of the observance of reasonable precautions, H.F. leads are almost certain to be longer than in a set in which switching is not included, so, where a high-gain H.F. amplifier is used, it may sometimes be necessary to increase inter-stage screening. The need for this addition may often be avoided by wiring in such a way that inductive loops are not produced, and by inserting the decoupling devices which have been described from time to time in this journal.

Some Characteristic Circuits.

It is, of course, immaterial whether the switch knob is raised or depressed for long or short waves, and there is really little need for standardisation in this matter; the writer generally prefers to arrange matters

Waveband Switching —

so that the knob is "up" for reception of the upper waveband.

The use of wave-range switching is seen in its simplest aspects when considering the simple circuit used as an illustration of the principles involved; some loss of this simplicity will inevitably arise, for instance, when we come to add reaction to a leaky grid detector

do well to follow a well-tryed specification rather than attempt to design a coil assembly for himself.

Hartley circuits (including modifications) lend themselves particularly well to waveband switching, as will be obvious if Fig. 3 is carefully considered. The unmodified circuit (a) is converted by the simple expedient of joining the outer ends of long- and short-wave coils to the outer contacts of a double-pole, change-over

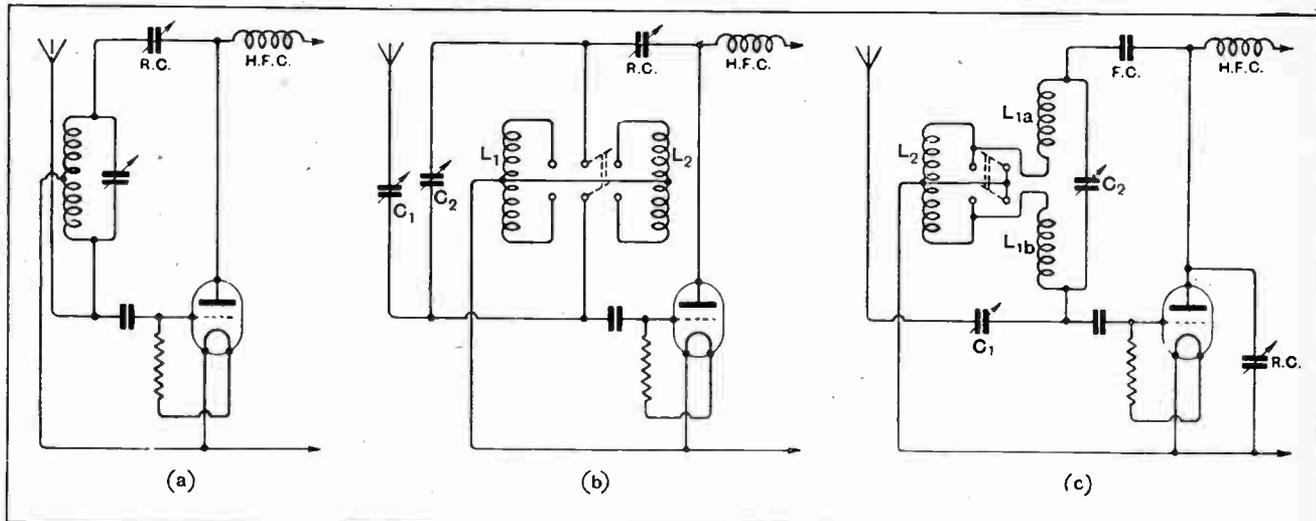


Fig. 3.—Plain Hartley circuit (diagram (a)) with method of switching. A modified arrangement is shown in diagram (c). C₁, aerial coupling condenser; C₂, tuning condenser; R.C., reaction condenser; F.C., feed condenser.

arrangement, as shown in Fig. 2. The first diagram (a) indicates an obvious but quite satisfactory method of procedure to be followed when reaction is controlled by means of a condenser (R.C.). The grid coils L₁ and L₂ are connected by one blade of the switch exactly as in Fig. 1 (c), the associated reaction windings L₃ and L₄ being placed in circuit by a second pole. On tracing the circuit it will be observed that R.C. is at high potential, and is not connected to the earth sides of the reaction coils. This arrangement is adopted in order to avoid further complications, and, in view of the fact that condensers with insulated and shielded rotors and stators are now obtainable, is free from any serious objections.

Advantages of Hartley Circuits.

What is probably the simplest, and certainly one of the most popular, methods of switching a regenerative detector receiver is that shown in Fig. 2 (b). Here it will be seen that the long-wave loading coil L₂ is merely short-circuited by means of a switch when receiving on the medium band. The reaction coil L₃ is common to long- and medium-wave grid inductances, and is so arranged that it is in inductive relation with both of them. This means, in practice, that L₁ and L₂ will be wound co-axially, and as a rule they will be wound on the same former, with the reaction coil between them. Although the arrangement is attractive, in view of its freedom from complication and the need for special components, it calls for care with regard to windings and coupling, and the less-experienced amateur would

switch, the moving blades of which are connected across the tuning condenser. It is probably because ordinary commercial centre-tapped coils are suitable for this circuit that it has such a wide appeal.

The throttle-control Hartley circuit, as used in the "Everyman Portable," and, with the substitution of a differential reaction condenser, in the "Pentode Two" receiver, is particularly successful in a "switch-over" set. It is illustrated in Fig. 3 (c), and need not be described, beyond saying that the short-wave tuning

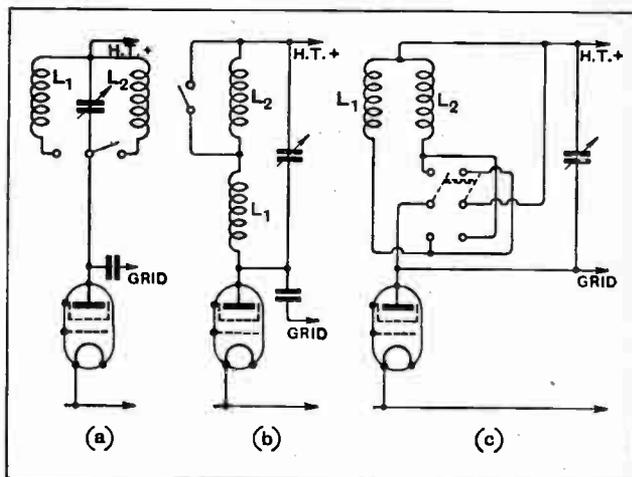


Fig. 4.—Changing tuned anode inductances in an H.F. amplifier with screened-grid valve.

Waveband Switching.—

inductance is divided into two halves ($L_1 (a)$, $L_1 (b)$); to receive the long waves a loading coil L_2 is inserted at this point, and is short-circuited when required by means of a switch.

When we come to the switching of H.F. coupling circuits, it is found that the requirements are not vastly different from those obtaining in the grid circuits of a detector valve, especially when screened-grid valves are

discussed, and has the same advantages in that it affords almost perfect reaction control. Although it requires a special split short-wave winding, $L_1 (a)$, $L_1 (b)$, the long-wave loading coil may be an ordinary centre-tapped inductance of compact design. It should be pointed out that this coupling is suitable only when the valve following it is operating as a grid detector, but, from the fact that the application of reaction is being discussed, we can safely assume that this will be the case. The

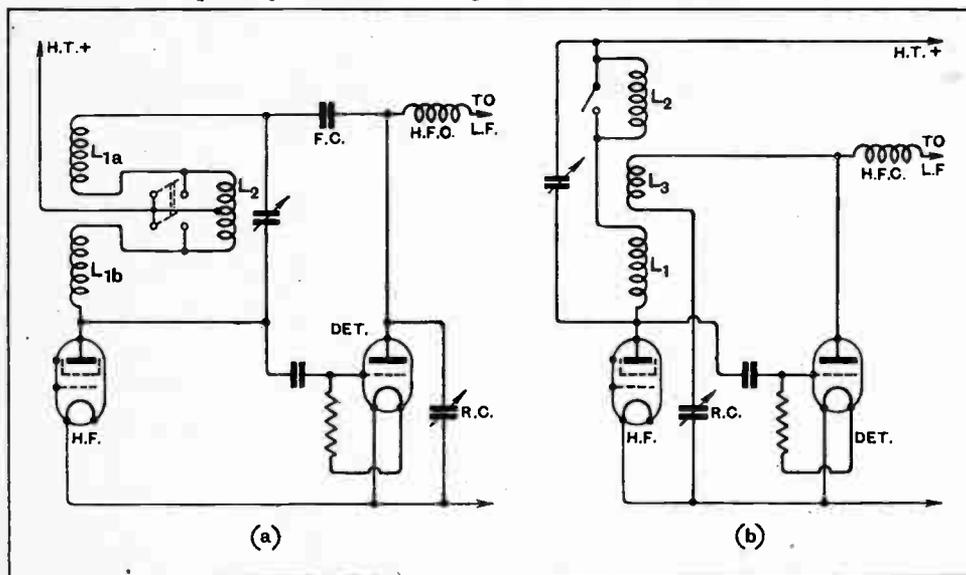


Fig. 5.—Tuned anode coupling circuits with reaction.

used in conjunction with tuned anode couplings. Fig. 4 (a) shows the simple and obvious method of throwing different anode coils into circuit. The alternative method of joining long- and short-wave windings in series, and short-circuiting the former, will certainly appeal, on account of the fact that a simple, single-pole switch only is required. This is shown in diagram (b). Another arrangement, which is preferable when the spacing between the coils is insufficient to prevent interaction, is that suggested in diagram (c); here a D.P.D.T. switch is arranged to place the appropriate coil in circuit and at the same time to short-circuit the other. All these forms of connection are applicable only in cases where reaction on to the anode coil is not applied.

Switching Regenerative Circuits.

As in the case of a plain detector valve, the addition of reaction to an interstage coupling is bound to introduce some complication, but there are fortunately means of attaining the desired results without expending too much effort. The arrangement of Fig. 2 (a)—with the obvious modification of connecting the low-potential ends of the coils to the high-tension positive terminal instead of to earth—is in some ways the most satisfactory, although it calls for a double-pole, double-throw switch in conjunction with separate pairs of specially wound tuning and reaction coils.

Two other circuits for tuned-anode-and-reaction couplings are given in Fig. 5. The first (a) is an adaption of the throttle-controlled detector arrangement already

discussed, and has the same advantages in that it affords almost perfect reaction control. Although it requires a special split short-wave winding, $L_1 (a)$, $L_1 (b)$, the long-wave loading coil may be an ordinary centre-tapped inductance of compact design. It should be pointed out that this coupling is suitable only when the valve following it is operating as a grid detector, but, from the fact that the application of reaction is being discussed, we can safely assume that this will be the case. The second method, Fig. 5 (b), is akin to that of Fig. 2 (b); the same care is necessary with respect to the relative spacing of the three coils and the number of turns in the reaction winding L_2 . This is certainly the most popular arrangement of today, as it is both simple and effective.

When screened-grid valves are used in conjunction with tuned transformers as interval couplings, there seems to be no real alternative to connecting a D.P.D.T. switch so that plate and grid of preceding and succeeding valves are connected to the high-potential ends of appropriate coils. If it is possible to allow fair spacing between the transformers short-circuiting of the idle coil is unnecessary, but where space is restricted it is desirable to connect the third blade of a three-pole switch to carry out this operation in the manner shown in Fig. 6; it will be sufficient if one winding—preferably the secondary—is short-circuited.

In commercial receivers it seems to be considered

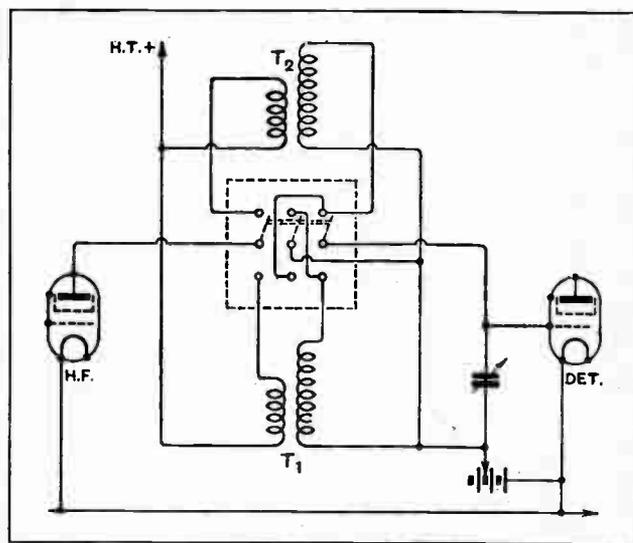


Fig. 6.—Transformer coupling with screened-grid valve: a switch change-over with short-circuiting device.

Waveband Switching.—

essential that wave-changing should be effected by operation of a single knob. In detector-L.F. sets this presents no difficulty; but where efficient H.F. stages are used it becomes necessary to provide separate switches for each grid and plate circuit. As to whether these switches should be mechanically coupled in a home-constructed set is a matter for the amateur himself to decide.

In the various diagrams of grid circuits which have been given, directly-connected aeriels are shown,

although it is nowadays usual to provide an inductive or auto-transformer coupling. A desire to avoid making the subject appear more complicated than it really is was responsible for this deviation from standard practice. A coupled open circuit can easily be added by using an extra pole on the switch and joining the aerial to its centre contact; the outer contacts are joined either to the primary windings or to the tapping points of appropriate coils. These remarks do not apply to the Hartley circuits given in Fig. 3.

A SUGGESTED EXPLANATION OF THE CRYSTAL DETECTOR.

Rectification Phenomena may be Traced to Piezo-electric Action.

AN interesting theory of the contact detector has been published by F. Regler in the *Physikalische Zeitschrift* based on research carried out in the Physical Institute of the University of Vienna, and which may contain the solution of this difficult problem. Regler starts with experiments in which the crystal is used as a rectifier for large currents and high voltages; in this direction he has already achieved considerable success. He has succeeded, for example, in rectifying ordinary alternating current at 110 volts, 50 cycles with the aid of two carborundum crystals, and has obtained in this way direct current up to 0.5 ampere. Further, he found it possible to increase the voltage up to 5,000 volts., and to rectify this with a carborundum crystal and a plate of stainless steel, obtaining a direct current of 0.1 ampere.

Glow at Point of Contact.

During these researches with high-voltage alternating current Regler noticed a distinct glow at and near the point of contact of the crystal, very similar in character to that seen on piezo-electric crystals. It was apparently in this way that Regler arrived at the idea that the rectifying action of the crystal detector might be traced to piezo-electric action, and has tested this theory of his in detail, so that he has been able to explain all the known phenomena of the crystal detector, though these have often seemed contradictory in the light of previous researches.

Regler makes a distinction between good and bad detectors. By good detectors he means combinations of two crystals, or of one crystal and a metal; bad detectors on the other hand are combinations of two metals. So far as these bad detectors are concerned, their operation appears to be due primarily to small crystals of metal oxide; furthermore, the phenomenon of the density of electrons on a metal point probably plays an important part. From the practical point of view only the good detectors, consisting of crystal against crystal or crystal against metal, need be considered. For these cases Regler assumes that the crystal contracts during one half-wave of the alternating current, and expands during the other, thus increasing or decreasing the resistance of the contact. It is clear that in this way a rectifying action will occur.

It might be advanced against this theory that the strongly piezo-electric crystals cannot be used for rectification. The reason for this however apparently lies in

the fact that the highly piezo-electric crystals conduct but badly, while detector-crystals must have a reasonably low resistance. As a matter of fact, all known crystals are more or less strongly piezo-electric, and apparently extremely small variations of contact pressure, such as are imaginable at a carefully chosen crystal point, suffice to provide for operation as a detector. In addition, the resistance of the piezo-electric crystal varies under the influence of the contraction and expansion, which possibly accentuates the effect of the varying pressure at the point of contact.

Oscillating Crystals.

According to Regler his theory gives an explanation of the oscillating crystal of Lossey, and other similar phenomena which have been observed in the last few years in connection with rectifying crystals. Regler has also succeeded in explaining, with the aid of his theory, various other effects, such as that of jarring on crystals that have become insensitive, the effect of heating, the need for a biasing voltage with carborundum crystals, the direction of the rectified current, and the characteristic of the detector.

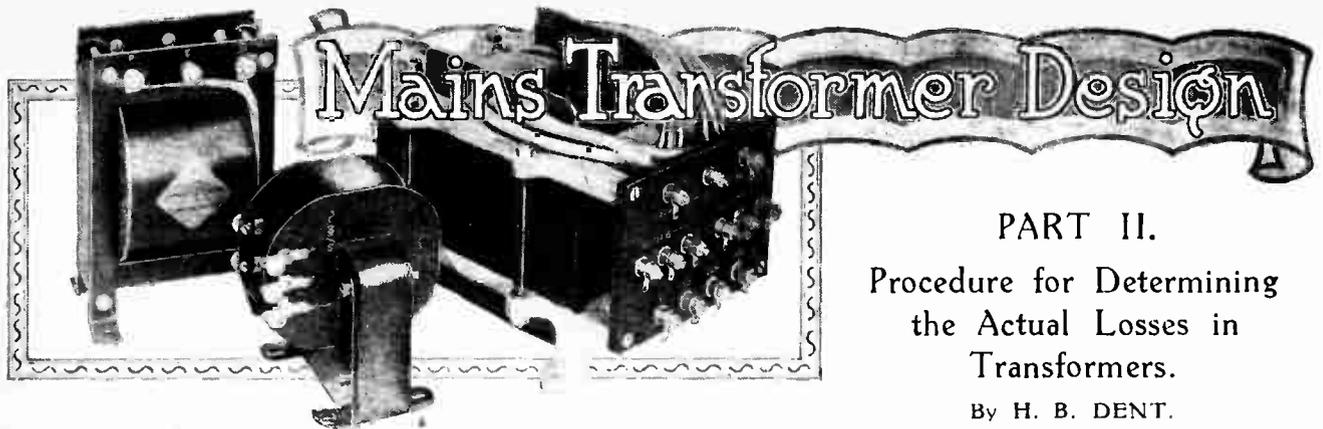
Before the problem can be regarded as finally solved, the comments of other physicists on the new theory must be awaited, but it is by no means improbable that the theory correctly explains at least the majority of observed phenomena.

WIRELESS DIARY FOR 1929.

The Wireless Amateur's and Experimenter's Diary and Note Book.

THE Diary fully maintains the high standard of its predecessors, and its pages are filled with information of value alike to the experimenter and the ordinary listener. Twenty-four pages are devoted to diagrams of typical circuits employed in wireless receivers and battery eliminators. A summary is given of the Regulations controlling amateur transmitting and receiving licences. The characteristic features of all standard valves are given in tabular form for ready reference.

Listeners will find a comprehensive list of European broadcasting stations arranged in order of wavelength, and, as these wavelengths are subject to alteration, a blank column has been left for amendments. The experimenter and home-constructor will appreciate the mass of useful data to be found in the pages of this little pocket book, which is published jointly by Messrs. Iliffe & Sons Ltd., and Charles Letts & Co. Price, bound in cloth, 1s. 1d. post free, or in leather case with pencil and season-ticket pocket, 2s. 7d.



PART II.

Procedure for Determining
the Actual Losses in
Transformers.

By H. B. DENT.

(Concluded from page 572 of October 24th issue.)

IN the first part of this article we discussed the nature, and the method of determining the magnitude of the losses common to all transformers of the type dealt with here. As we have now reached a stage in the design when sufficient information is available to calculate these we will apply the method to the present case, taking, to commence with, the copper losses. From the scale drawing of the core, the mean length of one turn is found to be $8\frac{7}{8}$ inches—for convenience we will take this as 8.8 inches—and if the total number of turns on each winding is multiplied by this figure the estimated amount of wire in each coil will be sufficiently accurate for the present purpose. Taking the primary first, we

calculate the length of wire as $\frac{1,440 \times 8.8}{12 \times 3} = 324$ yds.,

and from the table the resistance per yard of No. 26 S.W.G. is found to be

0.094 ohms, consequently the D.C. resistance of this coil is $324 \times 0.094 = 31.4$ ohms. Now, assuming the primary current to be as decided earlier, the I^2R loss will be $0.24^2 \times 31.4 = 1.88$ watts. Treating the high-voltage secondary in a like manner, the amount of wire here amounts to

$\frac{3,000 \times 8.8}{12 \times 3} = 730$ yards.

the resistance $730 \times 0.53 = 387$ ohms, and the I^2R loss

$0.05^2 \times 387 = 1$ watt. The copper loss in the low-voltage secondary will be

found to be

$$\frac{36 \times 8.8 \times 0.0075 \times 3^2}{12 \times 3} =$$

0.6 watts. Therefore, the total copper loss in the transformer is $1.88 + 1 + 0.6 = 3.5$ watts approximately.

The first step in working out the iron loss is to find the volume of iron in the core by multiplying together the three outside dimensions, taken from the scale drawing, deducting from this a volume equal to the two wind-

ing spaces, and multiplying the remainder by the iron space factor. Thus; $3\frac{9}{16} \times 3\frac{3}{16} \times 1\frac{9}{8} = 18.4$ cubic inches, and the winding spaces $2(2\frac{1}{16} \times \frac{7}{8} \times 1\frac{5}{8}) = 6.6$. Therefore, the total volume of iron is $18.4 - 6.6 \times 0.9 = 10.6$ cubic inches. To convert this to pounds, we multiply by 0.28 ($10.6 \times 0.28 = 3$ lb. approximately).

From the curve, Fig. 4, it will be seen that at a flux density of 50 kilo-lines and for 50 cycles supply, the watts lost are 2.6 per lb., so that the iron loss is $3 \times 2.6 = 7.8$ watts. By adding together the copper and iron losses we find the total watts lost in transformation, and thereby determine the efficiency factor of the device. In this case the losses are $3.5 + 7.8 = 11.3$ watts, or 20 per cent. approximately. Thus the efficiency of the transformer will be in the order of 80 per cent., or somewhat higher than we estimated at the commencement. This difference will

have some slight bearing on our calculations as regards primary current and copper loss in this coil, but it is not sufficiently serious to warrant revision of the working. Of course, in all designs based on assumed dimensions, as in the present case, a slight discrepancy between certain assumed values and true values must creep in, but in very few cases will this be serious.

Before embarking on the construction of the transformer, it would be advisable to ascertain the magnetising current, as although this will normally have no bearing on the efficiency, being a wattless

current, it would affect it if found to be too large. In designing a transformer for power work, this would be given consideration in the very early stages, but in the present case the method is based partially on the result of measurements made with components of a similar type, and, within certain limits, the mode of procedure

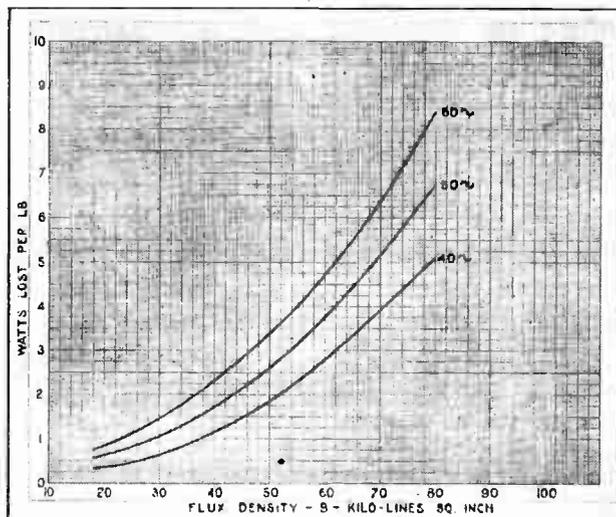


Fig. 4.—Curve showing watts lost per lb. of iron at various flux densities. (Courtesy Jos. Sankey & Sons, Ltd.)

Mains Transformer Design.—

explained in the foregoing chapters is admissible; it is also a short cut to results which could be obtained otherwise only by lengthy and tedious calculation.

Although the magnetising current is responsible for the flux in the core, and is accordingly a part of the current in the primary, normally it is 90 deg. out of phase with the supply voltage, and will have no effect, therefore, on the reading of a wattmeter. As electricity is sold at a definite rate per unit (current × volts per hour), the consumer pays nothing for magnetising the iron; this is, perhaps, one of the few instances where something useful can be obtained gratis. Should the magnetising current reach a comparatively large value, it may cause a considerable reduction in the efficiency and will certainly lead to over-heating, as under these conditions it will have a component in phase with the supply voltage which will add to the primary current and consequently to the I^2R loss in this coil.

Formula for Magnetising Current

The magnetising current depends on the ampere-turns per inch length of the iron circuit required to produce the working flux density in the core, also upon the magnetic resistance of the iron. This will vary with different samples, and the curve given in Fig. 5 shows the relationship between flux density and ampere-turns per inch for "Stalloy" transformer iron.

The formula for determining the magnetising current is as follows:—

$$\frac{l \times \text{ampere-turns per inch}}{1.41 \times \text{primary turns}} \dots \dots \dots (3)$$

where l = mean length of the iron circuit.

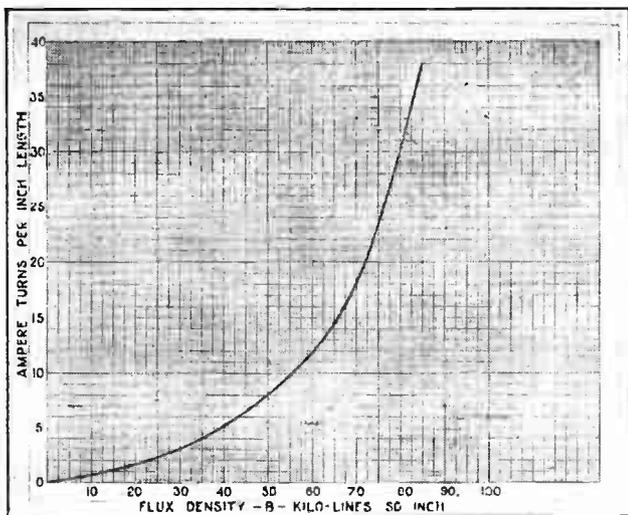


Fig. 5.—Relationship between ampere turns per inch length of magnetic circuit and flux density. (Courtesy Jos. Sankey & Sons, Ltd.)

From the curve in Fig. 5 we find that at a flux density of 50 kilo-lines per square inch the ampere-turns per inch will be eight, and the mean length of the iron circuit 8½ in. (scale drawing of core). Therefore, the magnetising current is as follows:

$$\frac{8 \times 8.5}{1.41 \times 1,440} = 0.033 \text{ ampere,}$$

which is 17 per cent., approximately, of the full-load primary current. Although this figure would hardly be acceptable to those concerned with the design of transformers for power work, the writer has found that in small components of the type discussed here the danger point is not reached until the magnetising current exceeds 20 per cent. of the full-load primary current.

Coil Winding.

This article would hardly be complete without a reference to the method of constructing and assembling the coils to comply with the conditions previously discussed.

It will be recalled that a suggestion was made to the effect that the primary and high-voltage secondary should each be divided into two coils of equal turns, and all be mounted in a symmetrical manner, as far as coupling is concerned, on the centre limb of the core.

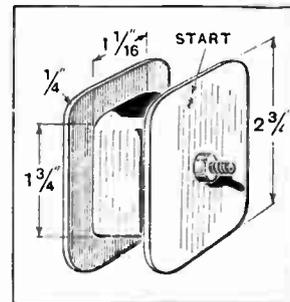


Fig. 6.—The coils described in the text could be wound on a former of this type.

This naturally postulates a slab type of coil, and we will now give attention to a consideration of the most suitable thickness for each. The length of the centre limb is 2 5/16 ins., and the available depth for winding 3/8 in. Now, having regard to the relative claims each winding has on the space available, we will decide to make each primary coil 1/8 in. thick, each high-voltage secondary 1/16 in., and the filament coil 3/8 in. This would appear to leave just over 1/4 in. to spare. It must be remembered that the coils will be bound with tape after winding, also they will probably swell slightly when the former is removed, so that actually there will be little or nothing to spare in this direction.

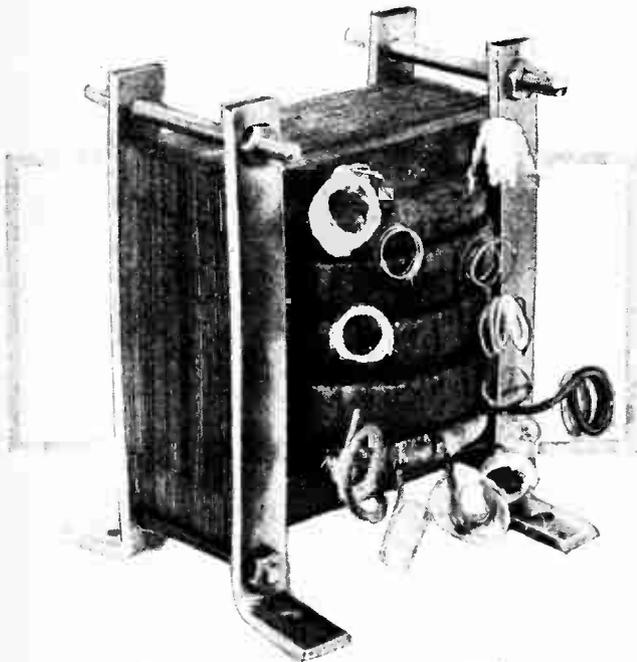
Any tendency on the part of the coils to swell when the winding former is removed can be mitigated by adopting the following method of construction. In the first case two or more formers should be made up to the dimensions given in Fig. 6, but those used need not have an exhibition finish, although the essential dimensions should be accurately reproduced. The side cheeks and centre bosses can be cut from any hard wood available, and the three pieces comprising each former held rigidly together by a nut and bolt passed through clearance holes in the centres. A small hole will be required in one side piece close to the centre boss, to pass the commencement of the wire through, and should be positioned so as not to bring the wire out of the coil at a side which is adjacent to the iron. As the long sides of the coil will pass through the window, the hole should be drilled in one of the short sides.

Before the first turns of wire are put on, two or three layers of thin paper should be wrapped round the centre boss to prevent the insulation being damaged when this is removed from the finished coil. If alternate layers of wire are given a coating of thin shellac varnish it will help to hold the coil together, and a layer of thin paper put on occasionally will help to maintain an even winding surface. The constructor must be very sparing with

Mains Transformer Design.—

the layers of paper, and should keep an even tension on the wire during winding, otherwise the coil will finish too large to fit on the core. When the required number of turns have been put on and a further coating of varnish applied the wound former should be placed in a warm oven to bake for about an hour, and then laid aside to harden. In the meantime another coil can be wound in a similar manner on one of the spare formers.

Before the varnish on the first coil has become too hard the side cheeks of the former should be carefully removed and the exposed wire given another application of varnish and again baked. When this has set, a very rigid coil will result, and it will be possible to remove the centre boss without affecting the shape of the coil. Now bind each coil with some thin linen or silk tape, using only just sufficient to completely cover the wire, after which a final touch of the shellac brush, to impart a workman-like finish, and a short spell in the oven, will see the end



A partially assembled transformer designed for a special experiment. The secondary windings give 2, 6, 8 and 30 volts. Rating 50 watts output.

of this work. It might be worth while to tie a small tag on each coil before binding with tape, as in some cases the gauges of wire may be so close that identification by this means alone would be impossible. Needless to say, the same direction of winding should be maintained throughout, then if the coils are assembled with the inside ends all coming out to the left, for example, the direction of winding will be the same in all coils. The

reason for this is obvious, as the primary and one of the secondaries are in two parts but connected in series, consequently the direction of winding must be the same in both halves of the coil.

A few hints with regard to the assembly of the core would not be out of place here, especially as this will

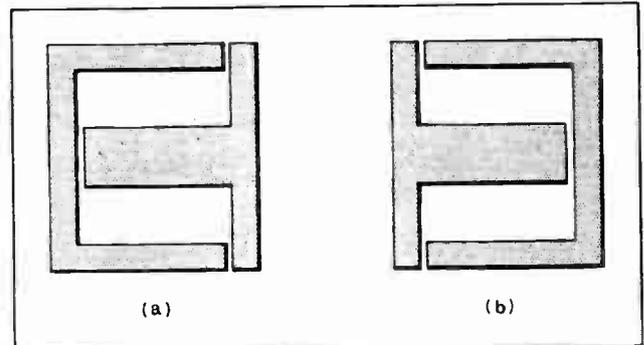


Fig. 7.—Air gaps in the core introduce serious losses so that adjacent pairs of laminations are assembled in reverse order. If (a) represents the first pair, the second should be as in (b).

have a bearing on the efficiency of the transformer. If air gaps are present the magnetic resistance of the iron circuit will increase enormously, and the efficiency of the device will be greatly reduced. The "No. 4" stampings referred to in this article consist of "U"- and "T"-shaped laminations, one of each, or a pair, giving the required shape to the core. The core should not be assembled in such a manner that all "U" and "T" pieces are the same side, otherwise three longitudinal air gaps will be formed. The correct mode of assembly is to reverse the order in each layer; thus if Fig. 7 (a) is the arrangement of the first pair, then the second should be assembled as in (b). By adopting this method of building up the core the gaps do not coincide. Needless to say, as each stamping is provided with insulation on one face, all laminations must be placed in position so that the insulated surface of one pair is adjacent to the bare surface of the other pair. As regards the clamping together of the core, it will suffice to say here that all holding bolts should clear the edges of the stampings, for the reasons discussed earlier in the article, and the final touches, such as fitting of terminal strips, will be left to the ingenuity of the constructor.

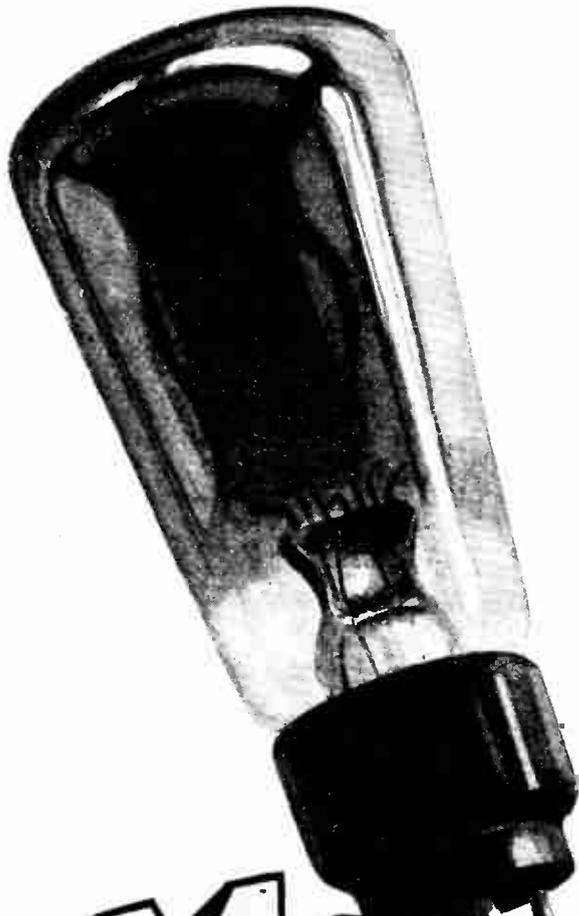
This opportunity is taken to correct an unfortunate error in the fundamental formula on page 569 in the first part of this article. The formula should read $4.44 \times F \times f \times t = 10^8$, and not as given.

In conclusion, the writer wishes to thank Messrs. Jos. Sankey and Sons, Ltd., 168, Regent Street, London, W.1, for kindly placing at his disposal the data from which the B/H and "iron loss" curves with regard to "Stalloy" transformer iron were prepared.

"THE WIRELESS WORLD" BUYERS' GUIDE TO SETS.

Next week's issue will contain this popular annual feature. Every endeavour is being made to ensure that our lists are even more comprehensive than on previous occasions. Readers desiring to select or make reference to specifications of any commercial set will find the guide invaluable.

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CURRENT TOPICS

Events of the Week in Brief Review.

ROYAL SET-BUILDER.

One of the latest recruits to the ranks of home constructors is King Alexander of Yugoslavia, who, according to a European correspondent, is himself constructing a short-wave set to receive America direct. His Majesty is described as "an inveterate radio fan."

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WHERE "X's" ARE PLENTIFUL.

"Let no one at home ever grumble again about atmospherics," writes a correspondent in South Africa. "I have been out here three months with broadcast and short-wave receivers, and one is truly in luck's way if one hears any station above 20 metres free from a very virulent form of static!"

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WIRELESS AND RAILWAY ACCIDENTS.

That trains should carry wireless transmitters in order to send out warning messages to other trains when stranded in remote districts is the suggestion of a correspondent in an evening newspaper.

A better application of wireless for train safety would probably be in the form of wired-wireless, whereby a train standing in one section would sound an automatic alarm in another train entering the same section.

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SOVIET'S SHORT-WAVE PROJECT.

Russia is constructing new short-wave stations. According to a Moscow message, the People's Commissariat for Posts and Telegraphs has decided to build several new short-wave radio stations in Middle Asia, namely, in the Pamiro, Khorog and Hassan-Kuli. It may be assumed that these are for administrative use and not for broadcasting.

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MUNICIPALITY PROVIDES BATTERY ELIMINATORS.

The Middlesbrough Corporation has completed arrangements whereby electricity consumers can be provided with wireless battery eliminators on a preliminary payment to the Corporation of £1, with half-yearly payments of £1 completing the purchase in five years.

The device has been designed by Mr. R. H. Scotson, the Borough Electrical Engineer; it can be plugged direct into an ordinary light socket, and will supply high and low tension current to any kind of valve set.

A 29

CHATS WITH PUEBLA.

On Thursday last, the Transatlantic Telephone Service was made available (in addition to the towns in Mexico to which the service has already been extended) to the town of Puebla. The minimum charge for a call to Puebla is £12 covering three minutes' conversation.

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I.E.E. WIRELESS SECTION.

The Wireless Section of the Institution of Electrical Engineers will open the winter session this evening (Wednesday) at 6 o'clock at Savoy Place, W.C.2, with an inaugural address by the chairman, Commander J. A. Slee, C.B.E., R.N.

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INDIAN BROADCASTING TO CONTINUE.

According to Bombay reports, the local Marconi interests have consented to finance the Indian Broadcasting Co., whose prospects hitherto have been so unsatisfactory as to lead to the resignation of Mr. Eric Dunstan and other European members of the staff.

ANY OFFERS?

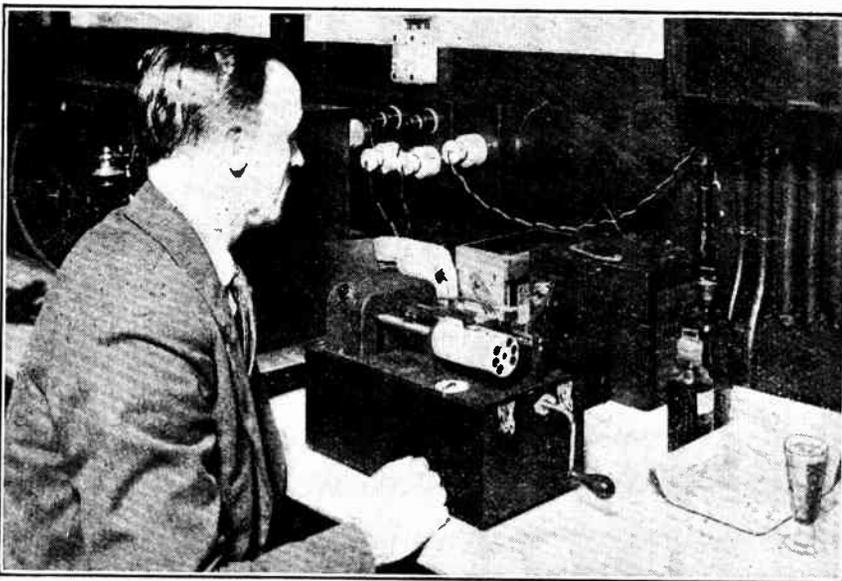
A wartime spark station installed by the Navy in the Seychelle Islands, Indian Ocean, is for sale. The Admiralty has no further use for it, and the Governor of the Seychelles invites tenders.

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THE "CRIMINAL HAND."

A search for the "criminal hand" in wireless is being conducted by the Radio Club, Cataluna, Barcelona. In an appeal to the world in the columns of its journal the club refers to the false news broadcast from time to time by unknown stations, and cites the case of the Nungesser and Coli Transatlantic flight attempt, which was accompanied by erroneous wireless reports.

Emphasising that the dissemination of false news is "absolutely criminal and inhuman," the Club proposes that all listeners on short-waves should "in case of reception of this kind of news, switch on a frame aerial so as to be able to find the direction from which the news is radiated."



PICTURE RECEPTION AT SAVOY HILL. The "Fultograph" receiver at B.B.C. headquarters used to check the picture transmissions from Daventry. The pictures are sent daily (except on Sundays and Mondays) from 2.0 to 2.25 p.m.

BREACH OF ACCUMULATOR REGULATIONS.

For each of five breaches of the Accumulator Regulations of 1925, C. T. Rhodes, a maker of wireless accumulators, was fined £1 at Halifax last week. It was stated that he had failed to make provision for efficient exhausts, for a health register to be kept where lead was burnt, for new employees to be medically declared fit for the job, and for suitable overalls, waterproof aprons, and footwear for the employees.

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IRELAND-AMERICA TEST ON 10 METRES.

The first transmission on ultra-short-waves between the Irish Free State and America was accomplished on Sunday, October 21st, at 4.30 p.m. G.M.T. The stations who took part were W-2JN, operated by Mr. C. K. Atwater, of Upper Montclair, New Jersey, and GW-17C, owned and operated by Messrs. J. E. and R. D. Scott, of 9, Upper Garville Avenue, Dublin. According to the *Irish Times*, trustworthy contact was maintained, with full daylight over the entire distance, signals being easily readable at each end, and messages were exchanged for one hour. The wave-length used was approximately 10 metres.

It will be remembered that the first contact between America and Europe on this wavelength took place at the beginning of this year, when the American amateur referred to above exchanged 10-

metre signals with M. Pierre Auschitzky, EF8CT, of Gironde. M. Auschitzky's own account of the achievement appeared in *The Wireless World* of August 15th last.

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GAUGING HEIGHT OF HEAVISIDE LAYER.

As a by-product of the researches to be carried out by the Byrd Expedition party, now in the Antarctic regions, it is hoped that information will be forthcoming on several radio problems. Mr. L. V. Berkner, of the U.S. Bureau of Standards has been specially deputed to make an investigation of fading phenomena, particularly of short-wave transmissions. It is expected, says the *Radio Service Bulletin*, that the equipment available will give information on the effect of the concentration of the earth's magnetic field at the South Magnetic Pole, of auroras, temperature, and also the height of the Heaviside layer.

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CRISIS IN AMERICAN BROADCASTING.

All America, when it finds time to forget the Presidential Election, is registering the hope that the great re-assignment of broadcast wavelengths on November 11th, in pursuance of the ruling of the Federal Radio Commission, will bring to an end the chaos which has existed in the American ether for the last three or four years. At the present moment the signs are not propitious. Several parties are still hotly

contending for wavelengths other than those allotted to them, although reallocations at this time of day will probably upset the delicate fabric of the scheme.

Among the unsatisfied stations is WGY, which recently asked for a power of 150 kilowatts, despite the Federal Commission order restricting stations to a maximum of 25 kilowatts. The station also objects to its "daylight only" assignment of 379.5 metres, the wavelength which it has used regularly for many years at all times of the day and night.

If every station is content when November 11th comes round, the Federal Commission will be free to cope with the anticipated riot of complaints when it is discovered that the scheme is prettier in theory than in practice.

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SUPER-BROADCASTING FOR GREECE?

An international competition is being opened, according to the Ministry of Communications in Athens, for the establishment and working of a broadcasting monopoly in Greece for a period of 20 years. At the expiration of that period all the installations will pass free of charge into the possession of the State.

It is stipulated that a central transmitting station must be established in Athens, capable of supplying the whole of Greece with a satisfactory service. Details of the competition are shortly to be communicated to agents abroad for publication.

Running a School Demonstration.

The wireless society in the rôle of public benefactor was illustrated recently by the Muswell Hill and District Radio Society which provided continuous demonstrations of high quality radio and gramophone reproduction at a local school bazaar, the latest B.T.H. coil-driven loud speakers being used in conjunction with a B.T.H. pick-up. Music was also relayed to the refreshment room for the entertainment of visitors at tea. The amplifier included a bank of four super-power valves in the output stage with 240 volts on their anodes. The whole of the apparatus was provided and installed by members of the Society.

Hon. Secretary, Mr. G. S. Sessions, 20, Grasmere Rd., Muswell Hill, N.10

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Getting New Members.

A campaign in search of new members is about to be instituted by the South Croydon and District Radio Society, and it is understood that several original ideas are to be exploited in this direction. At the meeting at the Surrey Drivers' Hotel on Tuesday, Oct. 23rd, a Questions and Answers evening was held, an important feature of the meeting being practical demonstrations to assist members in overcoming difficulties. Enquiries regarding membership should be addressed to the Hon. Secretary, Mr. E. L. Cumbers, 14, Campden Rd., South Croydon.

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A New Radio Club.

A new organisation—The Faraday Radio Club—has been inaugurated at the Watford Men's Institute, Beresford St., London, S.E.5, for the benefit of all in the neighbourhood who are interested in radio research. Meetings are held on Mondays and Thursdays from 7.45 to 9.45 p.m. under the direction of Dr. F. A. Williams, M.Sc. The activities of the Society will include lectures and demonstrations, besides the solving of members' wireless difficulties. Visits are to be made to transmitting stations, wireless factories and other places of interest. Communications should be addressed to the Hon. Secretary, Mr. T. D. Hawkins, 72, Inville Rd., Watford, S.E.17.

NEWS FROM THE CLUBS.**Makers' Valve Curves Confirmed.**

"How Valve Curves are Made" was the title of a lecture by Mr. H. E. Mellor, chair-

man of the South Manchester Radio Society at the meeting on Friday, Oct. 26th. Some popular and well-advised valves were employed for making comparative graphs, and the results showed very little deviation from the standard graphs published by the makers.

The Society is seeking new members, who are offered the benefit of an attractive series of lectures and demonstrations during the coming session. Enquiries will be welcomed by the Hon. Secretary, Mr. G. A. P. Mercer, 5, Rumbon Rd., Didsbury, Manchester.

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Gramophone Pick-up Tests.

A reproduction of gramophone records on a coil-driven loud speaker associated with a three-stage amplifier was conducted by Mr. F. W. Smurthwaite at the last meeting of the Croydon Wireless and Physical Society. Among the interesting tests carried out was the removal of the loud speaker from its cabinet mounting and the substitution of a baffle. Excellent results were obtained.

Hon. Secretary, Mr. H. T. P. Gee, Staple House, 51-52, Chancery Lane, W.C.2.

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A Film of a Radio Trip.

A Continental trip with a radio-equipped car was shown cinematographically by Capt. Plugg to members of the Wembley Wireless Society on Friday, Oct. 26th. For their travels, Capt. Plugg and his party used an ordinary car fitted with frame aerial and multi-valve apparatus with which it was possible to tune in any station in Britain and many Continental stations while travelling at high speed.

Friday last, Nov. 2nd, was "Members' Evening," and was devoted to a general discussion on difficulties encountered in operating sets under varying conditions. Meetings of this kind are a feature of the Society's activities, and anyone in the neighbourhood interested in wireless would do well to avail himself of the opportunities presented by informal meetings of this kind. The Society still has vacancies for a few members. The syllabus and full particulars can be obtained from Mr. H. E. Comben, B.Sc., 24, Park Lane, Wembley.

FORTHCOMING EVENTS.**WEDNESDAY, NOVEMBER 7th.**

Institution of Electrical Engineers (Wireless Section).—At 6 p.m. (light refreshments at 5.30). At the Institution, Savoy Place, W.C.2. Inaugural address by the Chairman, Commander J. A. Lee, C.B.E., R.N.

Muswell Hill and District Radio Society.—At 8 p.m. At Tollington School, Tetherdown, N.10. Demonstration by Mr. P. Turner, of Messrs. Graham Amplion Ltd.

Tottenham Wireless Society.—At 8 p.m. At 10, Bruce Grove. Business meeting, followed by Lantern Lecture.

North Middlesex Radio Society.—At 8 p.m. At St. Paul's Institute, Wimbore Hill. Demonstration: "Fault Finding," conducted by Mr. E. H. Laister.

Edinburgh and District Radio Society.—At 8 p.m. At 117, George Street. Business meeting.

THURSDAY, NOVEMBER 8th.

Lepton and Lynton Radio Society.—At 8 p.m. At Grove House, High Road, Lepton. Elementary Wireless Lecture.

Ilford and District Radio Society.—At the Wesleyan Institute, 16, Cleveland Road, High Road, Ilford. Demonstration by the Mullard Radio Valve Co., Ltd.

MONDAY, NOVEMBER 12th.

Newcastle Radio Society.—At 7.30 p.m. At 11, Saullie Row. Lecture: "Mains Operated Receivers," by Mr. J. G. Ogg.

Holloway Radio Society.—At 7.30 p.m. At the Holloway Secondary School, Hill-drop Road, N.7. Loud-speaker Demonstration by Messrs. S. G. Brown, Ltd.



PROGRAMMES

FROM ABROAD

BARCELONA (Radio Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—6.0, Chimes, Market Prices and Exchange Quotations. 6.10, Sextet Selections: One-Step, Sensational (R. Mayoral); Selection from El Carro del Sol (Serrano); Waltz, Dulce caricia (Gillet); Andante from Cassation (Mozart); Selection from Marie Magdeleine (Massenet-Mouton). 8.30, French Lesson by Prof. Martin. 9.0, Chimes and Weather Report. 9.5, Exchange Quotations and News. 9.10, Orchestral Selections: March (Woodhouse); Selection from Cavalleria Rusticana (Mascagni); Waltz, Wine, Woman and Song (J. Strauss); Dance, La niña flamenco (Fernández); Sercnata, Napoli (d'Ambrosio); Overture to The Bohemian Girl (Balfé). 10.0, Programme relayed from Madrid, EAJ7.

BERGEN (370.4 metres); 1.5 kW.—6.0, Talk for Girls. 6.30, Programme for Children. 7.0, Orchestral Selections. 7.20, Jon Auklend, Talk: Vittorino da Feltre. 7.50, Topical Talk. 8.0, Recitation by Mr. Erichsen. 8.30, Song Recital: Blåbaerli (Grieg); Modersorg (Greig); Queen Bertilla's Cradle Song (Sverre Jordan); To a Child (Sverre Jordan); Snow (Feyling); Aase's Song (Feyling); Folk Songs (a) Jeg jagde mig saa sildig, (b) I kvæld er eg glad, (c) Liti Kirsti, (d) Ormekongen, (e) Veste giten oppi Bakken. 9.0, Weather Report, News and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—3.0, Shorthand Dictation by Fritz Westermann. 3.30, Programme from Hamburg. 4.30, Herr Ehrmann, Talk: The State and People. 5.0, Dialogue with an Electrician, by Otto Eleher. 5.30, Elementary Spanish Lesson. 5.55, Dr. Elias Hurwic, Talk: Russia. 6.20, Talk by O. Schmitz. 7.0, Programme from Voxhaus.

BERLIN (Voxhaus) (484 metres); 4 kW.—9.10 a.m., Market Prices. 9.15 a.m., Weather Report, News and Time Signal. 10.0 a.m., Programme of Gramophone Records. 10.15 a.m., Albrecht Thaers Centenary Memorial Programme. 2.30, Talk by Dr. Th. Saling. 3.0, Dr. Paul Frank, Talk: Medical Hygiene. 3.30, Gramophone Selections of Songs by Josef Schwarz, followed by Concert: Overture to A Midsummer Night's Dream (Mendelssohn); Waltz from Faust (Gounod); Impression italienne (Charpentier); Under den Steuen (Courtivieux); Periettes Liebesgetändel (Fresco); Spanish Fantasy, Elin Vest in Aranjoz (Demersseman); Tango, Zwei dunkle Augen (Holländer); followed by Announcements. 6.0, Dr. Paul Ostwald, Talk: Truth and Fiction in the History of the Japanese Empire. 6.30, Talk on the following Transmission. 7.0, "Symphonic Mass" (Windsperger), relayed from the High School for Music, followed by Weather Report, News, Time Signal, Sports Notes and Dance Music. 11.30 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—6.20, Time Signal and Weather Report. 6.30, Dr. Streit, Talk: Weather and Weather Forecasting. 7.0, Readings, followed by Selections by the Kursaal Orchestra. 8.0, Cabaret à la Montmartre, relayed from Geneva (700 metres). 8.45, News and Weather Report. 9.0, The Kursaal Orchestra. 9.35, Dance Music. 11.0 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—3.0, Review of Books. 3.30, Orchestral Concert, relayed from Gleiwitz (320.7 metres). 5.0, Herbert Brunar, Talk: The American Negro. 5.25, Esperanto Talk by Alfred Hianschke. 5.35, Herr Sperling, Talk: South Silesian Frontier Questions. 6.20, Legal Shorthand Lesson. 6.50, Talk: The Pilgrim of St. Just. 7.15, Variety Programme by the Wireless Dance Orchestra and Robert Koppel. 9.0, News. 9.30, Dance Music. 11.0 (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—3.30, Programme for Children. 4.30, Dr. Vetterli, Talk: The Principles of Music. 4.45, German Transmission. 5.15, Weekly Review by Prof. Dostal. 6.0, Programme from the National Theatre. 9.0, Programme from Prague. 9.25, Tzigane Music relayed from Bratislava (300 metres).

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Orchestral Concert from the Restaurant of the Palace Hotel.

SATURDAY, NOVEMBER 10th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

6.0, Elementary English Lesson. 6.25, Advanced English Lesson. 6.45, Pianoforte and Violin Recital. 7.0, Gramophone Selections of Dance Music. 7.30, "Radio-Chronique." 8.15, Concert: Prelude (Rachmaninoff); Scheherazade (Rimsky-Korsakoff); Air from Prince Igor (Borodin); On the Steppes of Central Asia (Borodin); Romance for Horn (Scriabine); Ana (Rimsky-Korsakoff); Topical Talk; Gopak (Moussorgsky); Les forçats (Gretchaninoff); Orientale (Gai); Serenade (Giazounoff); Les Cosaques du Kouban; Dause de la Kovantehine; Prelude (Scriabine); Dances from Prince Igor (Borodin). 10.10, News and Announcements. 10.15, Orchestral Selections from the Restaurant of the Palace Hotel. 11.0 (approx.), Close Down.

BUDAPEST (556.6 metres); 20 kW.—4.10, Talk. 4.40, Symphony Concert from the Café Ostende. 6.0, Talk: The Hungarian Iron Industry. 6.35, The Letter Box. 7.30, "Prince Bob"—Operetta in Three Acts (Huska). 10.10, Concert from the Grand Hotel Britannia.

CRACOW (566 metres); 1.5 kW.—6.0, Miscellaneous Items. 6.30, Talk by Mr. Kumaniecky. 6.55, Time Signal from the Observatory. 7.0, Inter-Relay Programme from Cracow, Posen, Vilna, Warsaw and Katowitz, in celebration of the Tenth Anniversary of Polish Independence: Scenes from Kosciuszko à Racławice (Anezyce), from Cracow; Silesian Songs from Katowitz; Wielkopolska from Posen; Selections from the Works of Szamotulsky and Zielensky from Cracow "How Vilna was Liberated" from Vilna; Selections from the Works of Chopin from Posen; "Through Silesia" from Katowitz; Selections from the Works of Stanislas Moniuszko, from Vilna; Interval of Twenty Minutes. 10.0, Concert (continued) for Listeners and Friends of Polish Wireless in Other Lands: Talk in English and French on the National Fête, from Katowitz; Selections from "Akropolis" (Wyspiansky), from Warsaw; Marche de la Liberté (Marezcowsky), from Warsaw; Modern Polish Music, Music from the Works of Niewiadomsky, Rózycky, and Szymanowsky, from Warsaw; Selections from the Works of Walesky, Jachimczyk and Zielensky, from Cracow; Programme from Posen—Selections from the Works of Paderewsky, Pandiewicz and Gadomsky, from Katowitz; Selections from the Works of Mieczyslas Karłowicz from Vilna.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—1.30, Weather Report and Gramophone Selections. 7.20, News. 7.30, Recitations by May Pitchford. 7.45, Irish Lesson by Seamus O'Duirinne. 8.0, "The Open Gate"—Sketch, by the Croton Repertory Company. 8.30, Pianoforte Solos by Eileen Braid. 8.45, "Il Trovatore"—Opera (Verdi). 10.30, News, Weather Report and Close Down.

FRANKFURT (428.6 metres); 4 kW.—2.55, Hints for the Housewife, by Fini Pianus. 3.35, Concert of Operetta Music: Overture to Frühlingsluft (J. Strauss); Waltz from A Day in Paradise (Eyler); Song: Selection from Eva (Lehár); Overture to Der Fremdenführer (Ziehrer); Waltz, Red Roses (Lehár); Song; Selection from The Countess of Chicago (Kálmán); Waltz from Polenblut (Nedbal); in the Interval, News and Announcements. 5.10, Reading from Kurd Lasswitz "On Two Planets," by O. W. Studtmann. 5.30, The Letter Box. 5.45,

Talk on Chess by Prof. N. Mannheimer. 6.15, Alfred Auerbach, Talk: Young Hebbel. 6.45, Dr. von den Steinen, Talk: What does Schiller mean to us today? 7.15, A Play with Robert Koppel, followed by Dance Music from Voxhaus. 11.30 (approx.), Close Down.

HAMBURG, Call HA (in Morse), (394.7 metres); 4 kW.—10.0 a.m., Walter Cohen, Memorial Talk: Joseph Schwartz, followed by Programme of Gramophone Records. 2.30, Review of Books. 3.0, Illustrated Music Talk by Dr. Wilh. Heintze. 3.30, Concert: Gavotte and Musette (Bach); Two Minuets (Krebs); Three Dances from Céphale et Procris (Grétry); Minuet (Bach); Gavotte (J. Christ, Bach); Minuet (Boccherini); Two Dances (Mozart); Two Dances (Beethoven); Polonaise (Krebs); Polonaise (Bach); Polonaise in A Major (Chopin). 4.30, Request Programme. 5.30, Prof. Rob. Willbrandt, Talk: What is the Meaning of Social Legislation and What is its Aim? 6.0, Dialogue: The fight against the sand. 6.50, Frankfurt Exchange Quotations and Weather Report. 6.55, Programme from Voxhaus. 9.10, Weather Report, News, Sports Notes and Programme Announcements. 9.30, (approx.), Cabaret Concert. 10.50, North Sea and Baltic Weather Report

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Orchestral Concert, conducted by Max Tak, from the Tuschinski Theatre, Amsterdam. 3.10, Talk, followed by Italian Language and Conversation Lessons. 4.40, French Language and Conversation Lessons. 5.30, Orchestral Concert: Overture to Morning, Noon and Night in Vienna (Suppé); Weana Gmuth Waltz (Schrammel); Selection from the Circus Princess (Kálmán); Bell's Serenade (Kockert); The Trumpets of Jericho (Lindemann); Gallop, Radio-Funken (Lüling). 6.30, German Language and Conversation Lessons. 7.25, Police News and Time Signal. 7.45, Programme arranged by the Workers' Radio Society—Concert and Talk. 10.10, Concert relayed from the Royal Picture House, Amsterdam. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40 p.m. 12.10, Concert of Trio Music. 2.40, Programme for Children. 5.10, Talk by M. Laur. 6.10, Gramophone Selections. 6.30, Catholic Report. 6.40, English Lesson. 7.10, Dress-making Lesson. 7.40, Prof. Haag, Talk: Economics. 8.0, Concert of Choral and Orchestral Selections, Soprano, Tenor and Baritone Solos. Talk by M. Schwarz.

JUAN-LES-PINS (Radio LL) (244 metres); 1.5 kW.—1.0, Orchestral Concert. 9.0, Concert with Tenor Solos by M. Bessi. 10.0 (approx.), Close Down.

KALUNDBORG (1,680 metres); 7 kW.—Programme also for Copenhagen (337 metres). 6.30 a.m., Morning Gymnastics. 10.0 a.m., Weather Report. 12.15, Educational Talk. 2.0, Programme for Children. 2.30, Concert of Instrumental Selections. In the Interval, Recitations by Karen Margrethe Jensen. 5.20, Talk by Carl Schjøning. 5.50, Weather Report. 6.0, News and Exchange Quotations. 6.15, Time Signal. 6.30, Agricultural Talk by Karl A. Jørgensen. 7.0, Chimes from the Town Hall. 7.2, Concert of International Old-Time Dances. 8.0, Selected Danish Lyrics: Frisk op, naar Djaevlen gir sig vred (Anders Bording); Hver bar sin Skæbne (Thomas Kingo); Ked af Verden og Kaer af Himlen (Thomas Kingo); Lyrics (Ambrosius Stub), (a) Livet som en Sejlads, (b) Den kedsoem Vinter gik sin Gang, (c) Du dejlig Rosenknop, followed by News. 8.45, Concert: Spanish Comedy Overture (Kéler Béla); Dansons la Tarantella (Ryder); Grand Galop infernal (Kölling); Recitation of Old Danish Love Poems; March, The Torador (Kottam); Waltz, Hortensia (Lange); March from Polenblut (Nedbal). 9.45, Dance Music by the Industri Restaurant Orchestra. 11.0, Chimes from the Town Hall. 11.15, (approx.), Close Down.

KATOWITZ (422 metres); 10 kW.—3.0, Concert of Gramophone Selections. 4.10, Music Lesson by Mr. F. Sachse. 4.35, Children's Letter Box. 5.0, Programme for Children. 6.0, Announcements. 6.30, Mr. K. Rutkowski, Talk: Impressions of a Journey to Greece. 6.56, Time Signal. 7.0, See Cracow.

Programmes from Abroad.—

LAHTI (1,522.8 metres); 35 kW.—4.0, Talk. 4.35, Concert: March (Arphar); Waltz (Lanner); Overture to La Belle Galathée (Suppé). 5.15, Talk. 5.35, Orchestral Selections from Othello (Verdi). 6.0, Talk: The Education of Children. 6.50, Concert. 7.45, News in Finnish and Swedish and Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—11.10 a.m., Gramophone Selections. 12.5, Orchestral Concert: Overture to Hunyady Laszlo (Erkel); Intermezzo from Si (Mascagni); Suite No. 1 (Micheli); Impromptu in E Flat Major (Schubert); Potpourri, Der Zigeunerprimas (Kálmán); Waltz, Goldregen (Waldteufel); Selections (Krome). (a) Eine Frühlingsmächennacht, (b) Blues, Rose-Marie; Czardas No. 8 (Micheli). 1.30, Hints for the Housewife. 3.0, Dr. Jost, Talk: Wireless Regulations. 3.30, Talk for Women by Dr. Krause. 4.0, Dr. Huber, Talk: Pictures of Old Babylon. 4.20, Prof. F. Hase, English Talk. 4.45, Relay of the Martinian Procession, from Düsseldorf. 5.30, Popular Legal Questions. 6.15, Herr W. Stern, Talk for Workers: Social Problems of a large City—Architectural Problems. 6.40, Dr. Otto Förster, Talk: German Cathedrals. 7.0, Popular Programme, followed by News, Sports Notes, Business Announcements and Concert from the Breidenbacher Hof, Düsseldorf.

LEIPZIG (365.3 metres); 4 kW.—3.30, Concert Children's Symphony (Rouberg); Overture to the Nuremberg Doll (Adam); Little Grandmother (Lange); Children's Coruet (Bizet); Doll's Minuet (Mello); The Toy Shop (Jessel); Doll's Gavotte (Stolz); Children's Songs, March (Lindemann). 4.45, Wireless News and Talk. 5.20, Weather Report. Time Signal and Labour Exchange Report. 5.30, Programme from Königsbrunnshausen. 6.0, Josef Greff, Talk: Psycho-Analysis. 6.30, Prof. Herruberg, Talk Modern Socialism. 7.0, "Lilac Time," Operetta in Three Acts (Schubert), relayed from the Operetta House, Dittiriching, Leipzig. 9.45 (approx.), News, Sports Notes, Sunday Programme Announcements, and Dance Music, relayed from Voxhaus.

MADRID (Union Radio), Call EAJ7 (375 metres); 8 kW.—7.0, Chimes and Concert by the Station Sextet: Selections from (a) Los Gavilanes (Guerrero), (b) Haullet (Thomas), (c) Laguardia amarilla (Giménez), Interlude by Luis Medina. 8.0, Dance Music. 8.25, News and Announcements. 9.45, Weekly Market Prices. 10.0, Chimes and Selection from "El Rey que Rabio"—Musical Comedy (Chapi-Carrión), followed by News. 12.30 a.m. (approx.) (Sunday), Close Down.

MILAN, Call IMI (549 metres); 7 kW.—7.15, Wireless News and Announcements. 7.35, Time Signal and Music Talk. 7.45, News, followed by Variety Concert: Trio in D Major (Ferroni); Violin Solos (a) Hebrew Melody (Auer), (b) Pasquinade (Tirindelli); Baritone Songs (Schubert); "Cello Solos (a) Litany (Schubert), (b) Vito (Popper); Pianoforte Solo, Ballad (Debussy); Reading; Selections from the Works of Mancinelli, (a) Overture Romantica, (b) Contralto Song, La prière des oiseaux, (c) Orchestral Selection from Cleopatra, (d) Eros and Leander Prologue for Contralto, (e) La fuga degli amanti a Chioggia. 9.55, News. 10.0, Dance Music, relayed from the Fiaschetta Toscana. 10.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Båden (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres), Sundsvall (545.6 metres).—8.30, Old Dance Music. 6.30, Talk: Occupations: The Shoemaker. 6.45, Pianoforte Recital. 7.0, Balalaika Concert. 7.25, Recital of Negro Spirituals: Go down Moses; You may bury me in de seas; Swing low, sweet chariot; Little David, play on yo harp; All God's children got wings; Deep River; Dere's no hidin' place down dere; Nobody knows de trouble I see; O, wasn't dat a wide river? Sometimes I feel like a motherless child; Oh, didn't it rain? Waterboy; Old Folks at home; My old Kentucky home; Dixie. 8.0, Topical Talk. 8.45, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

NAPLES, Call INA (833.3 metres); 1.5 kW.—3.45, Weather Report and News. 3.50, Reading. 3.58, Chamber of Commerce Report. 4.0, Variety Concert: Orchestral Selections, (a) Intermezzo, Ivesse (Frontini), (b) Intermezzo, Mattinata (Brogi); Soprano Solo, April (Gounod); Orchestral Selection, Intermezzo, Scene della spiaggia (Blou); Soprano Solo, Amor fa morire (Rotoli); Orchestral Selection, Potpourri, Haschisch (Ponti); Soprano Solo, Luce ideale (Denza); Orchestral Selection, Graziella (Cipollone); Soprano Solo, from Manon Lescaut (Puccini); Orchestral Selections, (a) Intermezzo from Mestizia arcana Camandoli, (b) Waltz, Odette (Franceschi). 4.30,

Saturday, November 10th.

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Time Signal. 4.35, Foreign Report. 7.20, Wireless Notes. 7.30, Announcements. 7.40, Time Signal. 7.45, News. 7.48, Harbour Notes. 7.50, Concert: Orchestral Selection, Overture to Preciosa (Weber); "Scampolo"—Comedy (Nicodemio); in the Intervals, Suite No. 2 from Pelles and Melisande (Sibelius); Rustle of Spring (Sinding); Carillon (Liadow); Hymn to the Sun (Rimsky-Korsakoff); Morning, Noon and Night Overture (Suppé). 9.0, Weekly Review, News, Calendar, Programme Announcements. 10.0, Dance Music from the Trocadero. 10.30 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (334.8 metres), Hamar (555.6 metres), Notodden (411 metres), Fossgrund (500 metres), and Rjukan (448 metres).—6.15, Weather Report, News, and Agricultural Report. 6.30, Mlle. Helga Berger, Talk: Siena and St. Katherine. 7.0, Time Signal. 7.01, Orchestral Concert: March, Moute Carlo (Schreiner); Ballet Suite (Popy); Barcarole appassionata (Murzilli); Valse (Durand); Romance (Rubinstein); La lettre de Manon (Gillet); Ruisseau sous bois (Chillemout); Humoresque (Dvorák); Hymn to the Sun (Rimsky-Korsakoff); Rhapsodantasy on Liszt (Artok). 8.0, Recital of Norwegian Poems. 8.30, Weather Report and News. 9.0, Recital of Operetta Melodies. 9.30, Dance Music from the Grand Hotel. 10.30 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—6.30, "Radio-Journal de France." 8.0, Legal Talk. 8.15, Talk by Dr. Grunberg. 8.30, Concert, followed by News and Weather Report, and Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—5.0, Pasdeloup Concert. 7.10, Weather Report. 7.30, "Le Journal Parlé."

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Concert: Overture to The Merry Wives of Windsor (Nicola); Ballet Music from Les deux Pigeons (Messenger); Finale of the Sixth Pastoral Symphony in F Major (Beethoven); Finale from the Brandenburg Concerto, No. 2 (Bach); Selection from Manon (Massenet); Dance from Siang-Sin (Hüe); Parade galante (Ganne), News in the Intervals.

PARIS (Radio Paris), Call CFR (1,750 metres); 5 kW.—12.30, Concert of Gramophone Selections: I Pagliacci (Leoncavallo), by the New Queen's Hall Light Orchestra, under the direction of Percy Pitt; Overture to The Mastersingers (Wagner); Allegro vivace from Rona No. 2 (Bizet), by the Band of the Garde Republicaine; Quartet in G Major No. 10 (Mozart), by the Leier Quartet; Organ Solo, Fantasia in G Minor (Bach), by M. Comette; Seven Spanish Songs (de Falla) to accompaniment by the Composer; Song, Ramona, by Chick Endor; Waltz, Chiquita, by Paul Whiteman and his Orchestra; Fox-Trot, I'd rather cry over you, by Paul Whiteman and his Orchestra. 1.0, News and Exchange Quotations. 1.15, Concert (continued). 2.0, Exchange Quotations, Market Prices and Religious Information. 3.45, Dance Music by the Joss Ghisliery Symphonians; News in the Intervals. 7.0, Agricultural Report. 7.45, Talk, followed by Market Prices. 8.15, Literary Programme. 8.45, Dance Music; News in the Intervals.

POSEN (344.8 metres); 1.5 kW.—4.45, Talk: Scouts. 5.0, Literary Programme. 5.30, Musical Interlude. 6.0, Herr Ruback, Talk: Excursions in the Posen District. 6.25, Advanced English Lesson by Dr. Arend. 6.50, Talk for Women by Mme. Sabina Swidzinska. 7.0, See Cracow.

PRAGUE (348.9 metres); 5 kW.—3.30, Dance Music. 4.30, Cultural Transmission. 4.40, Talk. 4.50, Agricultural Report. 5.0, German Transmission. 6.0, Programme relayed from the National Theatre, Brno. 9.0, Time Signal and News. 9.25, Zrigane Music relayed from Bratislava (300 metres).

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Johnson, from New York. 12.30 a.m. (Sunday), Concert from the Hotel Sagamore, Rochester. 1.0 a.m., Concert from

the Hotel Onondaga, Syracuse. 1.30 to 4.0 a.m., New York Relay. 1.30 a.m., "The Park Bench." 2.0 a.m., Variety Programme. 3.0 a.m., Lucky Strike Programme. 4.0 a.m., Time Signal and Dance Music from Buffalo. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—6.15, Concert of Turkish Music. 7.30, Weather Report and Time Signal. 7.40, Orchestral Concert: Symphony No. 2 (Beethoven); Songs; Violin Solo; March from The Prophet (Meyerbeer). 9.0, News and Announcements. 9.10 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—4.0, Relay of the Opening Ceremony of the Stuttgart Artificial Lighting Exhibition: Greetings by the Mayor, followed by Talk on Light. 4.30, Songs by the German Workers' Choral Society, relayed from the Market Place and Chimes from the Town Hall. 5.0, Time Signal and Weather Report. 5.15, Talk by Dr. Karl Laux, relayed from Mannheim. 5.45, Talk by Herr Schwab-sch. 6.15, Book-keeping Lesson by Dr. Wolff. 6.45, Time Signal, Weather Report and Sports Notes. 7.0, Concert from the Railway Hotel, Mosbach: Choral Selections, (a) Walderwachen (Ratgeber), (b) Die Vesper (Beethoven); Songs, (a) Sei nur still (Frank), (b) Die Allmacht (Schubert); Choral Selections, (a) Wachsen mir Flügel (von Weinzierl), (b) Drinking Song (Bruch); Six Gellert Songs (Beethoven), (a) Bitte, (b) Busslied, (c) Gottes Macht und Vorsehung, (d) Die Liebe des Nächsten, (e) Vom Tode, (f) Die Ehre Gottes aus der Natur; Songs, (a) Ach, ich habe sie verloren from Orpheus (Gluck), (b) Eboli's Song from Don Carlos (Verdi); followed by News. 10.30, Dance Music from the Pavilion Excelsior.

ROME, Call IRP (447.8 metres); 3 kW.—3.50, Wireless Talk. 4.15, Agricultural Report. 4.20, Time Signal. 4.30, Vocal and Instrumental Concert: Pianoforte Solo, Suite (Alderighi); Soprano Solos from (a) Il re Pastore (Mozart), (b) Sciegio le labbra a un cantic (Magaldi); Tenor Solo from La Rondine (Puccini); Barcarolle from A Masked Ball (Verdi); Three Pianoforte Solos (Vatticelli); Festa di contadini boemi (Smetana); Soprano Solo, Eugima (Zauella); Scherzo (Respighi); Tenor Solos from (a) La Wally (Catalani); (b) Germania (Franchetti). 6.50, Time Signal, Wireless Notes and Announcements. 7.10, Sports Notes, News, Exchange Quotations and Weather Report. 7.28, Topical Talk. 7.39, Time Signal. 7.45 "Cendrillon"—Opera in Four Acts (Massenet). In the Intervals, Review of Art and Literature by Lucio D'Ambrà, and Fashion Review. 9.50, News. 10.0 (approx.), Close Down.

TOULOUSE (Radiophonie du Midi (391 metres); 3 kW.—12.45, Concert. 8.0, Exchange Quotations and News. 8.30, Concert: Pianoforte Solo, Grand Polonoise (Chopin); Selections of Old French Songs, (a) Envoi de fleurs, (b) La chanson de Marieette, (c) Les trésors de ma mie, (d) Le cœur de ma mie, (e) Bonsoir, Madame la Lune, (f) Le temps des cerises; Waltzes, (a) Santiago (Corbin), (b) España (Chabrier). 9.0, Selections (Delibes) (a) Ballet Music from Coppélia, (b) Selections from Iakmé. 9.55, Balalaika Music; Chant sans paroles (Tchaikovsky); Song of the Volga Boatmen; Clair de lune; Toreador and Andalous (Rubinstein). 10.15, North African News. 10.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—5.25, Walther von der Vogelweide's 700th Centenary Programme. 6.30, Violin Recital by Joseph Sziget, relayed from the Music Society Hall: Tufelstriller Sonata (Tartini); Solo Partita in E Major (Bach); Sonatina in D Major (Schubert); Violin Solo, Sonata in G Minor (Ysaye); La Fontaine d'Arethuse (Szymanowski); Tremolo Caprice in G Minor (Paganini); La Fille aux cheveux de lin (Debussy); Spanish Dance (de Falla-Kreisler), followed by Orchestral Concert: Coronation March from The Prophet (Meyerbeer); Overture to the Impresario (Mozart); Delirium Waltz (Jos. Strauss); Fantasia on Dvorák's, The Old and New Worlds (Leopold); Waltz from Der Lebermann (Grünfeld); Waltz for Two Violins, Nachtfunken (Lanner); Ballad and Polonoise for Violin (Vieuxtemps); Potpourri, All round the world (Henning); Dance Song, Die ganze Welt spielt Kummy (Engel-Berger); March, Man ist nur einmal jung! (Hummer). Phototelegraphy Transmission.

VILNA (435 metres); 1.5 kW.—3.10, News in Lithuanian. 3.30, Announcements. 3.45, Talk for Women by Mme. Ely Bandler. 4.10, Programme from Warsaw. 5.0, Literary Programme. 5.50, Art Talk by Prof. Jules Klos. 6.15, News. 6.30, Programme from Warsaw. 6.55, Time Signal and News. 7.30, See Cracow.

WARSAW (1,111 metres); 10 kW.—4.10, Prof. A. Sujkowski, Talk: The Tenth Anniversary of Poland's Independence Day. 4.35, Talk by Prof. H. Moseicki. 5.0, Programme for Children. 6.0, Miscellaneous Items. 6.30, "Radio-Chronique" by Mr. M. Stepowski. 6.55, Time Signal. 7.0, See Cracow.

Programmes from Abroad—

SUNDAY, NOVEMBER 11th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

BARCELONA (Radio-Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—11.0 a.m., Chimes relayed from the Barcelona Cathedral followed by Report of the Provincial Meteorological Service of Barcelona. Weather Report and Forecast for Europe and North East Spain and Aviation Route Conditions. 1.30, The Iberia Trio in a Concert of Light Music with Gramophone Records in the Intervals. 2.45 to 6.0, No Transmission. 6.0, Opening Signal and Stock Exchange Quotations. 6.10, Concert of Light Music by the Station Orchestra and Vocalists: Tenor Songs by Señor Eusebio Carasusan; Romance from "Los Cavallanes" (Guerrero). In the Interval from 7.0 to 7.30, Weekly Report of the Catalonian Agricultural Institute at San Isidro. 8.40, Sports News. 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—Programme relayed from Bern. 7.0, Concert. 7.30, Programme relayed from Zürich. Tenor Solos by Karl Melzer of the Zürich Municipal Theatre. 9.0, Sports Notes, late News Bulletin and Weather Report. 9.15 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—9.30 a.m., Service relayed from the Korschurch. 11.30 a.m., Weather Report and Forecast and General News Bulletin. 5.0, Evening Service relayed from the Korschurch. 7.0, Concert by the Station Orchestra. 7.50, Topical Talk. 8.0, Song Recital by Gudrun Nordraak-Feyling. 9.0, Weather Report and Forecast, Late News Bulletin and Time Signal. 9.15, Programme of Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—7.55 a.m., Relay of Garrison Church Chimes from Potsdam. 8.0 a.m., Morning Recital with Address in the Interval, relayed from Voxhaus and followed by Berlin Cathedral Chimes. 3.30, Concert relayed from Voxhaus. 5.0 to 7.0, The "Deutsche Welle" Series of Talks followed by relay of another German programme. 9.15, Late News Bulletin and Sports News. 9.30, Dance Music. 11.30 (approx.), Close Down.

BERLIN (Voxhaus) (484 metres); 4 kW.—7.55 a.m., Chimes relayed from the Garrison Church at Potsdam. 8.0 a.m., Morning Concert with Vocalists and Address, followed by Relay of the Berlin Cathedral Chimes. 3.30, Programme of Music followed by Advertisements. 5.40 to 7.0, Three Talks. 7.0, Popular Programme. 8.30, Instrumental Music. 9.15, Weather Report and Forecast, Time Signal, Sports Notes and Late News Bulletin. 9.30, Dance Music by the Otto Kernbach Orchestra. 11.30 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—9.30 a.m. to 10.30 a.m., Religious Address. 12.0 Noon, Time Signal and Weather Report and Forecast. 12.5, Concert. 5.29, Time Signal and Weather Report. 7.0, Concert of Songs and Violin Solos. 8.45, Sports Notes, Late News Bulletin and Weather Report. 9.0, Concert by the Kursaal Orchestra. 9.35 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—Programme relayed by Gleiwitz (329.7 metres). 8.15 a.m., Relay of the Christ Church Chimes. 10.0 a.m. (approx.), Evangelical Festival of Music with address in the interval. 11.0 a.m., Concert with Choral and Instrumental Solos. 1.0, Ten Minutes for the Amateur Gardener. 1.10, Talk or Literary Selections. 1.35, Chess Talk by Adolf Kramer. 2.0, Stories for Children. 2.30, Talk for Farmers. 3.0, Talk. 6.50, Talk. 7.30, Probable relay from Gleiwitz. Festival of the Beethoven Choral Society. 10.0 (approx.), Relay of Dance Music. 11.0 (approx.), Close Down.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Light Music, relayed from the Palace Hotel, Brussels. 6.0, Entertainments for Children by Bonzo and Sylvia of the Théâtre des Enfants. 6.30, Instrumental Music by the Station Trio. 7.30, "La Radio-Chronique." 8.15, Concert on the Anniversary of the Armistice. Programme of works by Belgian Composers. "La Brabançonne." 10.15, News from the Evening Press. 10.30 (approx.), Close Down.

BUDAPEST (556.6 metres); 20 kW.—8.0 a.m., Press Review and Beauty Hints. 9.0 a.m., Relay of Morning Service. 11.15 a.m. (approx.), Musical Programme. 3.45, Time Signal and Weather Report. 6.45 (approx.), Concert or Operatic Relay. 9.30, Light Music. 10.30 (approx.), Close Down.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres), and Münster (250 metres).—7.5 a.m., Summary of Forthcoming Programmes in Esperanto. 7.15 a.m., Lute and Guitar Lesson. 7.35 a.m. to

7.55 a.m., Esperanto Instruction by Alfred Dormanns 8.0 a.m., Morning Recital of Music and Address 10.0 a.m., Talk by Fritz Worm on The Value of the German Language. 11.35 a.m., Readings by Helene Thimig. 12.0 Noon, Concert, with Soloists, followed by Literary Talk and Notes for Chess Players. 3.30, Afternoon Concert. 7.0, Concert of Orchestral Music, followed by Late News Bulletin, Sports Notes and Dance Music conducted by Herr Eysoldt. 11.0 (approx.), Close Down.

CORK, Call GCK (400 metres); 1.5 kW.—8.30, Concert by the Station Sextet, and Pianoforte Solos by Horace Somerville. 11.0, National Anthem and Weather Report and Forecast. 11.15 (approx.), Close Down.

CRACOW (566 metres); 1.5 kW.—11.0 a.m., Relay of the Ceremony on the Occasion of the Laying of the Foundation Stone of Marshal Pilsudski's House. 11.30 a.m., Orchestral Concert relayed from Warsaw. 9.0, Programme relayed from Warsaw. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—8.30 to 11.15 (approx.), Programme relayed from Cork. Vocal and Instrumental Concert with Mezzo-Soprano Solos by Mary Maguire. 11.0, National Anthem and Weather Report. 11.15 (approx.), Close Down.

FRANKFURT (428.6 metres); 4 kW.—Programme relayed by Cassel (252.1 metres).—7.30 a.m. (approx.), Morning Concert. 12.0 Noon, Transmission arranged by the Agricultural Institute at Wiesbaden. 7.30, Musical or Literary Programme. 9.30 (approx.), Dance Music. 11.0 (approx.), Close Down.

HAMBURG, Call HA (in Morse), (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres), and Kiel (254.2 metres).—7.25 a.m., Time Signal. 7.30 a.m., Weather Report and Forecast and General News Bulletin. 8.0 a.m., The Week's Log Notes. 8.15 a.m., Morning Festival. 9.55 a.m. (for Kiel only), Morning Service from the Kiel University Church. 11.55 a.m., Time Signal relayed from Naica. 12.5 (for Hamburg and Kiel), Concert. 12.5 (for Bremen), Music Recital. 12.5, (for Hanover), Gramophone Records. 1.0, Programme for Children by Pünkeheizenhain. 2.0, Concert of Orchestral Music. 4.30 (approx.), Literary or Musical Programme. 6.30, Talk by arrangement with the Hamburg School of Physical Training. 6.40, Sports News. 6.55, Weather Report and Forecast. 7.0 (approx.), Concert or Play. 9.30, Weather Report, Late News Bulletin and Concert of Light Music. 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40, Concert by the Hilversum Wireless Trio. 2.10, Selections of Music. 7.40, General News Bulletin and Sports News. 7.50, Programme from the Studio; Performance of "Tristan and Isolde" (Wagner), conducted by Albert van Raalte. 11.0 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40.—8.10 a.m. to 9.10 a.m., Relay of Morning Service and Address. 12.10, Concert by the Katholieke Radio Omroep Trio. 1.10, Religious Instruction. 2.10, Concert. 5.0, Relay of Evening Service from Veendam (on 1,870 metres). Sermon by the Minister, the Rev. N. Posters. 7.30 (approx.), Concert. 10.35, Choral Epilogue, conducted by Mr. Jos. H. Pickkers. 10.40 (approx.), Close Down.

JUAN-LES-PINS (Radio L.L.), (244 metres); 1.5 kW.—1.0 to 2.0, Concert of Light Music with Children's Corner. 9.0, General News Bulletin and Sports Notes. 9.15, Orchestral Concert. 10.0, Dance Music. 10.30 (approx.), Close Down.

KALUNDBORG (1,680 metres); 7 kW.—Programme also for Copenhagen (337 metres).—9.0 a.m., Divine Service relayed from Copenhagen. 10.30 a.m., to 10.40 a.m. (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 12.0 Noon to 12.25, Lesson in German, arranged by the paper "Radiolytteren." 12.30 to 12.55, French

Lesson, arranged by "Radiolytteren." 5.50 (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 6.0, Press Review. 6.15, Time Signal. 6.30, Talk. 7.0, Town Hall Chimes, relayed from Copenhagen. 7.5, Concert by the Station Orchestra. 8.15, "The Proposal," Comedy in One Act by Tchekov; Danish Translation by Emmanuel Hansen. 8.45, Orchestral Concert. 9.45, Dance Music, relayed from the Palace Hotel, Copenhagen. The Orchestra, conducted by Teddy Petersen. In the Interval at 11.0, Chimes relayed from the Town Hall, Copenhagen. 11.30 (approx.), Close Down.

KATOWITZ (422 metres); 10 kW.—1.30 to 4.0, Inter-relay Programme from Cracow, Katowitz, Posen and Vienna. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—8.0 a.m., Morning Recital and Address. 10.0 a.m. (Königsberg only), Weather Report and Forecast. 10.15 a.m., Concert by the Station Orchestra. 11.55 a.m., Relay of Time Signal from Nauen, followed by Weather Report and Forecast. 1.30, P. S. Leonhardt, Chess Talk, followed by Elementary Spanish Lesson, by Kurt Metzke, Lecturer in Spanish at the Königsberg Technical Institute. 6.30, Programme relayed from the Danzig Stadttheater. "Turandot," Lyrical Drama in Three Acts and Five Scenes, by Puccini. German Translation by Alfred Brüggemann. Musical Director: Cornelius Kun. In the Intervals, Late News Bulletin and Sports Notes. 9.30 (approx.), Dance Music relayed from Berlin. 11.30 (approx.), Close Down.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsinki (375 metres).—7.0 a.m. (approx.), Relay of Sacred Service. 9.5 a.m., Press Review. 10.5 a.m., Recital of Music. 10.50 a.m., Weather Report and Forecast, followed by Time Signal. 3.0, Concert by the Wireless Orchestra. 4.0, Talk. 4.25, Concert by the Station Orchestra. 4.57, Time Signal and Weather Report and Forecast. 5.10, History Talk. 5.40, Talk. 7.15, Concert by the Wireless Orchestra, conducted by Erkki Linko; Violin Solos by Erik Cronvall. 7.45, Late News Bulletin given in Finnish and Swedish. 9.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—7.5 a.m., Weekly Programme Review by Alfred Dormanns (in Esperanto). 7.15 a.m., Instruction on the Lute and Guitar by Olly Wirtz-Koort. 7.35 a.m. to 7.55 a.m., Esperanto Lesson by Alfred Dormanns. 8.0 a.m., Catholic Festival with Choral and Instrumental Selections, and Address in the Interval. 10.0 a.m., Talk on the German Language. 12.0 Noon, Orchestral Concert, followed by Talks on Literature and Chess. 3.30, Concert of Instrumental Music. 7.0, Popular Concert relayed from the Grosse Messchalle, Cologne. The Westdeutscher Rundfunk Orchestra and the Cologne Concert Fellowship. The Orchestra conducted by Dr. Wilhelm Buschköttler. Choral Director: Herr Wilhelm Brouwers. Followed by Late News Bulletin, Sports Notes and Concert of Light Music. 11.0 (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—Programme relayed by Dresden (275.2 metres).—7.30 a.m., Organ Recital, relayed from the Leipzig University Church. Organist: Professor Ernst Müller. 8.0 a.m., Choral and Instrumental Concert. 12.0 Noon and 12.30, Two Talks for Farmers. 1.0, Events Abroad. 1.45, Talk arranged by the German Speaking Union. 2.0, Popular Gramophone Records. 3.0, Concert or Play. 5.30, Talk. 6.30, Programme relayed from the New Theatre Leipzig. "Martha," Opera in Four Acts by Flotow. Musical Director: Albert Conrad. 8.0, Sports Notes. 9.30, Dance Music, relayed from Berlin. 11.30 (approx.), Close Down.

LYONS (Radio Lyon), (291 metres); 1.5 kW.—7.45, "Le Journal Parlé de Radio-Lyon." 8.0, Concert with Instrumental Solos by M. Camand (Violin); Madame Ducharme (Pianoforte); and M. Testanière (Cello). "The Pearl Fishers" (Bizet). 9.0 (approx.), Close Down.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—Programme relayed by Salamanca (EAJ22) (405 metres).—11.30 a.m., Relay of Concert by the Municipal Band from "El Retiro" (weather permitting); The Band conducted by Señor Villa. 2.0, Relay of Chimes and Time Signal. 2.5, Concert by the Wireless Orchestra and selection by Luis Medina. 3.30 to 7.0, No Transmission. 7.0, Relay of Chimes followed by Concert of Sextet Music. 8.0, Dance Music relayed from the Alkazar, The "Palermo" Orchestra. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Concert by the Band

Sunday, November 11th.

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where otherwise stated.

† the Asturias Regiment under the direction of Don Francisco Estel. 12.0 Midnight, Dance Music by the Palermo Orchestra relayed from the Alkazar. 12.30 a.m. (approx.) (Monday), Close Down.

MILAN, 1MI (549 metres); 7 kW.—9.30 a.m. to 10.0 a.m., Morning Recital of Sacred Music with Soloists. 11.20 a.m., Time Signal and Quartet Selections. 12.30 to 3.0, No Transmission. 3.0, Opening Signal and Concert by the Milan Radio Quintet. 5.0 to 7.25, No Transmission. 7.25, Opening Signal and Notes on Current Events. 7.35, Time Signal and Talk by Ulrico Tegani: Town and Country. 7.45, Sports Notes. 7.50, "The Girl of the Golden West," Opera, by Puccini; Late News Bulletin and Sports News at the end of Act 2. 10.45 (approx.), Close Down.

MOTALA (1,389 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres) and Sundsvall (545.6 metres).—10.0 a.m., Morning Service relayed from a Church in Stockholm. 3.30 (approx.), Concert or Dramatic Programme. 5.0, Relay of Divine Service from Stockholm. 6.15, Concert or Play. 8.15, Late News Bulletin. 8.40, Relay of Foreign Stations. 11.0 (approx.), Close Down.

MUNICH (535.7 metres); 4 kW.—Programme by Augsburg (566 metres), Kaiserslautern (277.8 metres), and Nuremberg (241.9 metres).—10.0 a.m., Relay of Chimes from the Munich Town Hall. 2.0, Concert. 6.30, Time Signal and Local Sports News. 6.45, Concert of Orchestral and Vocal Selections. 9.0, Late News Bulletin. 9.30, Relay of Concert. 10.30 (approx.), Close Down.

NAPLES, Call INA (333.3 metres); 1.5 kW.—9.0 a.m., Concert of Sacred Compositions. 3.45, Programme for Children. 4.0, Popular Concert. 4.30, Time Signal. 7.20, Topical Notes. 7.40, Time Signal. 7.48, Harbour Notes. 7.50, Concert of Operatic Selections by the Station Orchestra with Vocalists, Micaela's Aria from "Carmen" (Bizet), Soprano Solo by Signora E. Blandi with Orchestral accompaniment. 9.0, Sports News. 9.55, Calendar and Programme Announcements. 10.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (500 metres), Rjukan (448 metres).—6.15, Weather Report and Forecast and News from the Press, followed by Literary or Musical Programme. 7.0, Time Signal and Concert by the Station Orchestra. 8.30, Weather Report and Press Notes. 8.45, Talk on Current Topics. 9.30 (approx.), Dance Music relayed from the Hotel Bristol. 10.45 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—Programme relayed at intervals by the following stations: Bordeaux PTT (275 metres), Eiffel Tower (2,650 metres), Grenoble (416 metres), Lille PTT (264 metres), Limoges (285 metres), Lyons PTT (480 metres), Marseilles (303 metres), Rennes (280 metres), Toulouse PTT (260 metres).—8.0 a.m., General News Bulletin and Time Signal. 9.25 a.m., International Time Signal and Weather Report and Forecast. 12.0 Noon, Concert under the direction of M. de Buxeuil and M. L. Raiter, and organised by "Les Editions Salabert." 1.0, Industrial Notes. 1.30, Concert organised by "L'Association Générale des Auditeurs de T.S.F.," Romance sans paroles by Fauré. 4.0, Padeloup Concert relayed from the Théâtre des Champs Elysées; Selections of Symphony Music. 6.30, "Le Radio Journal de France." 8.0, Talk under the auspices of the "Union des Grandes Associations." 8.15, Sports News. 8.30, Concert of Instrumental Music followed by Late News Bulletin, Time Signal and Weather Report. 10.30 (approx.), Dance Music relayed from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—7.58 a.m., Time Signal on 32.5 m. 9.28 a.m., Time Signal on 2,650 metres. 7.10 to 7.20, Weather Report and Forecast. 7.30 "Le Journal Parlé par T.S.F.," with Talks by its regular contributors, including Doctor Pierre Vachet, Detective Ashelbé, and M. René Casalis on Portez-vous bien; Police Memoirs; Events in the World of Sport, and Sports Notes from the paper "Paris-Sport." 7.58, Time Signal on 32.5 metres. 8.0 to 9.0, Concert. 10.28, Time Signal on 2,650 metres. 11.15 (approx.), Close Down.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Records. 8.50, Talk. 8.55, Press News. 9.0, Concert by Artists from the Opera House and the Opéra-Comique, Music to Shakespeare's "Tempest" by Chausson. 9.30, Concert of well-known Symphony Compositions conducted by Professor Estyle, of the Paris Conservatoire. 10.0, Late News Bulletin. 10.15, Orchestral Selections. 11.0 (approx.), Close Down.

PARIS (Radio Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and News from the Press. 8.50 a.m., Daily Physical Culture conducted by Dr. Diffre. 12.0 Noon, Religious Address followed by Sacred Recital arranged by "La Vie Catholique." 12.30, News from the Press. 12.45, Concert by the Albert Locatelli Orchestra with Interlude by Bilboquet. 4.30, Programme arranged by "L'Industrie Musicale." The Latest Gramophone Records, In the Interval, News from the Press. 7.0, Agricultural Talk and Press News. 7.45, The Radio-Paris Guignol, (a) Casandre et ses domestiques, (b) La Vertu récompensée, (c) Les Jacasseries de Polichinelle by Bilboquet. 8.30, Orchestral Concert. Between the Acts, Press News and Late News Bulletin.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.0, Sessions Chineses, followed by Church Service. 7.0, Roxy's Stroll Programme relayed from WJZ, New York. 9.45, Service relayed from the Shady Side Presbyterian Church, with Sermon by the Pastor, the Rev. Hugh Thomson Kerr. 11.0, Concert relayed from the William Penn Hotel, Pittsburgh. 11.30, Concert by the Whittall Anglo-Persians relayed from WJZ, New York. 1.0 a.m. (Monday), Programme from the National Broadcasting Company, New York. 1.15 a.m., Collier's Radio Hour. 2.15 a.m., The Utica Jubilee Singers. 2.45 a.m., Concert. 3.15 a.m., Longine Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—11.15 a.m., Ceremony on the occasion of the Celebration of the Tenth Anniversary of Polish Independence, relayed from the Posen University Hall and followed by inter-relay programme from Craoow, Katowitz, Posen and Vilna. 9.0, Time Signal. 9.40, Concert of Light Music. 11.0 (approx.), Close Down.

PRAGUE (349.9 metres); 5 kW.—8.0 a.m., Concert of Sacred Music. 12.05, Industrial Notes. 12.20, Social Announcements. 3.30, Concert of Orchestral Selections. 5.0, Programme for German Listeners. 9.0, Time Signal and Late News Bulletin. 10.15, Concert of Popular Music.

RABAT, Call PTT (416 metres); 2 kW.—12.30, Concert by the Station Orchestra. 4.0 to 5.0, Military Music. 8.20, Sports Talk by M. Barrier. 8.30, Concert of Orchestral Music. 10.30, Relay of Dance Music. 11.0 (approx.), Close Down.

RIGA (526.3 metres); 4 kW.—8.15 a.m., Relay of Divine Service from the Mara Church. 12.0 Noon, Programme of Music and Tales for Children. 3.0, Concert by the Station Orchestra under the direction of Arved Parups. 4.0, Talks. 6.0, Concert with Soloists. 8.0, Weather Report and Forecast and Late News Bulletin. 8.30, Dance Music by the Orchestra at the Café de l'Opéra. 10.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—8.0 a.m., Opening Signal. 9.5 a.m., Vocal and Instrumental Concert. 9.45 a.m. to 12.0 Noon, No Transmission. 12.0 Noon, Opening Signal. 12.5 to 1.0, Concert by the Wireless Trio. 1.0 to 4.0, No Transmission. 4.0, Opening Signal. 4.5, Selections of Dance Music by the Casinetta Orchestra. 5.0 to 6.40, No Transmission. 6.40, Opening Signal. 6.45, Topical Talk. 7.0, Agricultural Talk. 7.10, Sports Results and News from the Stefani Agency. 7.38, Time Signal. 7.45, Concert devoted to the works of Schubert, on the occasion of the First Centenary of his Death (November 1828); Overture to "Alfonso and Estrella." 9.50, Late News Bulletin. 10.15 (approx.), Close Down.

SAN SEBASTIAN (Union Radio), Call EAJ8 (335 metres); 0.5 kW.—10.0, A Programme of Light Music by the Orchestra at the Sans Sebastian Casino. 12.0 Midnight (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.98 and 31.4 metres); 30 kW.—9.30, Relay of Church Service from Schenectady, N.Y. 6.30 to 7.0, The United Radio Corporation Programme. 8.30, Organ Recital by Elmer A. Tidmarsh, relayed from the Union College Memorial Chapel, Schenectady. 9.0, Talk for Men under the auspices of the Bedford Branch of the Y.M.C.A., relayed from Brooklyn, N.Y. Speaker: Dr. S. Parkes Cadman. 10.30, Acousticon Programme

relayed from New York. 11.0, Stetson Parade Half Hour, relayed from Boston, Mass. 11.30, Musical Selections relayed from New York. 12.0 Midnight, Reinald Werrenrath: Old Company's Programme, relayed from New York. 12.39 a.m. (Monday), Programme relayed from the Capitol Theatre, New York. 2.0 a.m., Talk on "Our Government," relayed from Washington, D.C. 2.15 a.m., Atwater Kent Hour relayed from New York. 3.15 a.m., Time Signal. 3.17 a.m., Experimental Transmission of Television Signals. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (434.8 metres); 1 kW.—2.0 to 3.0, Light Music by the Seville Wireless Orchestra. 9.30, Orchestral Concert with Vocalists. 11.0, Flamenco Songs and Selections of Dance Music by the Station Orchestra. 11.30 (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—3.30, Orchestral Concert. 4.30, Stock Exchange Quotations. 5.15, Turkish Music. 7.30, Weather Report and Forecast and Time Signal. 7.40, Talk. 7.55, Orchestral Concert. 9.0, Late News Bulletin. 9.30 (approx.), Close Down.

STETTIN (236 metres) 0.75 kW.—Relays Berlin (Voxhaus) programme at intervals from 8.0 a.m. to 11 p.m.

STUTTGART (379.7 metres); 4 kW.—Programme relayed by Freiburg (577 metres).—10.15 a.m. (approx.), Morning Recital. 11.0 a.m. (approx.), Orchestral Concert, followed by Gramophone Selections. 1.0, Programme for Children, relayed from Berlin. 7.15 (approx.), Concert or Play, followed by Programme of Light Music and Late News Bulletin and Sports Notes.

TALLINN (408 metres); 2.2 kW.—7.30 a.m. (approx.), Relay of Morning Service. 1.0, Orchestral Concert. 6.0, Concert of Orchestral and Vocal Items. 7.30, Late News Bulletin.

TOULOUSE (Radiophonie du Midi), (391 metres); 3 kW.—12.30, Weather Report and Forecast and Stock Exchange Quotations. 12.45, Concert. 1.0, Time Signal (Carillon). 1.45, News from the Press. 8.0, Stock Exchange Quotations and News Bulletin. 8.15, Communications from "La Dépêche" and "Le Petit Parisien." 8.30, Concert. 8.48, Concert arranged by "L'Association des Commerçants Radio-Électiciens du Midi." Selections from Pelléas and Mélisande, Lyrical Drama in Five Acts by Maeterlinck. 10.15, Daily Bulletin of North African News, followed by Late News Bulletin. 10.30 (approx.), Close Down.

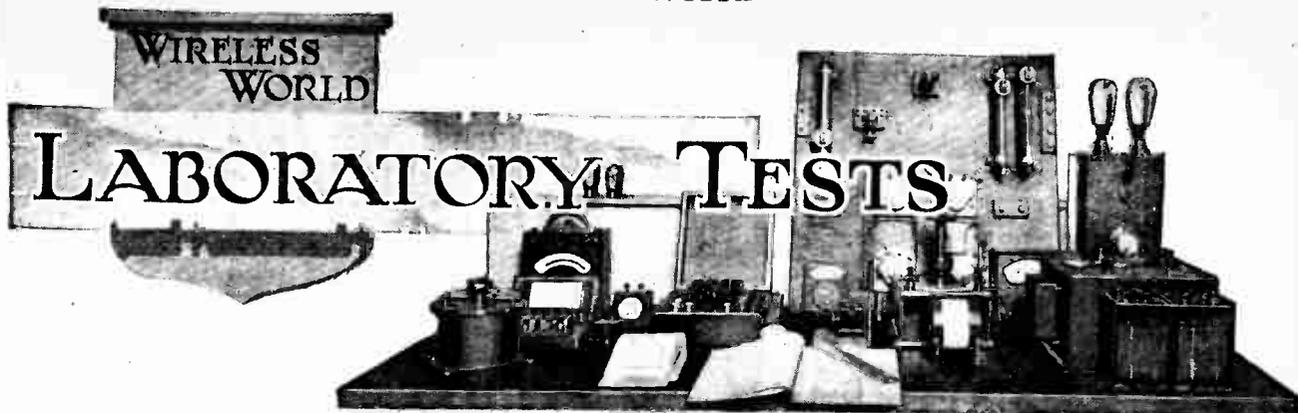
VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—Programme relayed by Graz (577.1 metres), Innsbruck (294.1 metres), Klagenfurt (272.7 metres), and Linz (254.2 metres).—9.20 a.m., Organ Recital. 10.0 a.m., Selections by the Vienna Symphony Orchestra. 2.15, Experimental Transmission of Pictures. 3.0, Orchestral Concert. 6.30, Programme relayed from the "Grosse Musikvereinsaal." Concert of "Labour" Symphony Music. "Peace on Earth" by Schönberg followed by Selections of Light Music. 10.0 (approx.) Close Down.

VILNA (435 metres); 1.5 kW.—11.0 a.m., Relay Warsaw. 1.30 to 4.0, Inter-Relay programme from Craoow, Katowitz, Posen and Vilna in celebration of Tenth Anniversary of Polish Independence. 9.30, Concert of Light Music.

WARSAW (1,111 metres); 10 kW.—11.0 a.m., Concert by the "Philharmonic de Narsovie." 1.30 to 4.0, Inter-Relay programme from Craoow, Katowitz, Posen and Vilna in celebration of the Tenth Anniversary of Polish Independence. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.

ZAGREB (309.2 metres); 0.7 kW.—10.30 a.m., Orchestral Concert. 4.0, Dance Music, relayed from the "Club-Bar." 6.45, Wireless Notes. 7.0, Relay of an Opera from the Zagreb National Theatre.

ZÜRICH (588 metres); 1 kW.—10.0 a.m., Light Music by the Orchestra at the Capitol Theatre. 11.0 a.m., Weather Report and Forecast. 11.30 a.m., Concert by the Zürich Wireless Orchestra. 3.0, Concert relayed from the Carlton Elite Hotel. The Castellano Orchestra. 6.30, Time Signal. 6.33, Religious Address. 7.0, Chamber Music by the Station Orchestra; Violin Solos by Erwin Gilbert and Max Scherbaum; Viola Solos by Viktor Chmelik; Cello Solos by Julius Bächli. 9.0, Weather Report and Late News Bulletin of the "Neue Züricher Zeitung." 9.30 (approx.), Close Down.



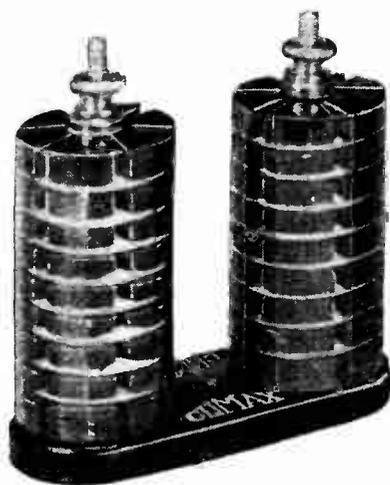
A Review of Manufacturers' Recent Products.

CLIMAX H.F. CHOKE

The "binocular" construction of this choke reduces the possibility of coupling with other circuits in the receiver, since the coupling between the two sections confines the field to the immediate vicinity of the choke. Each section is wound on a slotted cylindrical former from which much of the dielectric is removed by vertical milling. It is thus possible to examine the windings, which are exceptionally regular and uniform, through the transparent celluloid covering.

The impedance curve shows that the choke is suitable for wavelengths up to 2,500 metres. There is, however, a possibility of self-oscillation between 700 and 800 metres where the slope of the curve is negative. The choke was tested in circuit for oscillation over this waveband, but under the conditions of test the receiver remained stable; increased reaction in the vicinity of this waveband was, however, necessary. The kink in the curve is due to the fact that the coupling between the two halves of the choke is not so great as the coupling be-

tween the sub-sections in each unit. The self-inductance and self capacity of each



Climax binocular H.F. choke; D.C. resistance 1,320 ohms.

half, therefore, forms a closed circuit, and the overall performance is equivalent to that of two chokes in series. Fortunately the kink occurs on a waveband on which there are few important stations and the choke is quite efficient on the 200-500 and 1,000-2,000 metre bands. The impedance at various typical wavelengths is as follows:—

Wavelength (metres).	Impedance (ohms).
200	12,700
500	54,000
1,600	238,000

The price of the Climax choke, which is made by Messrs. Climax Radio Electric, Ltd., Quill Works, Putney, London, S.W.15, is 7s. 6d.

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"STELLA" CABINETS—A NEW FINISH.

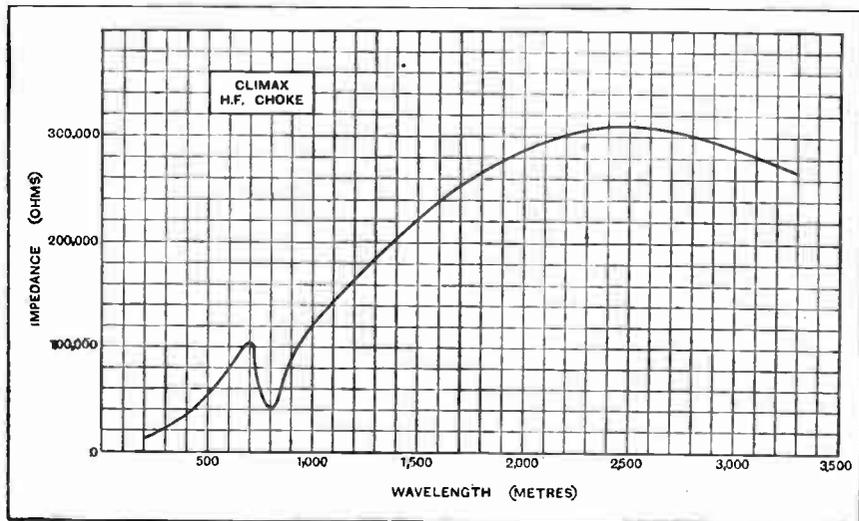
In order to expedite the delivery of "Stella" aluminium cabinets, a new finish has been developed to replace the original machine-chased and lacquered surface. The new finish is described as "marble," and is a hard and durable enamel artistically mottled either in greyish white or dark brown. The prices remain the same as for the original chased finish, and readers requiring further particulars of the structural details of these cabinets are referred to page 140 of the issue for August 1st.

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BROWN "L.F." TRANSFORMER.

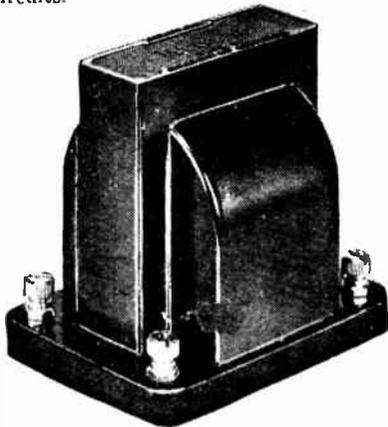
The manufacture of intervalve transformers is a new departure for Messrs. S. G. Brown, Ltd., but the N.P.L. curve for their first model (Type A) shows that they are fully conversant with the principles of transformer design.

The N.P.L. report gives curves for three combinations of valves, and it is interesting to note that the loading effect of the power output valve on the secondary winding has been taken into account in plotting the curves. The best results would appear to be given with a D.E.L. 610 valve preceding the transformer, the output valve for this curve being a D.E.P. 610, with an inductance of 3 henrys in the anode cir-



Impedance curve of Climax H.F. choke; external capacity 8 micro-mfd.

cuit. Starting at 30 cycles, the voltage amplification rises from 35 to 52 at 80 cycles, after which it remains constant up to 1,000 cycles, and then starts to rise gradually to 60 at 5,000 cycles. This rising characteristic at the upper frequencies is useful in combating high-note loss due to selective tuning in the H.F. circuits.



Brown Type "A" intervalve transformer.

No condenser is connected across the primary winding, so that a by-pass condenser may slightly modify the characteristics as described above. The makers state, however, that a by-pass condenser up to 0.0003 mfd. can be used with advantage.

The transformer, which has a ratio of $\frac{1}{2}$: 1, is hermetically sealed in a brown moulded case, and the price is 30s.

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RIPAULT DOUBLE-CAPACITY H.T. BATTERY.

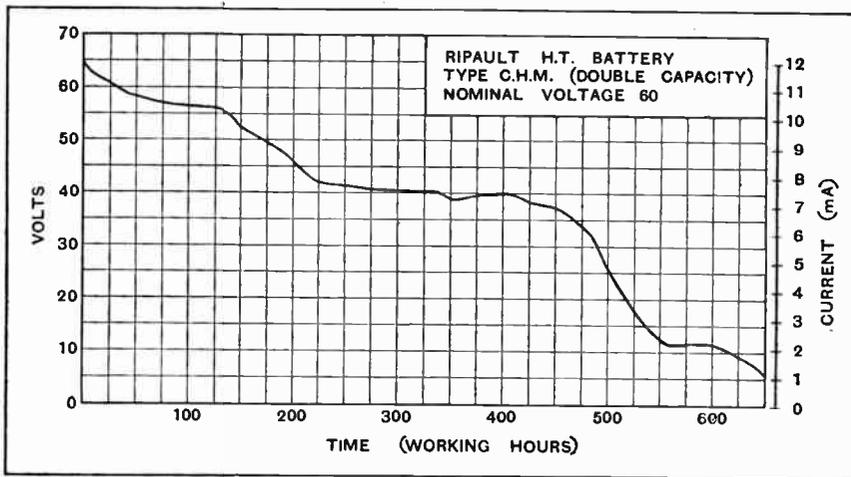
The following test relates to the type C.H.M. (Blue Label) battery with a rated E.M.F. of 60 volts. Reference to the maker's unique table of useful life for different rates of discharge shows that the battery is suitable for discharges up to 15 milliamperes. The following figures are abstracted from the table:—

Discharge Rate (mA).	Approx. Life (hrs.).
7	750
10	475
15	285

With the object of obtaining an average discharge of about 10mA, the



Ripault 60 volt double-capacity battery, Type C.H.M. (Blue Label).



Discharge curve of the Ripault type C.H.M. battery.

fixed loading resistance was set to give an initial current of 12 mA. With this current flowing the terminal voltage was found to be 4.5 volts in excess of the maker's rating.

The general form of the discharge curve is exceptionally good, and the fall of voltage is small and progressive until the "cut-off" point is reached, when the drop to zero is rapid. In this respect the Ripault battery conforms to the text-book ideal of dry cell battery performance. It will be seen that the steep "cut-off" starts at about 475 hours, which confirms the figures given for the 10 mA rate.

Readers may find it of interest to compare the general shape of the curve with that of the smaller capacity battery reviewed on page 478 of the issue of May 2nd, 1928. In our opinion, the similarity is a striking testimony to the uniformity of the materials used in these batteries.

The price of the 60-volt C.H.M. battery is 15s. 6d., and the maker's address is 1, King's Road, London, N.W.1.

o o o o

WEARITE "MEGAVOX" COILS.

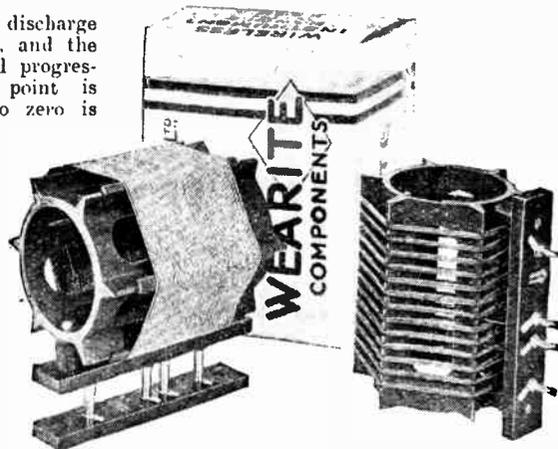
Messrs. Wright & Weaire, Ltd., 740, High Road, Tottenham, London, N.17, have now put in production a set of aerial coils for *The Wireless World* "Megavox" receiver, described in the issue for September 19th.

The coils are mounted on ribbed ebonite formers and are wound exactly to specification. A special base is made to fit the coil pins, and the contact between pins and sockets is perfect.

The coils have been tested in the original "Megavox," and the performance is identical with that given by the original hand-made coils.

The price of the Litz-wound short-

wave coil is 15s., and the long-wave coil costs 10s. 6d. The base is priced at 1s. 3d.



Wearite coils for the "Megavox."

PURE RUBBER SHEET.

A specimen of rubber sheet produced by the Britannia Rubber & Kamptulicon Co., Ltd., 7, Newgate Street, London, E.C.1, has been examined as to its suitability for moving-coil loud-speaker diaphragm support.

The manufacturers have apparently appreciated that it is an error to attempt to use extremely thin india rubber for this purpose, which becomes unduly stretched in the process of mounting the diaphragm, and is apt, moreover, to perish readily. The specimen sheet examined was of pure brown rubber, and will be found in use to give prolonged service and provide for centring the diaphragm without need for any auxiliary centring devices.

o o o o

TRADE NOTE.

Messrs. Read Radio, Ltd., have now moved to new premises at 32, Newman Street, London, W.1., the telephone number (Museum 2244) remains as before.

“Click!” and that's all

A “one-knob” control of your complete Apparatus

With the small, neat B.T.H. Power Control Switch you can control the entire switching on and off of a mains-operated receiver. A single movement of this switch puts your set into full operation. The reverse movement puts the set out of action and the accumulator on charge.

ON (Receiver Operation)

- (1) Connects H. T. Eliminator to lighting circuit.
- (2) Disconnects Trickle Charger from lighting circuit.
- (3) Connects L.T. Battery to Set.
- (4) Disconnects L.T. Battery from Trickle Charger.

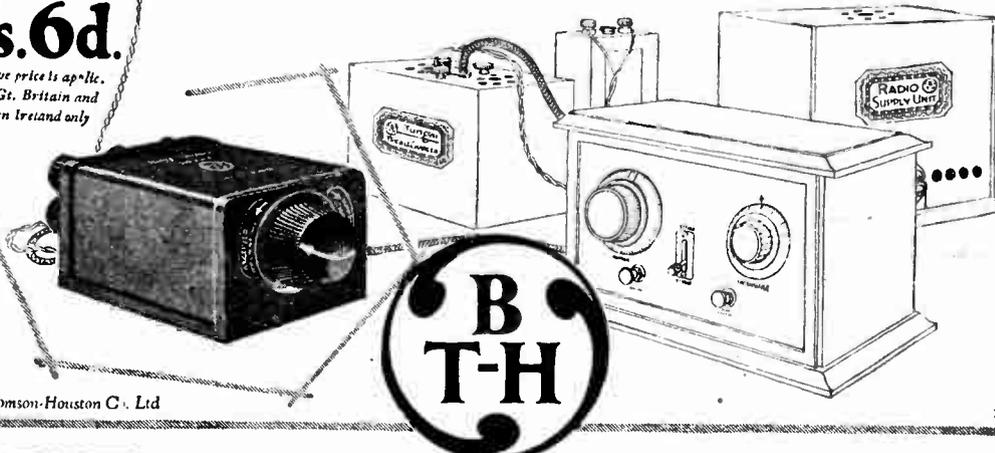
OFF (Battery Charging)

- (1) Disconnects H.T. Eliminator from lighting circuit.
- (2) Connects Trickle Charger to lighting circuit.
- (3) Disconnects L.T. Battery from Set.
- (4) Connects L.T. Battery to Trickle Charger.

Buy a B.T.H. Power Control Switch—one of the most ingenious radio conveniences ever invented.

**PRICE
17s.6d.**

The above price is applicable in Gt. Britain and Northern Ireland only



The British Thomson-Houston Co., Ltd

3067

POWER CONTROL SWITCH

MADE IN BRITAIN BY BRITISH LABOUR



A FREE VALVE WITH EVERY CONDENSER—the most generous offer ever made to the Radio Public.

We have made arrangements with the Victory Valve Co., of 104, High Holborn, W.C.2, by which we are able to offer with every Voltron Condenser ordered direct from us on or before the 14th of November a free valve costing 3/6.

WHAT YOU HAVE TO DO.

Send your order for condensers direct to us together with postal order to cover cost of condensers and state which type of valve you require (1 valve per condenser). Enclose 3d. per valve to cover postage and extra packing required. If you require a power valve enclose 1/- extra to cover the extra cost. The only condition is that you enclose the names and addresses of two local wireless dealers. This offer only applies to orders sent direct to our factory at Ponders End.

WHERE IS THE CATCH?

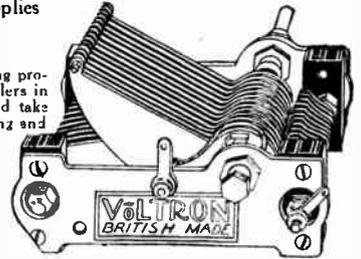
There is no catch. This is a plain straightforward advertising proposition. We require the names and addresses of all radio dealers in the United Kingdom. It would cost a great deal of money and take a very long time to obtain such a list through normal advertising and we prefer to give the benefit to the Wireless User.

GUARANTEE.—If dissatisfied with condenser or valve return to us within 7 days of receipt for free replacement.

VALVES AVAILABLE.

DESIGNED FOR	2 VOLT.	4 VOLT.	PRICE.
R.C. Coupling	2 V H	4 V H	3 6
H.F. Det. and 1st L.F.	2 V L	4 V L	3 6
POWER	2 V P	4 V P	4 6

CLOSING DATE
NOV. 14,
1928



5!
EACH
·0003 MFD.
·0005 MFD.

VOLTRON

VOLTRON Co. Ltd., QUEENSWAY, PONDERS END, MIDDX.
AGENTS FOR THE NORTH OF ENGLAND, L. KREMMER SHUDEHILL MANCHESTER.

Pin this COUPON to your order.

VOLTRON VALVE GIFT SCHEME.

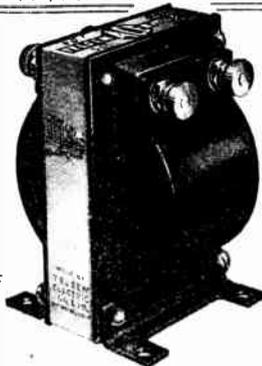
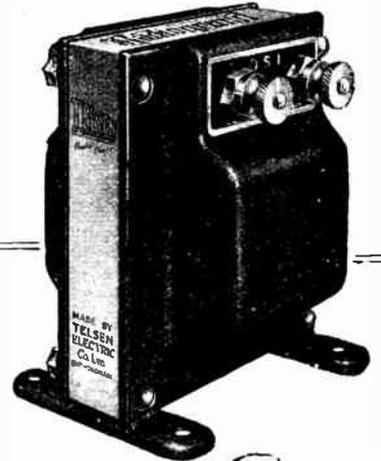
W.W.31

W.H.M. 340



EVERY TONE A SHEER DELIGHT.

This will be your experience if your Receiver includes one or more TELSEN L.F. Transformers. Remarkable purity throughout the scale is a feature of our products that delights the true musician. Until you use a TELSEN you will not realise what "Better Radio Reception" really means.



TELSEN
Radiogram
L.F. TRANSFORMER
FOR BETTER RADIO RECEPTION

Our Standard model with its many exclusive features reigns supreme as an instrument with extraordinary powers of amplification without distortion. The favourite component of the most exacting enthusiasts.

Shrouded and with detachable feet.

12/6

Made in ratios 5-1 and 3-1.

Irish Free State 15 8

TELSEN ELECTRIC CO., LTD.,
207, ASTON RD.,
BIRMINGHAM.

'PHONE: CENTRAL 5265. 'GRAMS: "ESCORT, B'HAM."

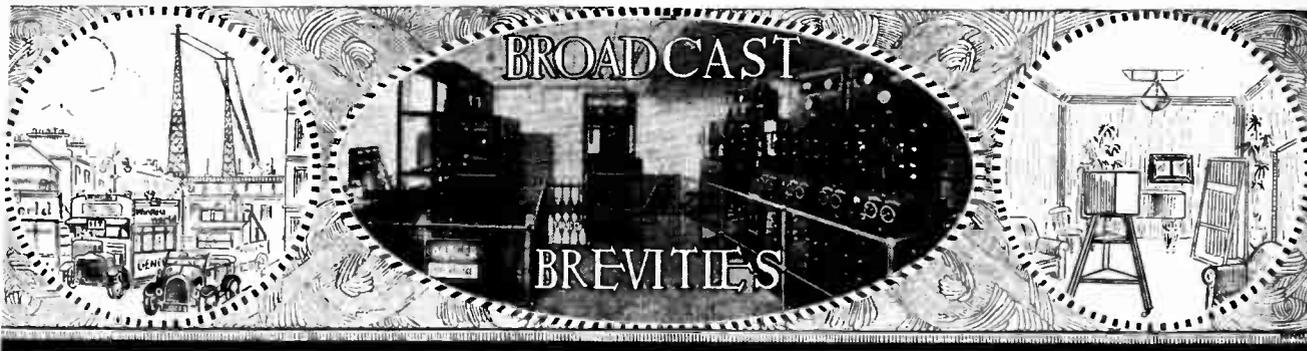


For pure production TELSEN gets all the volts.

"Ace"

Our smaller model, combining compactness, light weight and efficiency specially designed for Portable Sets. Shrouded and in ratios 5-1 and 3-1. Detachable feet. **8/6**
Irish Free State 10 8

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.



News from All Quarters: By Our Special Correspondent.

Television Tests in England?—Picture Transmission Success.—Visits to Nottingham.—Wales and the Regional Scheme.—A Shakespearean Venture.—Controversy in Earnest.—Bristol's Radio Week.

More About Television.

A number of people would not be at all surprised if the present *impasse* over television were to end abruptly in Humpty-Dumpty fashion. In a recent editorial *The Wireless World* suggested that the Baird Company might be given an opportunity of showing what they could achieve by means of tests outside broadcasting hours from, say, the stand-by transmitter at Marconi House. From what I can gather this suggestion has not gone unheeded in influential quarters.

In the Wee Sma' Hours.

What will probably happen in the near future is that the B.B.C. will lend a station to the Baird Company for experiments in the early morning hours. An arrangement of this kind would permit of the use of a wide band of wavelengths without interference to stations on the Continent.

I understand that the possibility of conflicting with the Geneva wavelength scheme was one of the reasons which led the B.B.C. to reject the Baird Company's original proposals. Television at the present time needs to have more than one frequency to play with.

It is hardly likely that the proposed television experiments from Scheveningen, in Holland, will be conducted at times when European broadcasting stations are working.

The Fultograph Tests.

With regard to the Fultograph transmissions, the B.B.C. is watching very carefully to discover what public demand exists for this service.

From a technical point of view the picture transmissions during the past week have amply justified the experiment, and it now remains to be seen to what extent John Citizen is intrigued by the notion of "pictures" from the ether.

Trouble in Nottingham.

As was expected, the closing down of 5NG on Wednesday last has loaded the Savoy Hill postbag with complaints from

the "stricken area." Nottingham folk who were getting 5NG's programme on a periodic bits of chicken netting find that 5GB is appreciably weaker than the good old local station, and they want to know the reason why.

prepared to wager that the fault will lie with the receiver in nine houses out of ten. This was the proportion of defective sets found in a similar tour in Birmingham when 5IT closed down.

And What of Wales?

While the B.B.C. is still uncertain where it will pitch the Northern regional station, acute interest is being aroused over the next station on the list, viz., the West Regional, not only in regard to its position on the map, but its ultimate functions on the programme side.

A strong persuasion exists in favour of "nationalising" the station, i.e., making it the artistic and cultural mouthpiece of the Welsh people, many of whom have clamoured after this ideal ever since broadcasting started. It is fairly certain that they are doomed to disappointment.

What Would Cornwall Say?

The West Regional station will cater for the needs of the whole of the West country, including Devon and Cornwall, and one can hardly imagine anything more irritating to the Cornishmen than spending long evenings in listening to Welsh.

Wales, however, is justified in asking for proper representation in the programmes, and it is certain that this desire will be met, probably by the inclusion of a preponderance of Welsh material in the transmissions on one of the twin wavelengths.

It is practically admitted at Savoy Hill that the West Regional station will occupy a site on the hills near Cardiff.

Putting Shakespeare to the Test.

With all due respect to Mr. R. E. Jeffrey, the B.B.C. dramatic producer, I confess that his avowed intentions in regard to the forthcoming production of "Hamlet" without declamation makes me shudder.

Imagine the famous soliloquy without declamation! I would rather hear it in modern American! ("You're for it, or

FUTURE FEATURES.

- London and Daventry.**
NOVEMBER 11TH.—Armistice Day Service from the Cenotaph and Remembrance Festival from the Royal Albert Hall.
NOVEMBER 13TH.—Danish National Programme.
NOVEMBER 14TH.—"The Pretenders," by Ibsen.
NOVEMBER 15TH.—Hallé Concert, relayed from the Free Trade Hall, Manchester.
NOVEMBER 16TH.—"Tom Jones" (Sir Edward German).
Daventry Exp. (5GB).
NOVEMBER 11TH.—Armistice Day Programme.
NOVEMBER 12TH.—Act 3 of "Lohengrin," relayed from Leeds.
NOVEMBER 13TH.—"The Pretenders," by Ibsen.
NOVEMBER 15TH.—"Tom Jones" (Sir Edward German).
Manchester.
NOVEMBER 12TH.—A Jewish Programme.
Newcastle.
NOVEMBER 12TH.—"My Programme," by Sir John Fitzgerald.
NOVEMBER 13TH.—"In the Cellar," a play by Gertrude Jennings.
Glasgow.
NOVEMBER 11TH.—Scottish "Remembrance" Programme.
NOVEMBER 13TH.—A Concert by the Glasgow Choral and Orchestral Union.
Aberdeen.
NOVEMBER 17TH.—"The Reed in the Wood," a romance by Edwin Lewis.
Belfast.
NOVEMBER 12TH.—"Le Cabaret de Lapin qui Sauté."
NOVEMBER 15TH.—A Light Russian Programme.
NOVEMBER 16TH.—Belfast Philharmonic Society's Concert, "The Song of Songs," set to music by Granville Bantock."

A Round of Visits.

The B.B.C. engineers are now running through the correspondence, and in the next few days visits will be paid to the houses of certain picked complainants. In each case the resident's receiver will be checked against a standard set of the same type. I hear that the engineers are

you aint; d'you get me, guy?") However, it would be unfair to say more until we have heard the experiment for ourselves. The date will be November 22nd.

"X."

Constant invocation of the Deity is a poor and outworn device for heightening the dramatic flavour of stage dialogue. There was too much of it in last week's radio thriller, "X," an unknown quantity which did not gain much on closer acquaintance.

The play would have been more acceptable if we had not so recently heard "Speed" and "The Greater Power," two efforts which at least tilled fresh soil. "X" did not; it sought to make capital out of the old superstition which would put ghosts into every machine.

A Good Opening.

The opening passages were best, but soon after the machinery stronghold in the Sahara Desert had been discovered the affair became tedious in its absurdity. The dialogue could have been cut in chunks, likewise those irrelevant scenes dealing with odd, unplaceable people who were obviously about to die as "victims of the machine" in motor and aeroplane accidents. (This was done far better in "Speed.")

The effects were good, though I think some variation might have been tried in the "spook music." We are getting too accustomed to those dithering semitones.

Cecil Lewis and Max Mohr.

As the result of further collaboration between Cecil Lewis and Max Mohr, a

new radio play entitled "Caravan" will be broadcast from 2LO and 5XX on November 26th.

It is a play about Egypt and will be the fourth in which Mr. Lewis has collaborated with the German author for broadcasting purposes, the three previous being "Improvisations in June," "Pimpus and Caxa" and "Rampa." The last-named was produced in London a few days ago at the Gate Theatre studio.

A Chess Talk.

The game of chess has not hitherto found a niche in the broadcast programmes.

The first chess talk is to be broadcast on November 16th by Mr. Brian Harley, who will deal with that popular opening move, "the Queen's Gambit declined."

Without a Manuscript!

The B.B.C. will permit Sir Thomas Hughes to come to the 2LO microphone on November 20th without a manuscript. Sir Thomas is a great Dickens enthusiast who, in spite of his public duties, finds time to learn by heart long passages from his favourite author. On this occasion he will recite a scene from "David Copperfield" entirely from memory.

The Fun Begins.

Controversial broadcasting has hitherto been confined to isolated debates, but on Friday next, November 9th, at 7.25, we are to have the first of a series of talks revolving round the same vexed topic, viz., modern industry. Lord Melchett will be the speaker on Friday, and he will urge the case for Rationalisation.

Other speakers on successive Friday evenings will be, respectively, Mr. Walter M. Citrine, on the attitude of organised labour; Mr. H. D. Henderson, on the New Industrial Revolution; Major



THE FIRST PICTURE. The portrait of H.M. the King as it was received on the demonstration "Fultograph" at the Savoy Hotel.

Walter Elliot, M.P., on World Trade; Miss Lynda Grier, on Women in Industry; and the Rt. Hon. Sir Herbert Samuel, on "What of the Future?"

Most shades of political opinion are represented in this list, so if nobody is offended it will not be the fault of the B.B.C.

Radio Week in Bristol.

The week beginning November 18th is Bristol Radio Week, and the Carliff programmes will be designed to show Bristol's fame and history. On November 18th evensong will be relayed from Bristol Cathedral.

On November 19th the Bristol Post Office Staff Concert will be relayed from the Central Hall, Bristol.

"The Apex," a comedy in one act by R. J. McGregor, will be given on November 23rd. This play is written by a Bristolian, and the three members of the cast are Bristol artists.

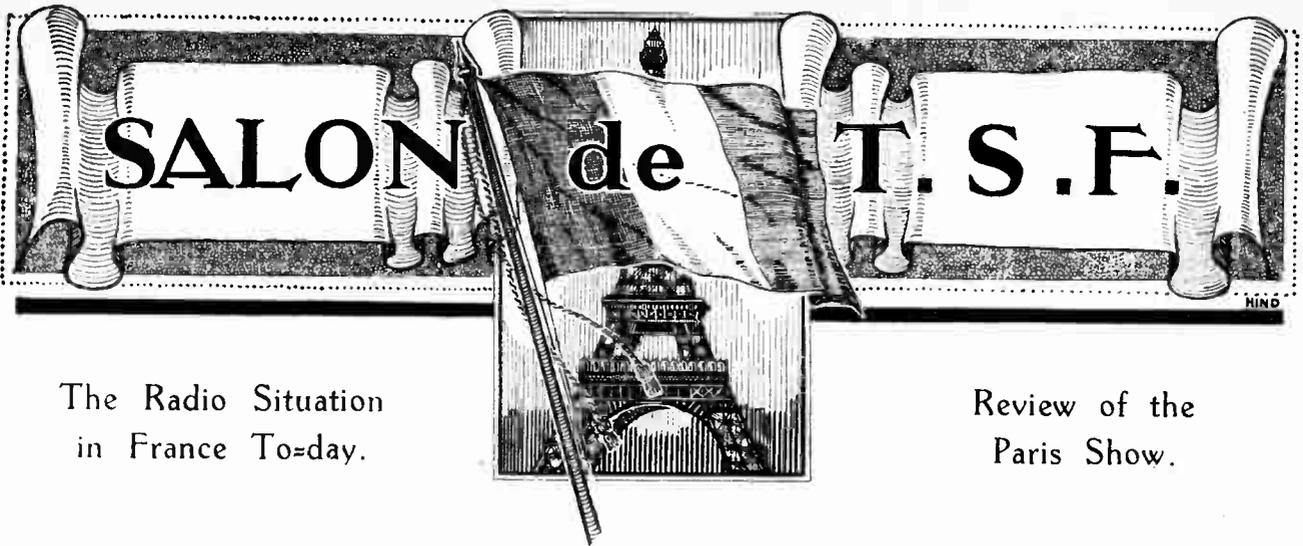
Keighley Annoyed.

I see that Keighley is indignant. Who's Keighley, anyway? "Keighley's not," as Mrs. Arris would say, "a 'oo, but a it." The Yorkshire town of Keighley is indignant with a poor, uneducated announcer who dropped a brick in giving the result of a football match between Hull Kingston Rovers and "Keeley"; he ought to have said "Keethly."

Why Keighley makes such a fuss about it puzzles me, but then I didn't hear who won the match.



PICTURE BROADCASTING BEGINS. The "Fultograph" transmitting apparatus photographed just before sending the first picture from Daventry, 5XX, on Tuesday, October 30th. The image was transmitted from Savoy Hill by landline to 5XX, whence it was broadcast and picked up on a demonstration set at the Savoy Hotel.



The Radio Situation
in France To-day.

Review of the
Paris Show.

FRANCE seems to know but one type of receiver—the superheterodyne. To the enthusiast in this country such an observation is almost unbelievable, as that form of receiver passed out of vogue here, for both commercial and home constructed sets, more than two years ago. It is hard to find a reason, not only for the survival of the superheterodyne but for its development and elaboration in the hands of the French, to the exclusion, almost, of the highly efficient form of receiver of not more than four valves. Its longevity is governing the entire technique of radio reception in France calling for the standardising of special valves, the suppression of battery eliminators as their failing are evident with seven- and eight-valve receivers, and the exclusion of the moving-coil loud speaker. This is the predominant note that strikes one on visiting the fifth Salon de T.S.F., which opened in Paris at the Grand Palais on October 25th.

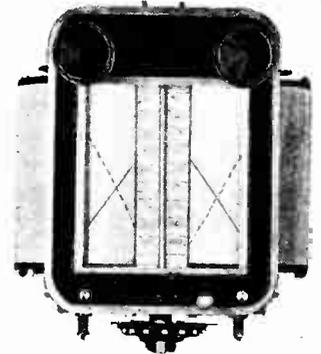
Bigger than Olympia.

No fewer than 280 exhibitors have taken stands occupying a floor space of some 60,000 square feet. To compare with the Olympia Radio Show, that exhibition included 266 exhibitors with a stand area of 40,000



The Berren superheterodyne with calibrated tuning drums and frame-aerial indicator.

square feet. An analysis of the types of receivers exhibited showed that of 250 sets, some 200 embodied the superheterodyne principle and about one-third of this number were portable superheterodynes. Both in the town and country districts the almost entire absence of aerials is a fact one cannot help noting, and it can only be assumed that the majority of French listeners find satisfaction in the use of frame aerial and superheterodyne. Judging by results quality of reproduction is a second consideration to the making of a set with calibration chart showing all the broadcasting stations of Europe. The exclusion provided by the tariff on imported sets, combined with the exclusion of other than French



Drum-enclosed tuning condensers of the Berren set. The wavelength indicating scale is changed by the switch.

receivers from their exhibition, completely eliminates foreign rivalry which would undoubtedly have a beneficial effect on the design of French productions. Casual inspection of many of the sets suggested the incorporation of both screened grid valves and pentodes, valves which are even better known in certain of the Continental countries than they are here. Closer observation, however, showed that what at first sight might have been a screened grid H.F. amplifier, was, in reality, an arrangement for combining the received and interfering frequencies in the superheterodyne circuit, while in the output stages an additional valve connection resembling a pentode was nothing more than the introduction of an additional grid for neutralising the space charge around the filament.

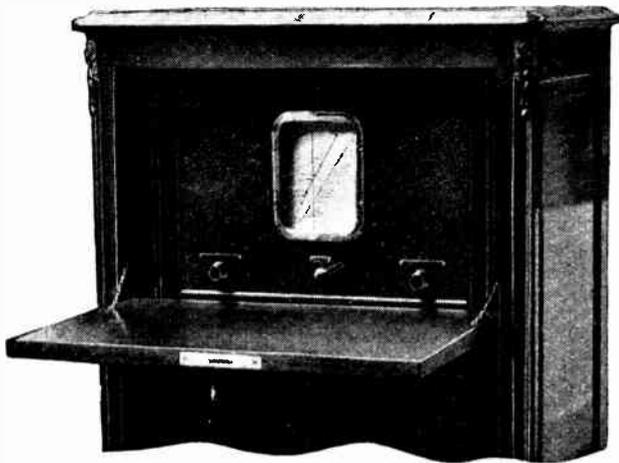
Station Indicators.

Turning now to the actual details of the sets, one might quote the Elgédine of Gaumont as representing

Salon de T.S.F.—

a highly developed superheterodyne. One large engraved dial, perhaps a foot in diameter, is marked off with the degrees setting for the frame as well as the tuning positions of a large number of stations. No technical skill is required to operate the set, which is built as a tall piece of furniture complete with batteries and battery charger, enclosed frame aeri-als, and pleated diaphragm loud speaker. This form of construction, as with many other elaborate sets having semi-automatic tuning controls, calls for the rigid assembly of the

enclosed within the drums. Curves set out on graph paper wrapped around these condenser tuning drums gave the wavelength settings against vertical tuning scales, as can be seen in an accompanying illustration. Wave change switching being arranged by a lever situated between the two drums provided, also, for the turning over of a vertical metal flap, in a like manner to turning over a leaf in a book, so as to expose the appropriate scales against the drums. This system, it is understood, is adopted in a number of French receivers, and is described to evidence the great difference which exists between French and British radio receiver design. In the Berrens' receivers, also, is to be found a beautifully finished dial exposed horizontally on dropping the front of the receiver and used to rotate the two-section frame. Close examination revealed that the mechanical connection to the frame was by cord and pulley concealed within the thickness of the woodwork. In the matter of cabinet work, the Berrens receivers are superb, although this remark applies to many of the receiving sets exhibited at this year's Salon.



A pair of intersecting cross wires give the tuning positions of the Périscand receiver.

components on a metal frame, and in this respect introduces a good feature into receiver construction. Of the six valves used in the Elgédine, the first is a four-electrode valve serving as a combined detector oscillator, followed by two intermediate amplifiers, second detector, and two low-frequency stages.

Ingenious Tuning Devices.

The Synchrodyne is another chassis-built receiver and a product of Radio L.L., a well-known French concern, whose activities include the construction of high-power broadcast stations. It is built on an all-metal frame of heavy aluminium with a front panel nearly three feet in length. Great ingenuity is shown in its tuning system, and as it is calibrated the wave change switch is arranged to expose the appropriate scale on a drum carrying the tuning scale. Its three tuning condensers have their rotating plates linked together on a common shaft, while the stators of two of them are likewise ganged and operated from a separate control.

Accuracy of calibration or the ability to tune a set to any given station being one of the principle merits of the superheterodyne, every care has been taken, in many of the sets, to preserve this property and present it in a form usable by the non-technical listener. At the stand of Etablissements J. H. Berrens was to be found a particularly ingenious calibrated tuning unit. Two small tuning knobs actually operated drums carrying the tuning scales as well as revolving what would normally be the fixed plates of tuning condensers

Artistic Cabinet Designs.

As to external finish and workmanship, artistic design and colouring, there is no equivalent to the French sets on the British market, and these sets, some half as large as an upright piano, sell for prices averaging about £25, to which the cost of accessories must be added, by way of valves, batteries, and, in some cases, the loud speaker.

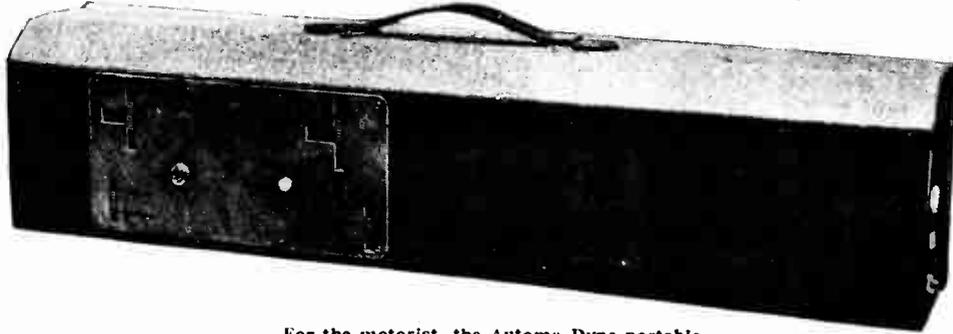
Probably the most ornate of receivers was the Super-



The Super-Torold, a combined superheterodyne and electrically reproducing gramophone.

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Toroid of Etablissements P. Hugla. Its cabinet resembled an exceedingly well-finished sideboard and the top panel, exposed by lifting the lid, was of a white



For the motorist, the Automo-Dyne portable.

irrescent substance resembling pearl. All controls and fittings, and there were many of them, were highly nickel-plated and harmonised with the "gettering" on the valves, which were recessed into the panel. A turntable was provided so that the outfit served as an electrical reproducing gramophone, while side compartments housed batteries and records.

On the receiver by Etablissements Péricaud was to be found another clever form of tuning indicator. Its two tuning knobs were linked by strings and pulleys so as to propel a pair of cross wires behind a glass panel. A vertical wire moved horizontally and was intersected by a horizontal wire moving vertically. Behind the wires was a wavelength and station calibrated curve, and it was only necessary to turn the tuning knobs so that the wires intersected on the required station.

For radio reception in the car a special receiver, the Autoino-Dyne, has been designed, and was exhibited by Intégra. As the name suggests, it is a superheterodyne with six valves, and it can be mentioned here that the names of practically all French receivers terminate with "dyne." The Automo-Dyne is all-metal enclosed and suitably shaped for accommodating either beneath the dashboard or out of the way, on the floor of the car in front of the seat. It is robustly built, has no projecting parts or dials, and will maintain its tuning adjustments. A second unit is supplied carrying batteries and frame aerial.

Among the accessories those which predominated were loud speakers and frame aerials, neither of which greatly interest

listeners in this country. Practically all the loud speakers were of the cone type, and quite a large number had stretched celluloid diaphragms, invariably operated by reed-driven movements. Cabinet work,

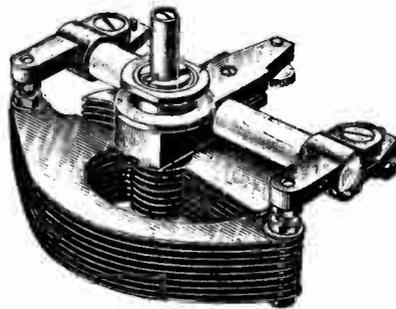
as with the complete receiving sets, was particularly attractive, differing from the simple rectangular boxes commonly met with here. An interesting four-pole differential movement selling for just over £2 and known as the Royal Duplex, was shown on the stand of Omnium Radio Electrique. The necessary requirement of liberal armature movement in an almost

constant magnetic field is obtained by the use of two horse-shoe magnet systems and four coils. This unit is likely to prove popular in France.

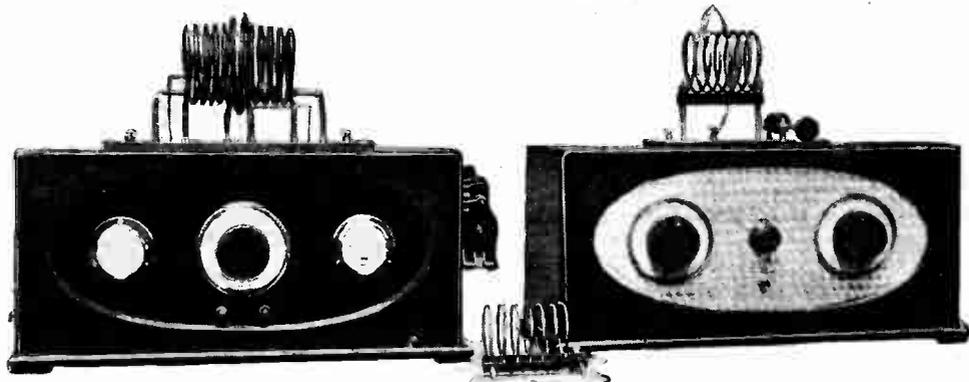
No Moving-coil Loud Speakers.

With the Olympia and Manchester Shows still fresh in one's mind and the conspicuous part taken by moving-coil loud speakers at these exhibitions, the Salon appeared to lose its identity as a wireless exhibition owing to the almost total exclusion of loud speakers of this type. Hidden away on two of the stands, however, specimens were to be found, one incorporated as a matter of routine in a Panatropé, while the other was on the stand of Radio L.L., though not in a position where it could be readily seen or inspected. It is doubtful if the moving-coil loud speaker will gain prominence in France until the receiving systems and low-frequency amplifiers are completely modified.

Components formed only a small part of the total exhibits, and in this field variable condensers predominated. Although the general instrument work inside of quite a number of the sets was poor, many of the variable condensers, and particularly their



An interesting variable condenser, assembled about a quartz rod (Gravillon).



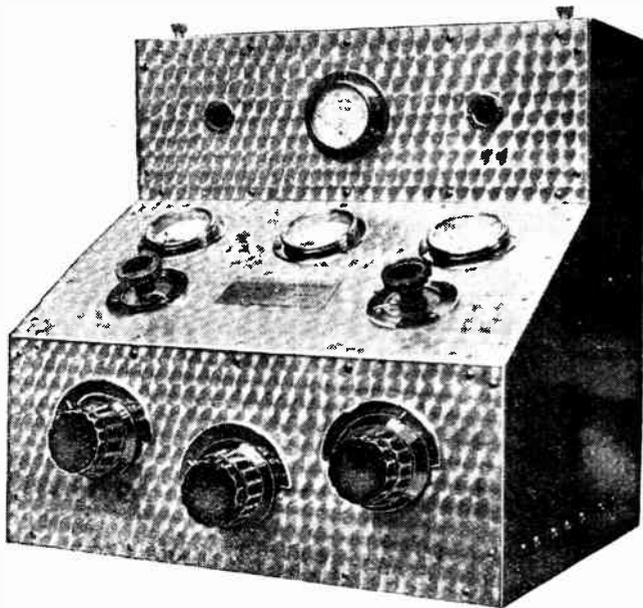
The Creo short-wave transmitter and receiver.

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reduction gearing and dials, were exceedingly interesting. Revolving dials are not fashionable, and most attractive was the large knob with vernier window moving over a scale on a well-finished circular aluminium plate, a typical example being the Le Vernier condenser of Les. C. V. Travernier. The aluminium scales look exceedingly well, the effect in some instances being produced by actually grinding the face of the aluminium prior to lacquering. Quartz glass bars are largely used for insulation in variable condensers, two examples being the condensers of Pival and Gravillon. In the first case two short circular rods support the stator, while in the latter the condenser assembly is built up around a straight quartz rod with a centre clamp giving support to the bearing of the moving plates, and a pair of end clamps supporting the fixed plates. The average price of a good quality variable condenser in France is 9s. without dial.

L.F. Transformers and Fixed Condensers.

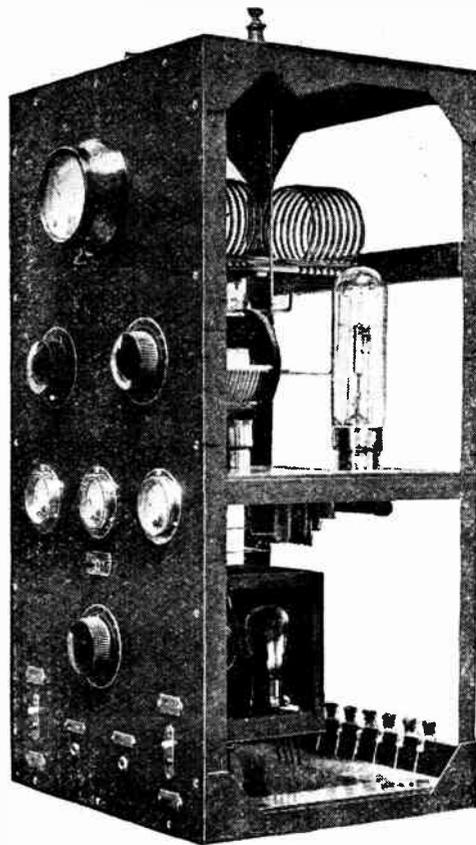
Fixed-capacity condensers are invariably of the air dielectric type. They are compact, of low loss, and cannot be broken down. Typical examples are the Riga of Constructions Radio-Électrique and the Le Capac of Etablissements Gilson. Edgewise and drum dials were not greatly in evidence, though one exemplifying attractiveness of design is the Electron condenser made by a company whose wide activities extend to the construction of piezo electric oscillators. Low-frequency intervalve couplings by way of transformers and resist-



The combined transmitter-receiver by Merland and Poltrat.

ances were few, and there appeared little competition among manufacturers in this direction. Transformer curves were not displayed to the same extent as they are in connection with L.F. transformers in this country. Brunet and Pival transformers were most in evidence, selling at a range of prices up to 10s.

Battery eliminators practically do not exist on the French radio market, although there were a few A.C. rectifiers of the buzzer and arc types for battery charging. The Westinghouse form of rectifier so common



A telephony transmitter with master oscillator drive (Radio Provence).

in this country is almost unknown, though a single specimen was actually in the exhibition. For H.T. supply dry cells and H.T. accumulators, and particularly the latter, are in universal use.

Short-wave Transmitters.

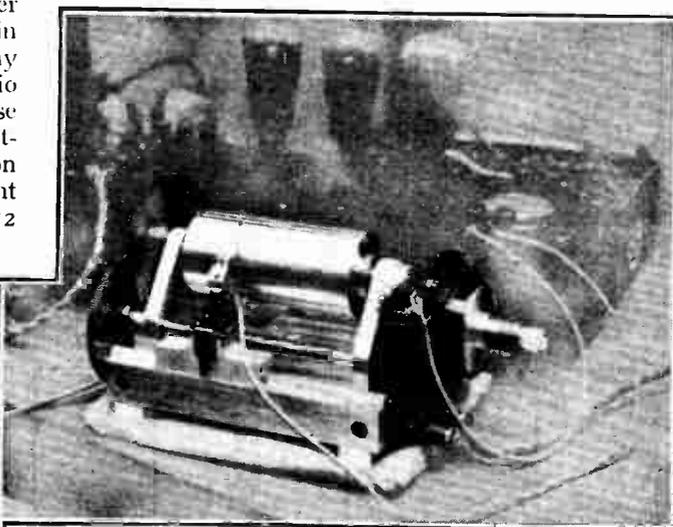
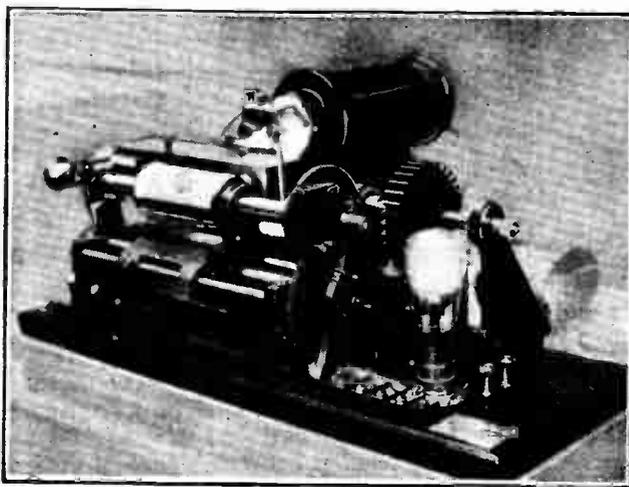
On many of the stands was to be found transmitting equipment and in particular short-wave apparatus for amateur use. The more simple sets used a symmetrical two-valve Meissner circuit, an interesting example being the Creo, a product of Etablissements Cie Radio Électrique de L'Opera. A selection from the many attractive short-wave transmitting sets is given in the accompanying illustrations, including one by Merland and Poitrat, which is a beautifully built combined transmitter and receiver, covering a wave range 10 to 100 metres, and the tall all-metal frame-built unit with totally-enclosed master oscillator drive by Radio Provence. There must be a lively demand for transmitting equipment judging by the number of stands on which sets were to be found, and as compared with our own exhibitions where no single example existed.

Not many years ago the most commonly used valve in this country was the "French valve," in particular the Métal and the Fotos, and it is interesting to con-

Salon de T.S.F.—

sider these products of to-day. The range of Métal valves of the Compagnie des Lampes includes those with tungsten, thoriated and oxide-coated filaments. A typical valve is the Micro-Métal D.Y.604. At a filament voltage of 4 it passes 0.1 amperes, has an impedance of 4,500 ohms and a magnification of 6, giving a mutual conductance as high as 1.4. It sells for a little more than 8s. Valves of the "bigrille" type are common in France, and are two-grid valves specially introduced for use in the detector oscillator stage of superheterodynes and have practically no parallel in England. In the Fotos-Gramont series one of the best popular valves is the B.F.1, which is rated at 4 volts 0.12 amperes, with a magnification of 6 to 7 and an impedance of 6,000 ohms, giving a mutual conductance of about 1, and selling at less than 7s. In the Fotos "bigrille" series are two L.F. amplifiers in which the extra grid is used as a means of reducing the working anode voltage down to between 10 and 25. Two other valves of this type are specially designed for use in superheterodynes. Dario and Crynos valves are worthy of mention, manufactured respectively by La Radio Technique and Etablissements M.C.B. Each of these concerns has a popular valve with a mutual conductance in excess of 1. the Dario R.56 has an amplification of 9, with an impedance of 6,000 for a filament current of 0.1 amperes at 3.8 volts. while the Crynos B.712

ducted from Radio Paris, and with the latter from the stations PTT, Radio-Toulouse, and Radio LL. Like the demonstrations given at the Manchester Exhibition, the Sferographe (Fultograph) was seen in operation recording a perfectly good picture. Nothing need be said concerning its technical details, which have been given at length in these pages. The Belinographe is synchronised by being driven with an A.C. synchronous motor arranged to produce a given speed of rotation depending upon the frequency of the A.C. supply. The illustration shows the double-ended magnet which is energised from the A.C. mains and propels a toothed wheel, different frequencies being accommodated by the substitution of wheels with an appropriate number of teeth. Unlike the Sferographe, the rotation of the cylinder is not momentarily tripped for synchronising and construction is therefore greatly simplified, though it calls for the frequency of the supply being correct



THE BELINOGRAPHE. On the left is the transmitter. A negative paper image is traversed by a point of light, the reflected light falling upon a photoelectric cell. Synchronising is checked by a flashing neon lamp illuminating a toothed wheel. The simple picture receiver is driven by an A.C. motor and runs at a constant speed related to the frequency of supply. A blue image is recorded by the application of the rectified current to a chemically moistened paper.

has a magnification of 7 with an impedance of 6,000 ohms for a filament current of 0.16 amperes at 4 volts. Practically all French valves are made for use on a 4-volt supply. Screened grid and pentode valves of French manufacture would appear to be, as yet, non-existent.

Picture Transmission Popular.

By far the biggest gatherings were to be found around the stands where demonstrations of picture reception were in progress. Two systems are now in use in France, the Sferographe, which is the name applied to the Fultograph of this country, and the Belinographe. Transmissions with the former system are being con-

within narrow limits. The machine is all-aluminium built and well finished, and makes use of the electrolytic method of recording. Here, again, it differs from the Fultograph in that the solution is a ferricyanide, producing a permanent blue image, although this solution is perhaps less sensitive than the starch iodide of the Fultograph. The picture is 10 x 13 cm., and the pitch of the traverse is six revolutions to the millimetre. Transmission is carried out by dispersion from a point of light falling upon a photoelectric cell.

The English visitor to this year's Salon cannot help being surprised, first with its magnitude and next with the vast technical differences which exist in radio practice in France and our own country.

USEFUL DATA CHARTS. (No. 15.)

Efficiency of Coupling by Grid Leak and Condenser.

WHEN, in an amplifier, the signal from the plate of a valve is handed on to the grid of the following valve by means of a grid leak and condenser, it is important to know what fraction of the signal is handed on—in other words, what is the efficiency of the coupling.

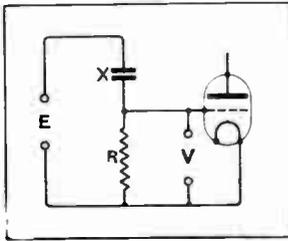


Fig. 1.—In an amplifier when leak and condenser coupling is employed the coupling efficiency is represented by V/E .

This fraction is V/E , as is evident from the figure, and is equal to $\frac{R}{\sqrt{R^2 + X^2}}$; if we put $\frac{X}{R} = \tan A$, then $\frac{R}{\sqrt{R^2 + X^2}}$ is equal to $\cos A$.

The abac is accordingly constructed by arranging that the right-hand line shall give the ratio X/R . Then a curve is drawn so that a tangent drawn to it from $\tan A$ on the right will give $\cos A$ (i.e. V/E) on the left.

An Example.

A grid leak of 100,000 ohms is used with a grid condenser of 0.0095 microfarads: What fraction of the signal

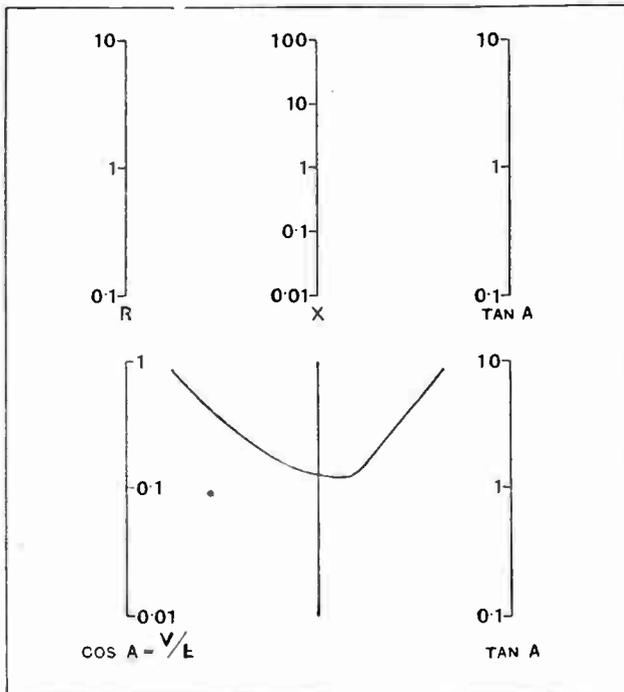


Fig. 2.—The abac given this week is constructed by arranging that the right-hand side shall give the ratio X/R . A curve is then drawn so that a tangent drawn to it from $\tan A$ on the right will give $\cos A$ (i.e. V/E) on the left.

will reach the grid of the following valve at 50 cycles/sec.?

Low Note Loss.

From abac No. 7 we see that the impedance of this condenser at 50 cycles/sec. is 167,000 ohms. Hence $X=167,000$, $R=100,000$, and on joining these two and drawing a tangent to the curve from the point where this line meets the reference line, we get $V/E=0.513$. Evidently the low notes would suffer considerable loss: either R or C , or both, should be larger.

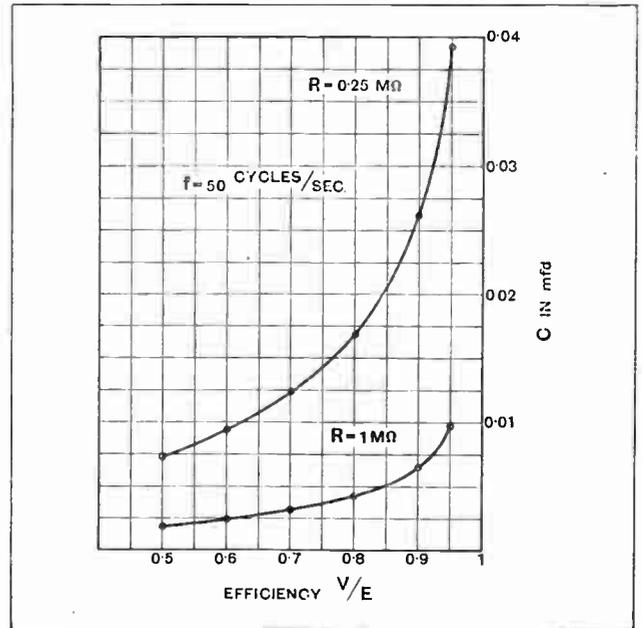
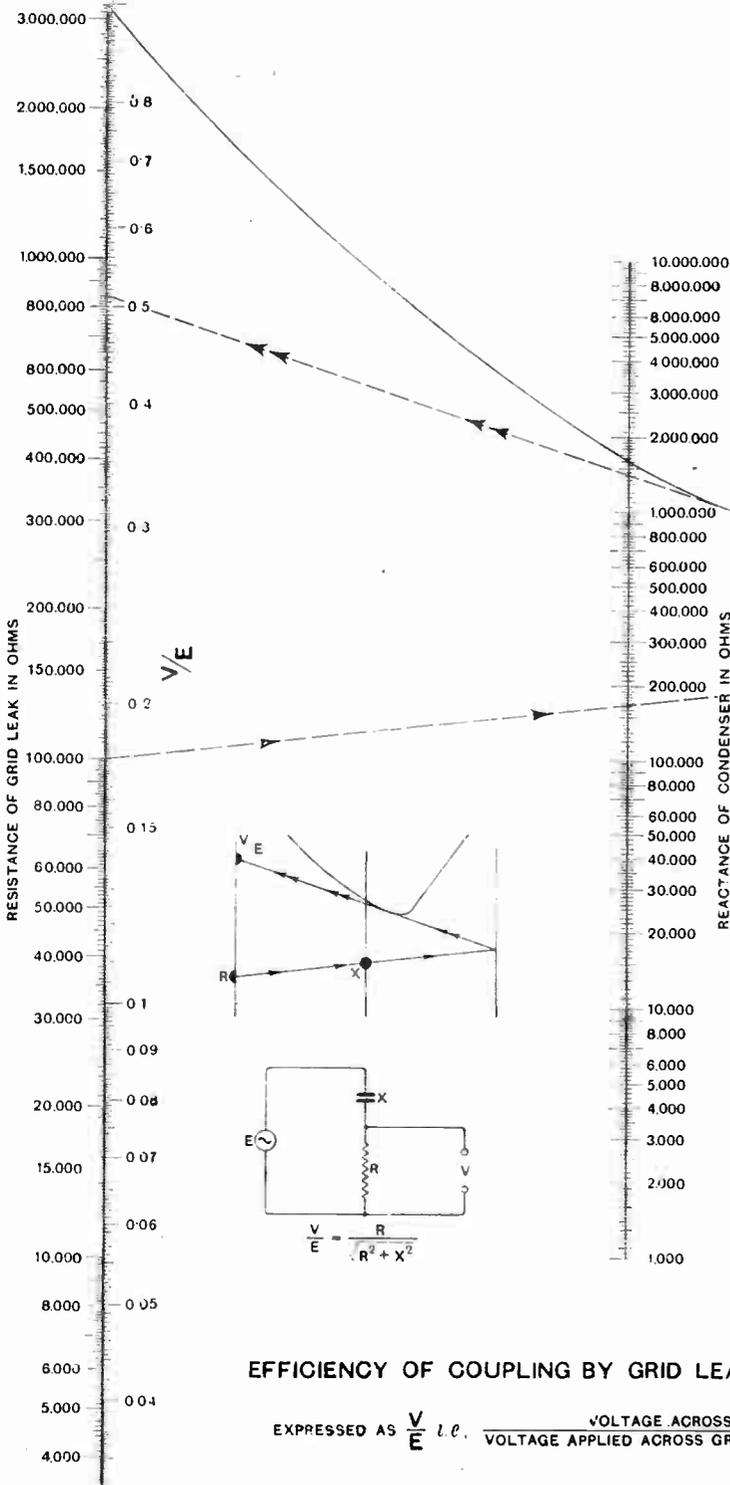


Fig. 3.—Curves showing how the efficiency of a coupling circuit changes as the grid capacity is varied.

From this abac, in conjunction with No. 7 (impedance of a condenser at audio-frequencies) it is easy to plot curves showing the relation between V/E and the grid capacity for different values of the grid leak: the frequency is taken as 50 cycles/sec. The curves show that 90 per cent. of the signal gets through to the grid for $R=1$ megohm, $C=0.0065$ mfd., or for $R=0.25$ megohm, $C=0.026$ mfd.

It is unwise to try for greater efficiency than this, for the use of larger leaks or condensers may give rise to blocking effects, of which details will be given in the next abac.—R. T. B.

At the end of the text associated with abac No. 14 in last week's issue a list was given of the useful data charts that have already appeared, together with the dates on which they were published.



LETTERS TO THE EDITOR.

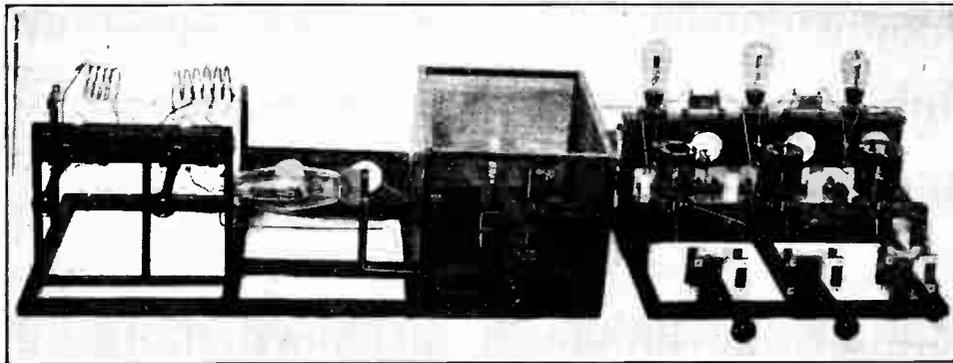
The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

LOUD SPEAKER ATTACK.

Sir,—According to recent correspondence in *The Wireless World*, it appears that at last the experts have realised the existence of "transients." It is to be hoped that microphones, amplifiers, transmitters and land lines will receive attention as well as the loud speaker. We have always understood that, so long as any piece of apparatus dealt uniformly with all frequencies the resulting output would be distortionless. It would be nice if the authorities concerned would state what happens in the case of shock excitation by sudden noises, such as drums, cymbals, and hand-clapping. Judging from general loud-speaker performance, the results are far from perfect.

Distortion is particularly noticeable with transients on any type of loud speaker, and seems to be caused by the natural resonances of the speaker being superposed on the sound to be reproduced. It is only necessary to tap a diaphragm to realise what a horrible noise is emitted whenever a really sudden whack comes along. Under working conditions transients of this nature must cause the speaker to make the output "diaphragmy," and this would appear to be the general effect in practice. It is likely that this accounts for the indistinctness in the bass in coil drives, where the reproduction of low-frequency transients is particularly bad. In the case of the reed drive, low-frequency transients have no chance at all, because there is no bass. From recent articles in *The Wireless World*, by Dr. McLachlan, we know that an improperly designed coil drive has serious low-frequency resonances which will be operative with every low-frequency transient, causing indistinctness and discordant notes.



The transmitting apparatus of Mr. J. W. Mathews (G6LL) who was successful in conducting the first British two-way communication on 10 metres with an American amateur station.

Surely it is absurd to utilise mechanical ingenuity to hustle a diaphragm having resonances whenever a transient is coming through. The suppression of resonances is the primary problem. An antidote for inertia is a secondary consideration and may be unnecessary.
London.

BRITISH AMATEURS BRIDGE ATLANTIC ON 10 METRES'

Sir,—I am pleased to be able to advise you that yesterday afternoon my station effected two-way communication with American stations 1A4D and 2BJD, using a wavelength of 10 metres. My test calls on 10 metres (my actual wave was 10.5 metres) at 1815 G.M.T. were answered by 1A4D, who reported my signals steady R5, and consistent two-way communication was maintained until 1940 G.M.T., when I connected with 2BJD.

The signals of 1A4D varied between R2 and R6, but

were steady and readily copied on two valves throughout the test.

My transmitter is quartz controlled from a 84.5-metre crystal through the usual frequency doubling stages, and the aerial used being double-wave horizontal voltage-fed supplied by short R.F. lines.

A message of greeting from RSGB to ARRL was passed and acknowledged.

I believe this is the first two-way 10-metre work between this country and U.S.A., and it is of interest to note that the G.P.O. has only this month issued permits to experimenters to use the 10-metre wave.
E. J. SIMMONDS.

West Drayton.

October 22nd, 1928.

Sir,—With further reference to my letter of 22nd inst. regarding 10-metre work, G6LL rang me up last night and informed me that he was in communication with an American station on 10 metres at approximately 1420 G.M.T. on the 21st, and he would thus antedate my 10-metre QSO by a few hours.

I am asking him to send you particulars. I understand he worked one U.S.A. station.
E. J. SIMMONDS.

West Drayton.

October 23rd, 1928.

Sir,—You will be interested to learn that 10-metre two-way contact with the U.S.A. was established on Sunday last at 1400 G.M.T., or soon after. The British station who was successful in hooking up with the States was G6LL, who has in all probability notified you direct.

There were at least three American stations audible on 10 metres on Sunday afternoon, and were received at my station at good strength. They were W2JN, who was in touch with G6LL, and W2AYR, who came in at strength R4-5, whilst the other, W2BDA, was even stronger.

I tried hard to effect contact with one of these three, but was unsuccessful, although my signals may have been heard on the other side by some other station.

The signals from the American stations were all of the R.A.C. type, whilst those of G6LL were pure D.C. with crystal control note.

R.A.C. type, whilst those of G6LL were pure D.C. with crystal control note.

Colliers Wood, S.W.19.

October 24th, 1928.

J. A. PARTRIDGE (G2KF).

Sir,—At 1430 G.M.T. on Sunday last W2JN was heard on 9.9 metres, calling CQ, at strength R5. On being called he replied, reporting signals from G6LL as being received at R6, and the following message was received:—"Congratulations on first 10-metre QSO between W and G."

Communication was maintained for an hour and three-quarters.

Signals were reported as fading from R6 to R3, and a reduction of power from 50 watts to 20 watts caused the signal strength to drop to R5.

The transmitter is shown in the accompanying photograph.
Clapton, E.5.

October 24th, 1928.

J. W. MATTHEWS (G6LL).

READERS' PROBLEMS

"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Changing a Resistance.

I understand that the anode resistance included in my R.C. coupling unit (which was obtained some time ago) has a value rather too high for good reproduction of the upper audible frequencies, and I should like to change it. Unfortunately, however, the various components of the unit are sealed with insulating compound in a moulded case, and it would seem to be impossible to obtain access to the interior. Is it practicable to connect another resistance externally?

F. T. T.

Yes, there should be no difficulty in using an external resistance. The H.T. + lead should be removed from the unit and connected to one end of the new resistance, the other end of which must be joined to the "plate" terminal of the unit, which will still be joined to the anode of the preceding valve. No other alterations are necessary.

Records and Radio.

I have so far been unable to obtain good results with a pick-up when the gramophone and wireless set are at opposite sides of the room, and presume that this trouble is due to the use of an extension lead about 18ft. in length. Can you suggest how the difficulty may be overcome?

T. E. M.

It is always unsatisfactory to connect a pick up to an amplifier by means of a long lead: if you do not wish to install the wireless set and gramophone side-by-side, we think that your best course is to use a pick-up transformer, which should be located near the receiver. This transformer should be of a design suitable for working in conjunction with the pick-up. As regards the choice of a suitable component, you should consult the makers of the latter instrument.

Bias for Screened Valves.

It seems that a slightly increased amplification is obtained from a screened grid H.F. valve if the bias applied to it is somewhat less than that of a single dry cell (1.5 volts). In the set I am building I should like to apply a bias of $\frac{2}{3}$ volt, if it is possible to do so without fitting a potentiometer. Can you suggest a plan?

C. E. G.

Assuming that you are using valves with a filament voltage rating equal to

that of the L.T. battery, we cannot think of any more convenient method of obtaining a bias of less than $1\frac{1}{2}$ volts than by the use of a potentiometer. It may be pointed out, however, that there is no need for continuous adjustment, and we think your needs would be adequately met by using a fixed resistance of some 200 ohms or more, with a few tapings. This could be made in compact form, and would be connected across the L.T. leads in the manner shown in Fig. 1.

In order to obtain the voltage you desire, it will be necessary to oppose the pressure of the bias battery by a suitable positive voltage picked up from the resistance. The potential drop along this resistance will be proportional to the length of wire in circuit, and, assuming

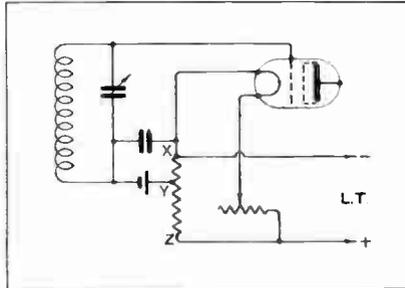


Fig. 1.—Obtaining intermediate grid bias voltages by means of a semi-fixed potentiometer.

RULES.

(1) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."

(2) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.

(3) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.

(4) Practical wiring plans cannot be supplied or considered.

(5) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

(6) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

that you are using a 4-volt L.T. battery, and wish to introduce a counter-E.M.F. of 0.75 volt, the tapping at Y (referring to the diagram) must be at a point which will include between X and Y slightly less than one-fifth of the total resistance between X and Z.

It is well to include a by-pass condenser of about 0.1 mfd. in the position shown.

o o o

H.F. in the L.F. Amplifier.

My set is a modification of the "All-Wave Four," and works well on the normal broadcast waveband. On the long waves, however, I have as yet been unable to obtain really satisfactory results; although the neutralising system seems to work properly, a "howl" is produced when the circuits are brought into tune, particularly if signals are coming in on this setting. Can you diagnose my trouble?

H. T. B.

We expect that the apparent instability on the long waves is due to the fact that H.F. voltages are being applied to the grid circuit of the first L.F. valve, and you should test the stopping resistance which was included in the original design in order to prevent this trouble. It seems quite likely that you will find it has a resistance value considerably lower than that at which it is rated. You might try the effect of connecting an H.F. choke in series with the resistance, but you should take care that it does not couple magnetically with the H.F. transformer.

o o o

Complicated Switching.

Now that switches seem to be widely used for changing wave ranges, I am wondering whether it would be possible to design a receiver to cover ultra-short, medium, and long waves without the need for changing coils. If you favour this plan, perhaps you would be good enough to give me a few suggestions.

W. G. S.

Although it is now a fairly easy matter to design a satisfactory receiver to cover two bands of wavelengths by means of a switch change-over, we think that there would be great difficulties in the way of devising a method of covering three bands, particularly when very high frequencies are included. In any case, we fear that the matter could not be discussed helpfully in the course of a letter.

Buzzer or Heterodyne?

I am thinking of making a buzzer wave-meter, but cannot decide whether this would be the most suitable kind for general use. Do you consider it preferable to the heterodyne type?

L. B. K.

It is rather difficult to give a definite answer to your query, as a good deal depends on the purpose to which a wave-meter is to be applied. If it is used as an aid to tuning, the buzzer type is almost certainly the better of the two, as its radiation can be picked up when the set is in a non-oscillating condition. Against this is the disadvantage that many buzzer wavemeters tune flatly, but this difficulty can be overcome; we think you would be well advised to read a description of an instrument of this type which appeared in our issue of August 3rd, 1927.

○○○○

Distortionless Detection.

Some time ago you published some circuit diagrams showing how a three-electrode valve could be used as a diode detector. Would it be possible to use this form of rectifier after a stage of transformer-coupled H.F. amplification, following it by a choke coupling to the L.F. amplifier?

R. S.

We assume that you are referring to the system of rectification in which the grid of an ordinary three-electrode valve

the earth terminal, with the result that the addition of an earth connection introduces a short-circuit across the mains.

It is quite possible that the set will work well with no other earth connection than that provided by the mains themselves, but if you are not satisfied with the results you can adopt one of two alternatives. The first is to connect a large condenser in the earth lead, and the second is to use an aerial-grid transformer with separate windings. In this latter case the low-potential end of the aerial coil must be connected only to the earth terminal and not to the filament circuit of the valve.

○○○○

A Fallible Rule.

I have in the past obtained a good deal of help from the simple rule with regard to grid bias values for amplifying valves (that the appropriate voltage is ascertained by dividing the H.T. voltage applied by twice the amplification factor of the valve). As far as some of the new valves are concerned, however, it does not seem to work out quite as well as before; am I correct in assuming that it no longer holds good?

F. E.

It must be remembered that the formula you quote is, after all, no more than a rule of thumb, and that it is not scientifically accurate. It is safe to say, however, that it is still helpful, even

good results, provided that signals are sufficiently strong. Of course, magnification will be much less than that obtainable from a pentode.

As your super-power valve is apparently capable of dealing with large inputs, we expect you will get best results (particularly from near-by stations) from anode-bend rectification, which is included as an alternative to the grid circuit method in the "Megavox" receiver.

○○○○

Another Use for the Crystal.

As it seems that the new directly heated A.C. valves do not work well as rectifiers, I am wondering whether it would be a good plan to use a crystal detector in conjunction with them. The set I have in mind would have an H.F. amplifying stage coupled to the crystal by means of a step-down tuned transformer (this was suggested in "The Wireless World" some time ago) and two L.F. amplifiers. Your comments on this circuit arrangement would be appreciated.

M. G. F.

Subject to the proviso that you use a really stable and reasonably sensitive crystal detector, we think that your proposed scheme has a good deal in its favour, but we should point out that selectivity, as far as the H.F. coupling is concerned, will not be of a very high order. In your locality this is not likely to be a serious disadvantage, and in any case matters can be improved in this respect by using, as an H.F. amplifier, a valve with a high impedance and a high amplification factor.

○○○○

A Way Out.

On account of interference from power circuits and electrical apparatus, I find it almost impossible at my present address to receive good signals except from my local station and the two Duventry transmitters; even these latter stations are heard through a background which is at times loud enough to be annoying. All the usual "cures" have been tried, but with no real success. Must I abandon all hopes of reasonably good distant reception, or can you suggest anything? Nothing very complicated or expensive, please.

H. L. P.

We sympathise with you in your difficulties, but fear that there is little we can do to help you, except to advise you to try a loosely coupled and separately tuned aerial circuit—if you have not already done so. This comparatively simple addition is often most beneficial.

Perhaps you would be well advised to concentrate on short-wave reception, and we would certainly suggest that you should give it a trial, particularly as this form of broadcasting now seems to be firmly established. Signals of these wavelengths are generally found to be less susceptible to interference from "man-made static" than are those in the normal bands.

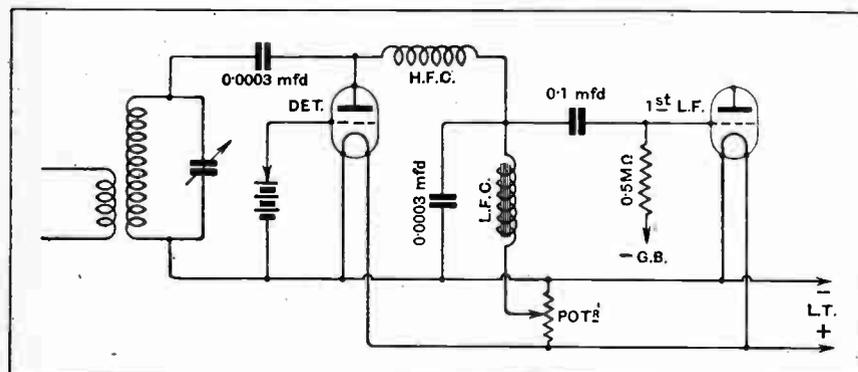


Fig. 2.—A diode detector with space charge neutralised by the application of a positive voltage to the grid.

is given a positive potential in order to neutralise the space charge, signal voltages being applied to the anode. This method can certainly be applied to an arrangement such as you describe; the connections are as shown in Fig. 2.

○○○○

Short-circuited Mains.

My receiver is fed with H.T. through a D.C. eliminator, and I find that the house-lighting fuses blow when the earth lead is joined to the apparatus. The set seems to work quite well without this connection, but I feel certain that something is wrong, and would welcome your advice.

W. S. J.

It seems that the positive side of your mains supply is earthed, and that the common H.T. and L.T. negative lead of the receiver is in metallic connection with

with modern valves having a high mutual conductance. When it was first devised the values given tended to err towards an excessively high figure; nowadays, the contrary is the case.

It should be added that the rule cannot be used for ascertaining the bias to be applied to pentode valves.

○○○○

Pentode or Triode.

Would it be permissible to use an ordinary super-power valve (which I already possess) in the "Megavox Three" receiver in place of a pentode? I have an ample H.T. supply, and the valve gives sufficient volume for my requirements when used in my present set.

D. M. V.

Yes, you could certainly use an ordinary triode as an output valve with

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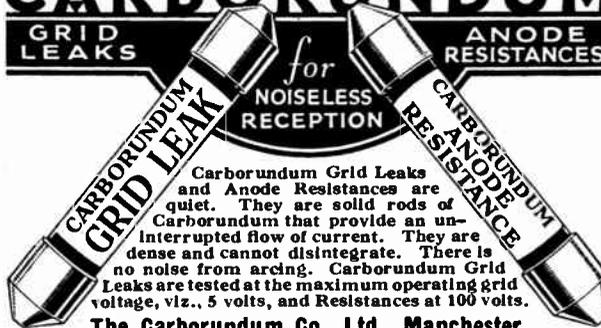
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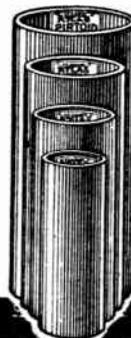
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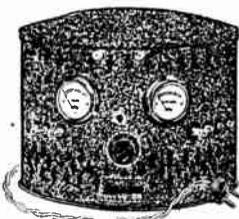
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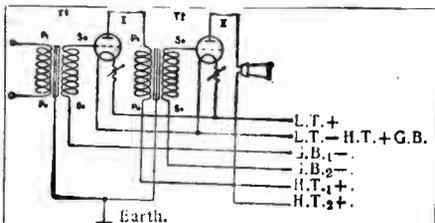
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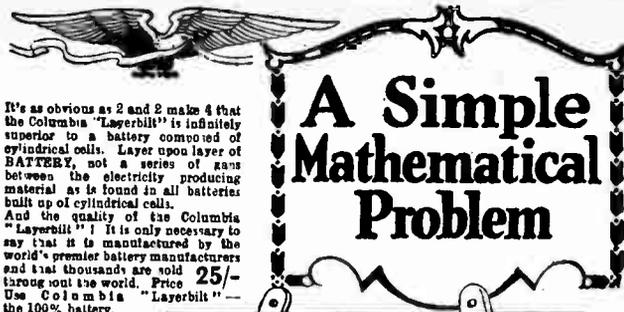
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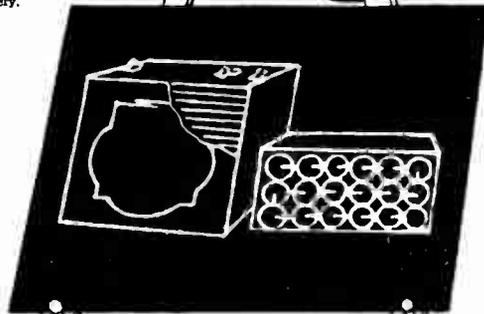
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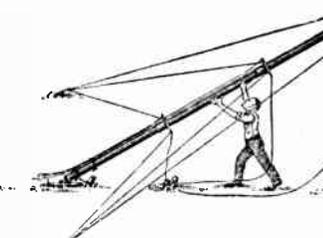
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READ and MORRIS, Ltd.—H.T. eliminators for D.C. mains, £4; for A.C. mains, £6/10; eliminator transformers from 15/-; full wave rectifier valves, 10/- 15

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READ and MORRIS, Ltd., for electrolytic condensers: we use them, have used them for 3 year liquid and dry; we test them all, but find Longton the best, capacity approximately 1,800 M.F., non liquid; price 12/6, as used in the famous L.T. unit 15

READ and MORRIS, Ltd., for moving coil loud-speakers; delivery from stock; also mains-operated receivers and amplifiers for same. Demonstration continually, service always. 15

READ and MORRIS, Ltd., undertake the design and construction of any type of radio apparatus. We make for the individual and guarantee results. I will pay you well to consult us before buying elsewhere. 15

READ and MORRIS, Ltd., have second-hand sets best makes only, at junk prices; Marconi V.2 50/-; voice amplifier, 30/-; Burndopt Ultra IV with Mark IV tuner, £10, original price £54. 15

READ and MORRIS, Ltd., 31, Eastcastle St. (facing back of Waring and Gillows's), Oxford St., W. 1515

SECOND-HAND Receivers, 1-8 valves, perfect; cheap; state requirements.—Coutts, Engineers, Horley. 1424

PHILIPS Three, new, will demonstrate: first offer P. £11/11.—Jones, 27, Woodberry Grove, Finchley, N.12. 1555

MARCONI 82 Type 8-valve Receiver, complete with 8 valves, ariel, and control box, in use under 2 months; £45; offers considered.—B. G. Holt, Pottersbury House, Northampton. 1580

MARK II Heterodyne Wavemeter, calibrated 470-3,200 metres, complete with Weston galvanometer, valve, H.T., and phones, guaranteed accurate; £3, or exchange H.T. accumulator.—Waller, 12, Barmby Av., Fulford, York. 1632

KILO-MAG 4 Screening Boxes, 27/6; set of 6 coils, 37/6; isolating resistances, 3/-.—Belwo. 1650

COMPLETE Set of Parts, valves, cone speaker, batteries, etc.; 2-valve £4/10, 3-valve £5/10.—Stott, 63, Syke Rd., Rochdale. 1650

5-VALVE Set, built specially for quality, 2 power valves in parallel, Weston milliammeter, Weston voltmeter, reads low tension and all high tensions, complete with coil drive speaker in cabinet, battery eliminator, 240 volts D.C., 6-volt accumulator, and valves; £30, or near offer; can be seen working.—Phone after 6 p.m.: Kingston 4368, or BM/SNF/6, London, W. 1628

ALL-WAVE 8-valve Superhet Ultradyne by Rothermel, very little used, perfect condition, complete with valves and leads; £15.—Box 8712, c/o The Wireless World. 1620

MCMICHAEL Short Wave Supersonic Set, as used for reception of Australian and American stations, will also work on 200-500 band; a bargain at 9 guineas.—Box 8713, c/o The Wireless World. 1621

Receivers for Sale.—Contd.

*OR Sale, McMichael 5-valve portable, 27 guineas model, in good condition; bargain, 17 guineas.—x 8711, c/o *The Wireless World*. [1619]

VALVE Cabinet Amplifier, 17/6; baseblock ditto, 14/6; 1v. amplifier, 7/6.—Gillespie, 78, Wemyss, Glasgow. [1618]

MARCONI 81 (Straight 8), as new; £17/10, with valves. [1618]

BURDEPT 4-valve Set, with valves and coils, £10; another, last season's model, as new, £12; all in od order and carriage paid.—James Scott and Co., Radio Engineers, Dunfermline. [10207]

JIMMONDS BROS.—Receivers constructed to any published design or to your individual requirements, guaranteed, workmanship, repairs, reconstructions, overhauls, modernisations.—Shirland Rd., Smithick. [19691]

MARCONI V2A Receiver, with 2 valves, Marconi 2-valve amplifier, with valves, offers together or separate; also condensers, R.A.C. units, cone unit, etc.; stamp, list.—Box 8759, c/o *The Wireless World*. [1727]

EVERYMAN Four Receiver, less cabinet, with Weston M.A., Geophone S.M. condensers, Perenti A.F.50 push-pull output transformer, 4 Marconi 10-volt valves and 2 D.E.A. power valves, as above; 8.—Radio, 114, Cavendish Rd., London, S.W.12. [1721]

W.W. Super Seven, an extremely sensitive and good set, in beautiful oak cabinet, carefully put together, complete with valves; £27.—Clayton, 22, Temple Row, Birmingham. [1716]

MARCONI Straight Eight, in perfect order, with valves and extra coils; £25, or nearest offer.—Stippier, Post Office, Marchwood, Southampton. [1685]

COSSOR Melody Maker, complete with valves, extras; £5. Cole, 10, Whitehall Park, Hightgate, N.19. [1684]

EVERYMAN Four, 4-volt valves, oak cabinet, only 6 months old; £9.—R. Page, Solihull, Warwickshire. [1683]

LONG Range Four Screened Coil Receiver, 250,2,000 metres, enclosed cabinet, bargain, £5/5; special model C12 multipay Celestion, £5/10.—Spink, 52, Brodric Rd., Wandsworth Common. [1682]

THE RECEPTE Co. were the first firm to specialise in building receivers to suit customers' own particular requirements, and their policy of building for the individual has amply justified itself; write for quotation, low prices and quick delivery; satisfaction guaranteed.

THE RECEPTE Co. also make a range of Standard Receivers which can be delivered from stock; write for particulars.

THE RECEPTE Co., 1, The Mall, Southgate, N.14. [1681]

HALCYON De Luxe Portable Five, absolutely unused; cost £34/13, sacrifice at £26/15.—Demonstrated anywhere by G. M., 19, Anson Rd., N.W.2. Willesden 0395. [1680]

WIRELESS is a Fascinating Subject, but makes heavy demands upon the purses of its devotees. For one who is determined to keep abreast of the times, there are always new components to be bought, and sets and loud-speakers to be superseded.

AT the Same Time, the would-be buyer is often deterred from buying because he knows that there will be still one more piece of apparatus left on his hands, to add to those already in the junk box.

WE Have Opportunities of disposing of semi-obsolete apparatus to those who are not fortunate enough to be able to afford the latest type, and will take such apparatus or components, providing they are in saleable condition, in part-exchange for any new set, loud-speaker or component required.

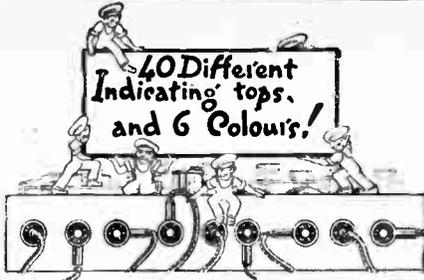
ALL We Ask is that You should Send Along a List of Your Old Apparatus, together with your new requirements, or, better still, send the apparatus to us to inspect, when we will make you a fair offer.

IF You Approve of this You can Send Your Remittance for the balance, and we will forward the apparatus required; if you have sent your old apparatus and you do not approve of our offer, we will return carriage paid.

THE Principal of this Firm, who has been a professional wireless engineer since 1910, and has been manager for the Sterling Telephone Co., radio expert to the General Electric Co., and Chairman of the Technical Committee of the National Association of Radio Manufacturers, will willingly give advice to those who are desirous of purchasing apparatus; we are entirely unbiased, and will recommend the best apparatus for your particular purpose; you save money by having genuine expert advice.

DON'T Forget We Will Take Your Old Receiver or Components in Part Exchange.

WE Will Also Build Any Sets to Specification (Marconi Royalties payable), and instal anywhere in the British Isles; sets modernised; send for estimate.—Scientific Development Co., 51, Fishergate, Preston. Tel.: 1364. [10226]



Here is another reason why **Eelex Treble-Duty Terminals** are different and better. 40 indicating tops to the Terminal can be obtained, all different wording, and six coloured tops for any special uses. By using coloured flex in conjunction with Eelex Treble-Duty Terminals the possibility of a wrong or accidental connection is minimised and you have the ideal "safety" system of connections.



are nickel-plated and hold securely spade, plug, pin, eye, or just plain wires—4½d. each. With plain top only, 3d. each.



Spades, plugs, pins and eyes as above with coloured insulated sleeves, 2d. each.

EELEX MOISTURE-RETAINING EARTH

The world's finest earth—as it collects and holds all the available moisture. As illustrated, with 9 ft. of rubber-covered wire and connector, 5/6, postage 9d.; or plain earth bowl, with 6 ft. copper wire and connector, 5/—, postage 9d.

Write for the new EELEX gnomes **BOOKLET X64**, free on application.



J. J. EASTICK & SONS,
Eelex Buildings, Bunhill Row,
Chiswell Street, London, E.C.1.
Phone: Clerkenwell 9282-3-4.

Receivers for Sale.—Contd.

SCOTT SESSIONS for Megavox 3 and Latest Circuit; read advertisement under Miscellaneous column. [1726]

OWING to Dealers:—

RALEIGH P.M. 5-valve.

BOWYER-LOWE Super Het, 8-valve.

GODWINEX Portable V.

CHEAP.

WARMSLEY, 40, Ainsworth St., Blackburn. [1718]

NEW 8-valve Super Het, Mullard Collingwood, 6-volt valves, £15; improved Sololyne, switching, 3 or 5 valves, long and port wave, 6 volt valves, best components, £8; Roadside Four portable, new, in oak case, £10, complete; Marconi 4-valve set, £3.—Coppin, Garage, Sylva Court, Putney Heath. [1678]

BATTERIES.

WET H.T. Batteries.—Parts per dozen: Jars, 2¼x 1½ square, 1/3; zincs, 11d.; sacs, 1/2 dozen; dozen cells (18 volts), complete with bands and electrolyte, 4/3, post 9d.; high efficiency, long life, self-charging, upkeep small; send 6d. for sample unit; illustrated booklet free; carriage free orders 10/-; write for free list wireless bargains; trade supplied.—W. Taylor, 57, Studley Rd., Stockwell, London. [10039]

C.D.E.S. Accumulator Charging Service.—Collection and delivery in 5 mile radius of Croydon; send for particulars to Croydon and District Electric Service, Dept. W., 98, Cherry Orchard Rd., Croydon. [1009]

BATTERIES.—Power doubled, capacity doubled, size doubled, but price halved; these advantages can only be obtained by dealing direct with the manufacturers, who offer 66-volt double capacity batteries at 7/6 each, 115-volt at 12/- each, all carriage paid and delivered against cash with order, or e.o.d.; these batteries are guaranteed British throughout and freshly made which ensures you getting 100% life and consequent, efficient reception; you haven't heard perfect reproduction until your set has been fed with a Ford battery, and these can only be obtained direct from the work of Ford and Co., Ford Battery Works, New Rd., Ponders End, Enfield. [1361]

WET H.T. Replacements.—Sacs (capped or uncapped), highest grade, No. 1, 10d. per doz.; No. 2, 1/9 per doz.—See below.

ZINCS.—Best quality (wired), No. 1, 8d. per doz.; No. 2, 9d. per doz.; orders valued 5/- carriage paid, otherwise 6d. for postage.—British Battery Co., Clarendon Rd., Watford, Herts. [10258]

BATTERIES Direct, a saving of 40%.—60-volt, 6/3; 108-volt 10/11; postage 9d. and 1/- respectively; British throughout and fully guaranteed; super and triple capacity also stocked.—The Johnson Electric Co., Dept. W.W., 86, Great Portland St., W.1. [1074]

TWO C.A.V. Wet H.T. 30-volt Units for 15/—119, Choumert Rd., S.E.15. [1631]

PLATINAT Patented Non-sal-ammoniac H.T. Dry Batteries, will outlast any make at present known to you, the only standard small cell type battery taking 20 mill. amp. discharge without fear of collapse, therefore suitable for new Pentode valve and multiple valve sets, no corrosion of zinc cells, no drying up of cells, no internal self-discharge or self-destruction, hence abnormal storage capacity, infinitesimally small internal resistance resulting in purest reception, astonishing recuperative powers; prices, 60 volts 9/6, in 100 volts 15/6 each, post free U.K., from sole distributors.—A. M. E. Sherwood, 68, Hatton Garden, London, E.C.1. Trade supplied, heavy and extra heavy duty taking 40 and 60 m.a. ready December. [1714]

CHARGERS AND ELIMINATORS.

RUNBAKEN H.T. and L.T. Chargers for A.C. and D.C. you may try 14 days.—Ardwick, Manchester, and 39, Victoria St., London, S.W.1. [10222]

TANTALUM and Lithium for A.C. Rectifiers; make up your own inexpensive chargers; blue prints for H.T. and L.T. Lithium electrodes fitted with terminals 2-3 amps. and 5-8 amps.—Blackwell's Metallurgical Works, Ltd., Liverpool. [19503]

ELIMINATOR Kit, comprising mains transformer, full wave output, 200 volts 30 milliamps., 32 heavy choke, 2 4mf. condensers, 500 volts, test, variable potential divider, valve holder, 0/50 milliammeter and base board; price £3; other outputs at slight extra cost; state mains voltage when ordering.—H. Goodwin, Woodcock Hill, Elstree. [10257]

ELIMINATEL Eliminators for A.C. and D.C. Mains, to pass 100 milliamps., 5 models, the eliminator you require for moving coil speakers; write for lists and full particulars; trade orders given special attention.—Stott, Clare Hill, Huddersfield. [1438]

ELECTROLYTIC Condensers.—For these go to the specialists, Read and Morris, Ltd., 31, Eastcastle St., London W.1. [1520]

We announce to-day a **REDUCTION IN PRICES** of our Radio Products because of increased output.

Ask for Particulars.

Anode and Filament Supply for

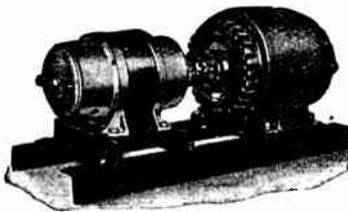
Transmission, Reception and L.F. Amplification:—
Public Address Systems, Gramophone Amplifiers & Band Repeater Equipment.

M-L Anode Converters, Rotary Transformers and Motor Generator Sets. ROTARY TRANSFORMERS

Input 12 to 250 v. D.C.
Output to 1,000 v. 100 w.

MOTOR GENERATORS

Input A.C. or D.C.
Output to 170 w. H.T., or 80 w. H.T. & 80 w. L.T.
Efficient. Silent. Ripple-free.



M-L MAGNETO SYND. Ltd., Radio Dept., COVENTRY
(Phone: 5001.)



Chargers and Eliminators.—Contd.

CHARGERS! Patent "Nocost" L.T. battery chargers; variable 1/2 amp. to 5 amps. D.C.; any voltage; guaranteed 3 years; 2/1; each, complete with instructions (trade discount); carriage free.—Robin Hood Electrical Co., Sole Makers, Prinrose Lane, Birmingham. [1356]

VARTA Charger. 220v. 50c. L.T. 2 to 6 volts. 1.3 amp. H.T. 60 to 120 volts 80-55 millamps. and 180v. H.T. Varta accumulators; £4/10.—74, Southdown Rd., Wimbledon. [1627]

TRANSFORMERS, chokes, etc., guaranteed, wound to any specification; phone for quotation. Kirby (Wimbledon) Ltd., 72, Merton Rd., Wimbledon, S.W. Tel.: Wimbledon 2814. [8987]

L.T. Eliminator Parts.—Complete set Stedipower mains; transformer, 200-250 volts, 2 chokes, Westinghouse A3 metal rectifier, condenser for 2, 4 or 6 volt valves at 1 amp., lot 65/-. or separate; H.T. eliminator parts; Marconi power choke, 15/-.; Marconi mains transformer, model C, 20/-; U5 valve, 10/-; Osram U8 valve, 15/-; R.I. power transformer, 230-250 volts output, 375 volts C.T., 100 ma., 7.5 volts C.T., 5.5 volts C.T., new, 40/-; 2 Marconi K.H.1 valves, 10/- each; Cosmos A.C. valves, 10/- each; Westinghouse H.T. eliminator parts; Metal rectifier, 200 volts 100 ma., mains transformer, Marconi choke, 6mf. Hydra condenser complete, 80/-, or separate; Weston model, 30/-; ebonite case voltmeter, 0-400, with resistance box, as new, 40/-.—Radio, 114, Cavendish Rd., London, S.W.12. [1723]

MARCONI Mains Transformer, 110-120 or 220-240 primary, 160-0-160 secondary, and rectifier filament winding, suitable for U5 or 2 U4 valves, maximum output 50 millamps., perfect condition, owner increasing voltage of eliminator; 25/-.—Toulmin, Garthrigg, Broughton, Preston. [1700]

EFESCA H.T. Eliminator for D.C. Mains, grid bias tappings, perfect condition, cost £4/5, must sell; £2/5 or nearest offer.—Flint, 13, Corporation St., Stafford. [1701]

TRANSFORMERS and Chokes for H.T. and L.T. Eliminators, half wave transformer, input any voltage from 100 to 250 v., secondary 200 volts at 25 ma., filament 6 v. 1 amp., 25/-; half wave choke, 18/6; transformers and chokes for extra heavy duty eliminators.—Messrs. Chester Bros., 244, Dalston Lane, London, E.8. [1702]

CABINETS.

ARTCRAFT Radio Cabinets are Britain's Best Value; satisfaction guaranteed

ARTCRAFT Cabinets, made in oak and mahogany; from 8/- to £6.

ARTCRAFT Cabinets can be made to customers' special designs and sizes; estimates free.

ARTCRAFT Illustrated Catalogue, post free; write now.

ARTCRAFT Co., 156, Cherry Orchard Rd., Croydon. Phone: 1981 Croydon. [0040]

CABINETS.—First class goods at competitive prices; send for lists.—Gilbert, Cabinet Maker, Swindon. [9833]

DIGBY'S Cabinets.—Table models in solid oak and mahogany; from 11/6 to 71/-. [9833]

DIGBY'S Cabinets, fitted with Radion or Resiston ebonite if required.

DIGBY'S Cabinets.—Pedestal model, with separate battery compartment; from 56/- to £12.

DIGBY'S Cabinets Made to Customers' own Designs.

DIGBY'S Cabinets.—Write for new 16-page art catalogue.—F. Digby, 9, The Oval, Hlackney Rd., E.2. Phone: Bishopsgate 6453. [0128]

RAMSEY for Distinctive Cabinets.—Portable cabinets, cone speaker cabinets, moving coil cabinets, radio-gramophone cabinets; call and inspect.—Illustrated folder free from F. W. Ramsey, 63, Shaftesbury St., London, N.1. Tel.: Clerkenwell 7139. [1315]

SPECIAL Cabinets.—Any design quickly made, pedestal cabinets battery tanks, etc.; satisfaction guaranteed.—Reginald Nichols, Bath Rd. Workshops, Swindon. [1120]

LARGE Wireless Cabinets, latest 1929 models, handsome design in figured oak, 40in. high, 25 1/2in. wide, 17 1/2in. deep, to take your set, batteries, and moving coil or cone speaker, removable fret; high grade cabinets of superior finish; buy direct from factory and save middle men's profits; price 75/-, carriage paid, write for illustration.—Thos. Eastham (Dept. 5), Electric Cabinet Works, Thornton, Blackpool. [1592]

METAL Cabinets for the New Cossor Set, complete with screen and baseboard; 16/- each, post free.—The Compton Manufacturing Co., 40, Compton Rd., Canonbury, London, N.1. [1635]

SIMMONDS BROS.—Cabinets for sets and loudspeakers in oak and mahogany; your own ideas carried out; best materials and workmanship.—Shireland Rd., Smethwick. [9692]

FREEMAN and **JOHNSON.**—Anything wood for wireless, cabinets, speakers, etc.; keen prices.—179a, Deritend, Birmingham. [1659]



"Resiston" panels come to you like this—each in a sealed envelope, squared-up and cut dead to size.

Guess-work eliminated.

A "Resiston" panel is cut squarely size, with its edges accurately ground, surface beautifully polished, packed carefully in a stout manilla envelope. No waste—either in time or material—you buy exactly the size you need. There are sixteen sizes from which to make your choice.

Send for new booklet to-day.

Please send me, free, a copy of your new booklet, "7 Panel Makes all the Difference." "W.W." Nov.

NAME

ADDRESS



American Hard Rubber Co., Ltd., 13a, Fore St., E.C. 6. [030]

The BROWNIE "POPULAR" Transformer



9/6

THE Brownie 'Popular' has been designed to meet the public demand for a general purpose transformer giving really good reproduction suitable for inclusion in home-constructed sets.

The remarkable results obtained on these "Popular" transformers are made possible by very careful attention to the windings and preparation of the core. The magnetic field is composed of special laminations of the softest iron procurable, and the accuracy of the windings on their moulded bobbins gives a resonance and reproduction unequalled by transformers costing twice the price.

The BROWNIE WIRELESS COMPANY (G.B.), LTD., Dept. 22, Nelson St. Works, London, N.W.1

Cabinets.—Contd.

NASTLE Radio Cabinets for the New Cosmor Melody Maker, Musio Magnet, Master Three, etc.; our sw list No. 37W is now ready, post free on application.—E. Farnell and Sons, Birkenshaw, near Bradford. [1709]

ABSOLUTELY the Finest Value Obtainable, direct from manufacturers to user, on 14 days' approval.—Moving coil loud-speaker cabinets, suitable for all the leading makes; in polished mahogany 27/6, 2 polished oak 26/-; think what this means to you!—M.C. Cabinet Co., 36, Anerley Station Rd., London, S.E.20. [1708]

CABINETS in Hand Polished Oak, 18x7 or 21x7, 17/6; mahogany, 21/-; cone speaker cabinets, oak 20/-, mahogany 25/-; carriage paid.—H. Horrobin, 39, Coiser St., Dudley. [1707]

COILS, TRANSFORMERS, ETC.

PENTODE—Star Engineering, Didsbury, Manchester are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Parne: Didsbury 1785. [1335]

B. & J.—All "Wireless World" coils from stock.

B. & J.—Megavox Three coils; see displayed advert.

B. & J. Guarantee Every Coil under Money Back Conditions.

B. & J. All-British Super Four Portable, employing the Mullard pentode valve; £18/10, plus the new cone of royalties.

B. & J. WIRELESS Co., 2, Athelstano Mews, N.4. [0043]

1929 Cos-or Melody Maker Coils to Specification: short wave, 15/- pair; long wave, 17/- pair.—Hall, 91, Fore St., Edmonton, N.18. [1331]

EVERYMAN Coils, exact to specification, 15/- each; 2 H.F., complete set and bases, 63/-; Selection 4, complete set and bases, 42/-.—Jennicus.

EVERYMAN Coils, approved plug in type, set of 2 low wave and 2 high wave, with bases; 72/6.—Jennicus.

LITZ Wire (genuine), 27/42, 70 turns, 4/8; tubes and Mikapac, 3in. x 3 1/2 in. 1/4, 3in. x 4in. 1/6, 7in. x 4in. 2/-.—Jennicus.

EVERYMAN Coil, ebonite bases, 1/6 each, screws. 3/-; spacers, grooved, with screws, acid or anode, 1/-; all wave, short, 1/-; long, 2/6.—Jennicus Radio, 30 Chapel St., Birmingham. [0075]

COILS—New All-wave Four, Regional Three, A.C. Three, short wave with bases, 35/-; long wave coils only, 40/-; above are Litz wound, long wave coils wound with 28 D.C.C., 27/- per pair; all tested and guaranteed.—Redgwell New Rd., Rayne, near Braintree, Essex. [1558]

MOVING Coils for Coil Driven Loud-speakers, wound to customer's requirements; trade enquiries invited.—Amalgamated Manufacturers, Aston Rd., Birmingham. [1559]

SUPERIET Transformers by Burndept, and oscillator; £2/10 the lot.—Dunn, 15, Sedgeford Rd., W.12. Museum 5126. [1617]

BERCLIF Coils, the standard of excellence, the best at Olympia leading all the time.

MEGAVOX Coils and Base, 33/-; screen, 7/6; resistance, 2/-; Two-Range Four, set of coils ready for mounting 67/6; Switch-Over Three, set of coils, 65/6.

NEW All Wave Four.—Berclif, standard coils; 77/9 the set.

SCREENED Grid Everyman Four.—Interchangeable long and medium waves, no wiring alterations, complete set £4, or L.W. coils and bases only, 44/-; conversion present coils, 10/6.

EVERYMAN FOUR Coils; 3/- pair.

EVERYMAN FOUR Conversion, L.W. coils and bases, with wiring diagram, 43/3; conversion present coils, 9/6

BERCLIF H.F. Choke spaced air wound, graduated windings, covers 10 to 2,000 metres; 8/6.

BERCLIF Coils for all "Wireless World" Receivers, all popular types in regular production, special coils to your special needs.

BERCLIF London Depot:—Appleby's, 44, Chapel St., W.1. [1258]

SIMMONDS BROS., Shireland Rd., Smethwick.

COSSOR Coils, a few surplus ones, wound silk wire, with terminals worth 7/6, 5/6 each.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1652]

L.F. TRANSFORMERS, ratio 1 to 5 and 1 to 3; honestly worth 12/6, sell for 6/6 each.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1654]

100% efficiency

PRICE: **6/6** HIGH OR LOW RESISTANCE.



Look into this new and improved "SELECO" moving coil. The last word in moving coils produced by

BAKER'S 'selhurst' RADIO

the leading manufacturers of moving coil Loud Speaker Components. This new coil has all the advantages of the copper strip coil described recently in "The Wireless World" with many entirely new improvements.

THIS NEW "SELECO" COIL IS WOUND ON A FORMER ONLY .003" THICK, yet it is positively rigid and truly circular.

THIS NEW "SELECO" COIL will vastly improve the results obtainable from any Moving Coil Loud Speaker.

THIS NEW "SELECO" COIL is light and strong.

THIS NEW "SELECO" COIL is easily attached to the cone.

THIS NEW "SELECO" COIL will impart a brilliancy to your reproduction that will prove a genuine revelation.

THIS NEW "SELECO" COIL has no equal to day on the market.

SEND FOR FREE 36-PAGE BOOKLET: "A New Hobby." — A Postcard will do.

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Offices: 89, SELHURST RD., S. NORWOOD, S.E.25.

Works: (Always Open) 42, CHERRY ORCHARD ROAD, E. CROYDON

DYNAMOS, ETC.

WEST HOUSE Motor Generator, 30 volts to 45C to 100 milliamps; £4.—22, West St., Huntingdon. [1644]

GENERATOR, Evershed 600v., 30 m.a. (almost new, not Disposal Board), direct coupled to Crypto 1/4 h.p. motor (D.C. 240v.), run only 2 hours, both perfect; £8.—Capt. W. H. Lloyd (5TV), 27, Copthall Gardens, Twickenham, Middlesex. [1717]

GRAMOPHONE PICK-UPS, ETC.

KUSHA Pick-up Arm, weight regulating, angle and length now adaptable to ensure best tracking in either limited or liberal space.

KUSHA Pick-up Arm for all Pick-ups, grooved below for concealment of leads.

KUSHA Pick-up Arm, swivelled 8in. from pick-up, thus avoiding harsh riding of needle, vibration and scratch, perfectly free in movement.

KUSHA Pick-up Arm is kind as a cushion to your records.

KUSHA Pick-up Arm ensures cushy job and long life for your records.

KUSHA Pick-up Arm, highest class British die-cast production.

KUSHA Pick-up Arm, adaptable; 15/6 (mail only), from R. H. Glasscoe, 3 and 4, Water Lane, E.C.3, or from principal factors. [1713]

B.T.H. Electric Gramophone Motor Resistance Box, any voltage, A.C. or D.C., complete with turntable, new, cost 45/6, accept 80/-; B.T.H. pick-up and balanced tone arm, 28/-; Igranite Phono pick-up, 10/-; Dubilier, 10/-.—Radio, 114, Cavendish Rd., London, S.W.12. [1722]

LOUD-SPEAKERS.

GOODMANS Can Give Prompt Delivery of Moving Coil Units; the lowest prices consistent with highest possible grade workmanship; list MC3 on request.—Goodmans, 27, Farringdon St., E.C.4. [0069]

BAKER'S SELHURST RADIO—Write for free 40-page booklet, The New Hobby, full of information for moving coil speaker enthusiasts, free. [0231]

If You are in London Call and See Goodmans' Coil Drive and Reed Units before purchasing elsewhere.—Goodmans, 27, Farringdon St., E.C.4. [0090]

AIR-CHROME Type Speaker Parts to build the speaker that has taken America by storm can be obtained from Components Production Co., Honeley, Huddersfield. Send for list. [0130]

COIL Drive Units from Stock, the usual high standard of workmanship associated with the name of Goodmans, 27, Farringdon St., E.C.4. [0091]

BAKER'S SELHURST RADIO—Write for free 40-page booklet, The New Hobby, full of information for moving coil speaker enthusiasts, free. [0232]

REED Movements.—Double acting reed movements specially designed to operate cone and other large diaphragms extremely sensitive on small input, yet capable of enormous volume with sufficient input; will work up to 5ft. cone with ease; no rattle or distortion; 27/6 each, but allowance on Brown A. cones, or Lassenols and other units in part exchange; send stamp for illustrated lists of these and seamless cones.—Goodmans, 27, Farringdon St., E.C.4. [0068]

AIR-CHROME Type Loud-speakers Parts, as described in the June 6th issue of this paper, can be obtained from Components Production Co., Honeley, Huddersfield. Send for list. [0129]

BAKER'S SELHURST RADIO—Write for free 40-page booklet, The New Hobby, full of information for moving coil speaker enthusiasts, free. [0236]

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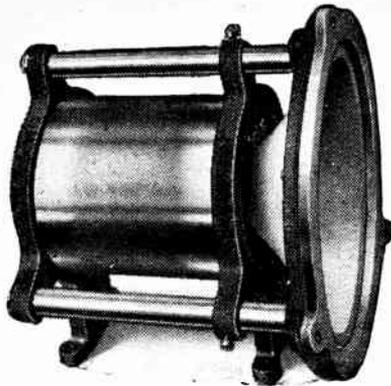
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The New Junior

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Loud-speakers.—Contd.

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MOVING COIL Loud-speaker Parts of Quality are made and fully guaranteed by Components Production Co., Honley, Huddersfield. Send for lists. [0149]

THE New Goodman Junior Reed Movement: 14/6; the finest unit, at anywhere near the price, for driving cone and other large disc type speakers; this unit should not be confused with converted earpieces or gramophone attachments; second only in efficiency and performance to our double acting reed movement; full description in our illustrated lists, free on request.—Goodmans, 27, Farringdon St., E.C.4. [0092]

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VIBRO-SKIN, special leather for fixing the diaphragm of the moving coil loud-speaker; price 2/6 per piece 11in. square, 2/- per piece 9in. square, post free, cash with order; special terms to the trade The Alder Leather Co., 3, Southwark St., S.E.1. Tel.: Hop 4448. [0224]

AIR-CHROME Type Loud-speakers Give Wonderful Results, and, with the assistance of a screw-driver and hammer, can be easily built from parts supplied by Components Production Co., Honley, Huddersfield. Send for list [0151]

PENTODE.—Star Engineering, Didsbury, Manchester, are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1336]

BAKER'S SELHURST RADIO.—Write for free 40-page booklet, The New Hobby, full of information for moving coil speaker enthusiasts, free. [0237]

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WRITE for Appointment to Hear My New Loud Speaker, which is the only one in existence that reproduces naturally; no resonance whatever; one type only, one price only.—Colato, 33, Edgware Rd., W. [1536]

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ALTON Coil-drive Speaker Outfits and Components, the lightest cone-unit ever produced with narrow gap and special centring device, give greatest efficiency with meagre field current, windings for 6-volts or mains, the Alton design definitely supercedes most other makes, and challenges comparison; send for list.—Rushton, 50, Humber Rd., Wolverhampton. [1556]

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BLUE SPOT Loud-speaker Units (2): cost 21/- and 25/-, guaranteed now, sacrifice 17/6 and 20/-.—Wilson, 44 Douglas Rd., Handsworth, Birmingham. [1658]

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VORTEXION Moving Coil Speaker Parts, any voltage, pots supplied, wound or unwound, guaranteed.—Kirby (Wimbledon), Ltd., 72, Merton Rd., Wimbledon, S.W. Tel.: Wimbledon 2814. [8986]

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YOUR Old Loud-speaker Taken in Part Payment for the latest type, see our advert. under column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0227]

SUPERIOR Loud-speaker Cone Unit, excellent tone, worth 21/-, sell 10/6; another, 9/6.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1653]

GOODMAN'S Moving Coil 6v. Speaker, complete with filter circuit; £2.—Forsyth, Netherlaw, Farington. [1641]

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Loud-speakers.—Contd.

BAKER'S SELHURST RADIO.—Write for free 40-page booklet, The New Hobby, full of information on moving coil speaker enthusiasts, free. [0240]

MAGNAVON Moving Coil Speaker, 6 volt ¼ amp., 90/- good condition; Magnavox M7K balanced magnet speaker, as new, 35/-;—Radio, 114, Cavendish Rd., London, S.W.12 [1723]

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POCH Moving Coil Parts, all models.—Trade enquiries must be addressed to the manufacturers, Poch Radio Manufacturing Co., Ltd., 53, Gracechurch St. (1st floor). Phone. Royal 4135. [1496]

BAKER'S SELHURST RADIO.—Write for free 40-page booklet, The New Hobby, full of information on moving coil speaker enthusiasts, free. [0241]

MAKE Your Coil Driven or Cone Speaker a Success; use the cone paper that speaks for itself. See below.

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M.P.A. Table Cabinet Model, £5/5, new; Mullard type E, £3/5, new; half price.—W. Wadsworth, Central Buildings, Steeton, nr. Keighley. [1687]

VALVES.

PENTODE.—Star Engineering, Didsbury, Manchester, are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1337]

THREE I.S.S.A Valves for sale, 1 new, 10/-, 2 recently tested O.K. by Marconi, 7/6 each, 22/6 the lot; all in perfect order.—A. T. Royer, 10, Parolles Rd., Higgiate, N.19 [1699]

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ARE used by "The Wireless World" because they offer definite advantages, such as a power amplifier for concert hall work, which only requires 60 volts H.T.

A.P. Four Electrode Valves

REQUIRE half the H.T. Needed for three electrode valves; the money saved in one year on three H.T. batteries pays for an A.P. valve.

A.P. Four Electrode Valves

ARE a Very Comprehensive Range, and include a type for every position; they can be used in conjunction with existing three electrode valves; they do not necessitate alteration to set wiring or require special batteries.

A.P. Four Electrode Valves

INCLUDE the Ideal Super Output Valve, I.S.680, which dissipates 10 watts at only 200 H.T.—half the usual voltage, "g" = 3.0, mm=3.0, R_a=1,000 ohms; the valve is perfect for big amplifiers and low power transmitters.

A.P. Four Electrode Valves

INCLUDE the Unique Triple Purpose A.P. 412 Screen Grid, with its amplification of 110; for non-neutralised H.F. amplification, improved anode bend detection (due to its exceptionally sharp characteristic) and super B.O. I.F. amplification.

THE A.P. Screen Grid is a Superb Valve for both Reinartz and Hartley Circuits; it is as good as two valves, and admirably makes up for the absent H.F. stage; the valve has the advantage of a standard 4-pin base.

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WE are so sure of A.P. Valves that we will send you the type required on 3 clear days' approval against cash order, and will accept risk in transit.

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SOME time ago I went to my Dealer in a state of perplexity. Edwards used H.T. Accumulators, and swore by them; Ridley on the other hand pinned his faith to a Mains Unit. Both of them were inclined to be superior when meeting me.

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VALVES, 2-volt.—Set of 3 low consumption G.P., E.C., and power, unused, a sacrifice for 15/6; and 3 Cleartron valves, same type, 14/-—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1657]

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COMPONENTS for Any Set Sent Anywhere.—Consult E. D. Armitage, 12, St. Domingo Grove, Everton, Liverpool. [9923]

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FRONTE Cutlines, all usable pieces, 7th. parcel; £4 6, post paid.—James Scott and Co., Radio Engineers, Dunfermline. [0225]

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FRETTED Fronts for Loud-speakers, 14in. Lyre pattern, 1/9, polished 2/3; speaker cabinets, 14in. 7/-, polished 9/6; gold tinsel, first quality, 1/- square foot; loud-speakers, 14in. cabinet, with Blue Spot cone unit, £1/7/6; special bargain, wood cut to size for 14in. speaker cabinet, including fretted front, in mahogany, 3/11; special paper for cone making, 9d.—Warrick, 16, Berther Rd., Hornchurch, Essex. [1525]

WIRELESS Apparatus and Parts, large selection.—Frith, 6, Cambridge Rd., Crosby, Liverpool. [1510]

WHAT More Do You Want?—The Matlock Radio Manufacturers can supply the components for any "Wireless World" circuit, build, overhaul, or repair your set, and guarantee results; expert staff who specialise in "Wireless World" sets, Megavox, Pentode Two, and Everman sets.

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EXCEPTIONAL but Genuine Offer of First Class Precision Condensers, 4/5 and 3/2, S.I.F. or Mid-Log, guaranteed accurate; absolutely new indicating push-pull switch, 1/-; improved spade terminals, 7 colours, 14d. 1/- doz.; detectors, 1/4; descriptive list of 1929 components on request; orders value 4/- post paid; cash with order.—F. Widdowson, 144, Trinity St., Gainsborough. [1638]

EXPERIMENTER'S Surplus.—Coils, condensers, etc.; stamp for list; bargains.—Box 8717, c/o The Wireless World. [1634]

PARTS for 2-valve Set, including oak cabinet and baseboard, to take a 3-valve set, and coils, but less transformer, 35/-, carriage extra; R.I. anode reactance, 200-4,000 metres, 10/6; 2 Iccwex 6-pin H.F. transformers and bases, 6/- each; P.M.5 valve, 6/-; 3 rheostats, 1/- each; Igranite 5-1 I.F. transformer, 7/6; all bargain.—King, 25, The Avenue, Eastbourne. [1626]

WAVEMETER, accurate, 200-500 m., lowloss coils, 10-250 m. Igranite Xios coils, Newton H.T. generator, Zenith power choke, 30-watt T.V.T., as new; details on enquiry.—F. Brockbank, 51, Palatine Rd., Withington, Manchester. [1624]

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K.H.O-MAG Four Screen Boxes, made out of hard polished copper sheets exactly to specification; price 25/- net, cash with order.—Rigby and Woolfenden, Sheet Metal Workers, Rochdale. [1614]

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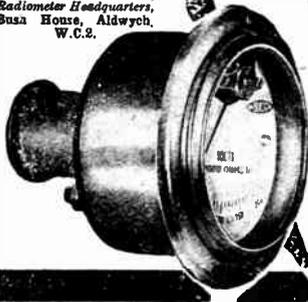
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10 ft. coil, 18 S.W.G. 7d.
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NEW P.M.12 Screened Grid; 14/-, or exchange Ferranti A.F.3 or A.F.5; guaranteed perfect.—Hoare, Brownlow, Hindhead.

A MATEUR'S Surplus new condition.—Set of 3 Radio Corporation coils, both wavelengths, 30/-; R.I. tuner, 21/-; pair Gambrell neotroverniers, 6/-; Blue Spot adjustable unit, 15/-; solid oak cabinet, 26x8, suit Everyman Four, never used, cost £6, sale 40/-.—Hoare, Brownlow, Hindhead. [1613]

ALL-WAVE For Transformers (Wright and Wear) and base, 15/-; R.I. aerial tuner, 15/-; Gambrell neotrovernier, 3/-.—Richardson, 69, Wilton Rd., Southampton. [1611]

EXPERIMENTER'S Surplus—Valves (new), Weston 506 panel voltmeter (0-7 1/2, 0-150), variable condensers, Igranic coils, rheostats, Igranic De Luxe pick-up, etc.; send stamp for list.—Hill, 11, Sutherland Gardens, S.W.14. [1612]

COILS, neotrovernier, variable condensers, shield, panel resistors and holders, all suitable for Everyman Three.—Apply R. Gardner, 29, Gladsmuir Rd., N.19. [1606]

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TWO B4s, 1 D.F.A.1 power valve, 1 D.F.A4R.C. 5/- each; 3 P.M.3s, 6/6 each; 1 P.M.256 super power, 10/6; 3 Geophone .0003 vernier control condensers, 10/- each; 1 3-wav polar cam vernier coil holder, 4/6; 5 Igranic coils, 25-75, 5/- lot; 5 Burndept coils, 5/- lot.—16, Sowo Lane, Binley, Coventry. [1607]

TWO S625 Screened Grid Valves and Burndept Holders, new, 30/-; set Leweos Solodyne coils and bases, 1928 type, 20/-; Ferranti push-pull A.F.3C O.P.3C, output O.P.1, half price; Pye choke, 32h., ditto 15h., 7/6 each; Success ditto, 2/6.—Box 8660, c/o The Wireless World. [1605]

BURNDIPT New Goods (deleted from catalogue).—Crystal metal dial, 1/6; vernier dials, ratio 7 to 1, 4/11; geared coil holders, 2-way 3/11, 3-way 4/11; transformers 5/11; rheostats, 1.4 ohms, 1/3; low loss .0002 anode condensers, 2/3 each; concert coils (set of 4), 5/6; short wave coils (set of 4), 5/6; separate coils: S1 6h., S2 1/-, S3 1/6; sizes 300, 400, 500, 2/6; postage paid on 5/- orders.—Rodwell, 14, Railway Approach, London Bridge. [0208]

ERICSSON Transformer, 8/-; Igranic volume control, 3/-; 2 microstats, 2/9; Ashley and Benjamin rheostats, 2/9; change over switch, 1/3; minus plug and socket, 1/3; offers; letters first.—Box 8718, c/o The Wireless World. [1633]

KILO-MAG 4 Screening Boxes, 27/6; set of 6 coils, 37/6; isolating resistances, 3/-.—Below.

COMPLETE Set of Parts, valves, cone speaker, batteries, etc.: 2-valve £4/10, 3-valve £5/10.—Stott, 63, Syko Rd., Rochdale. [1651]

AERO-DROP Frame Aerial, cost 57/6, 27/6; 3 McMichael superhet transformers, 1 filter, 35/-; 2 Colvern oscillators, long and short wave, 5/- each; 1 Peto-Scott, 1 Igranic reaction condensers, 3/- each; 1 Lissen pick-up, 7/6; 3x2 mid. condensers, 1/6 each; 2 Tritron power valves, 3/- each; 1 Mullard R.C. 2 volts, 4/-; 1 Mullard R.C.C. unit, 1/-; 1 Lissen transformer, 5/-.—Ryan (Flat 3), 82, Princes Rd., Liverpool. [1646]

STENTOR 6, unused, 9/6; Marconi Ideal 4:1, 14/6; Sifam M.C V.M., D/R., 0-6-120, 18/6; ditto, M/A., 0-50, 18/6; Philips T. charger, 230v., 45/-.—8, Hartington Rd., C.C.H., Manchester. [1647]

MARCONI D.C. Mains All-Power Unit, full components for building, 55/-; E.M.4 long wave aerial coil, 12/6; Success 20-2,000 meter coils, set 15/-; all guaranteed unused.—Humphreys, 367, Fulham Rd., S.W.10. [1645]

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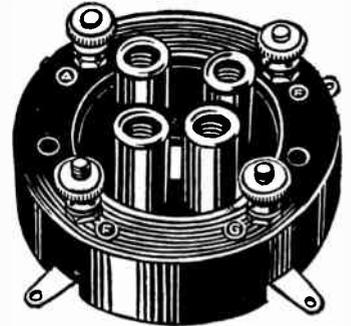
RADIO HOUSE, HUDDERSFIELD.—Double scale voltmeter, 0/6, 0/120; 5/6.

RADIO HOUSE, HUDDERSFIELD.—For all advertised components of various makes; trade enquiries solicited.—J. H. Taylor and Co., 15, Radio House, Maccaluly St., Huddersfield. [0028]

YOUR Old Components Taken in Part Payment for Latest Type; see our advert. in column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0028]

MEGAVOX Three.—Complete set of parts, with long and short wave coils and valves, less cabinet and panel; £10. Box 8729, c/o The Wireless World. [1667]

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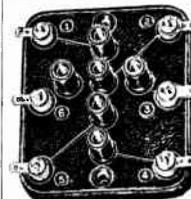


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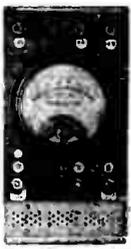
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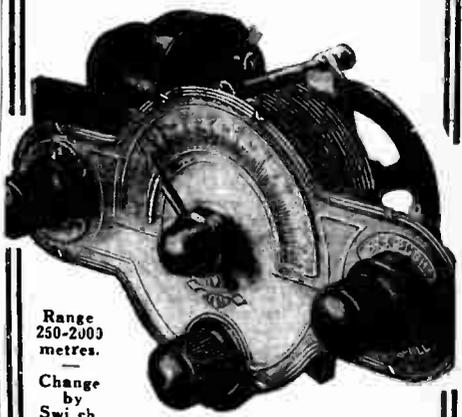
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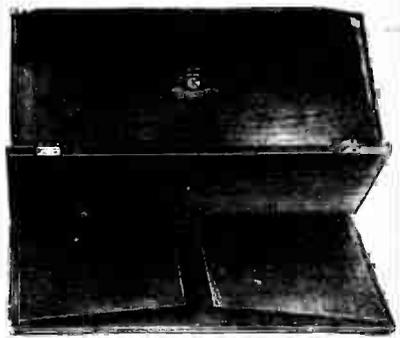
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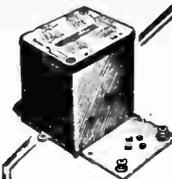
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37/6

with circuit diagram.

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FREE—Inventor's Guide on Patents.—Chatwin, 253 (W.), Gray's Inn Rd., London, W.C. [1158]

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COMPONENTS for A.C.3 and New All-wave Four, A.C. and D.C. voltmeter, milliammeter and ammeter.—Blackmore, 22, Grafton St., Derby. [1649]

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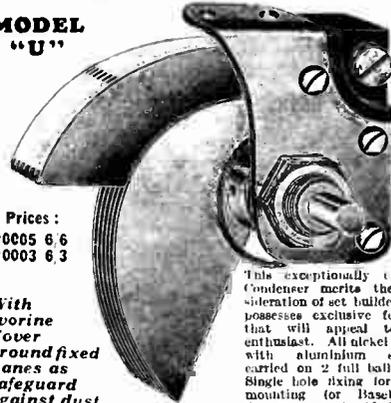
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Prices: 0005 6 6 0003 6 3

With Ivoryine Cover around fixed Vanes as safeguard against dust accumulating.

This exceptionally efficient Condenser merits the consideration of set builders and possesses exclusive features that will appeal to the enthusiast. All metal plated with aluminium spindle carried on 2 full ball races. Single hole fixing for Panel mounting for Baseboard. Can be ganged. 1" spindle to fit Verrier Dials. Send for Lists.

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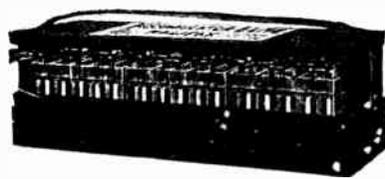
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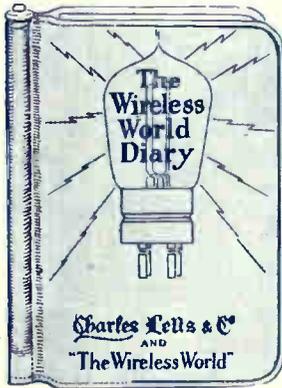
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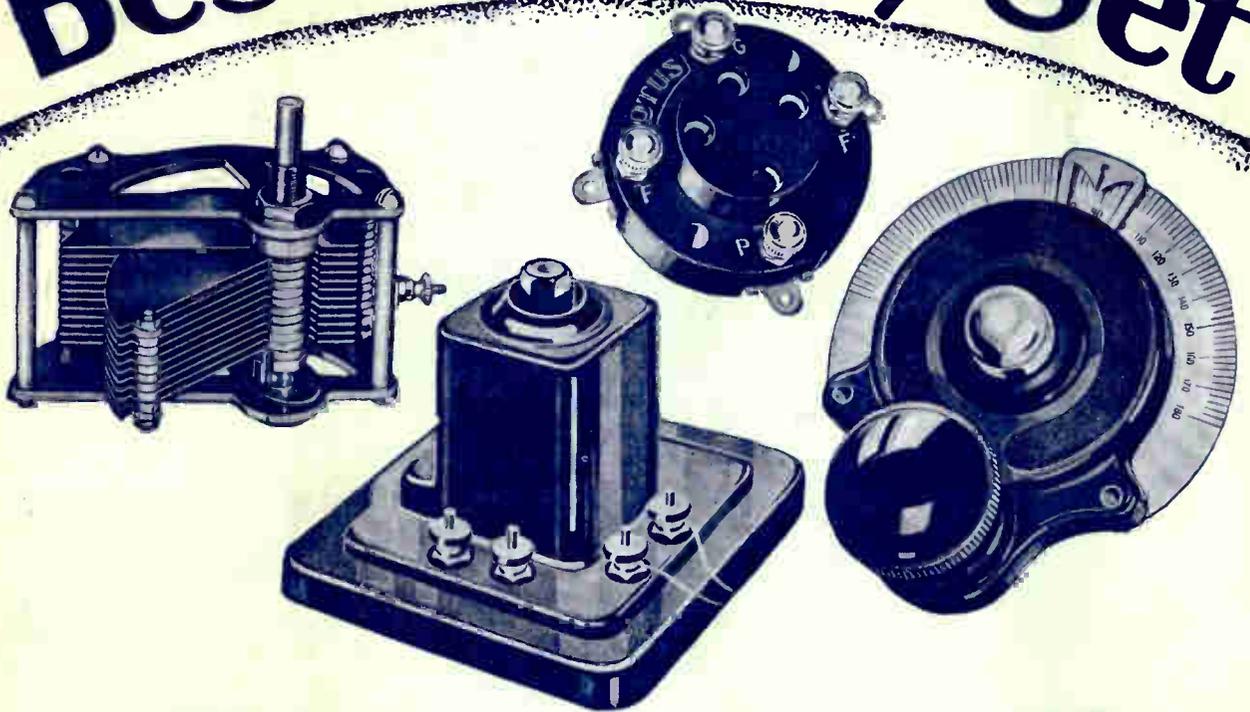
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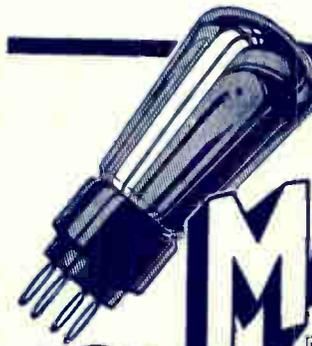


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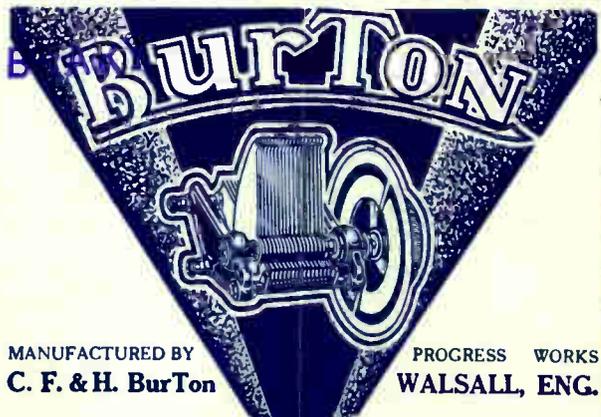
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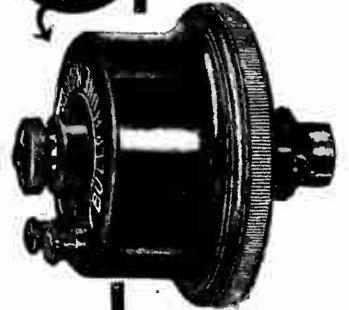
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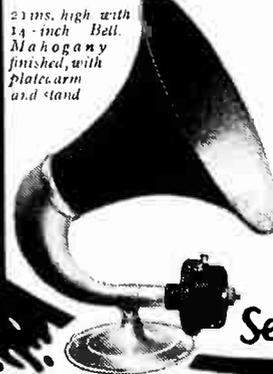


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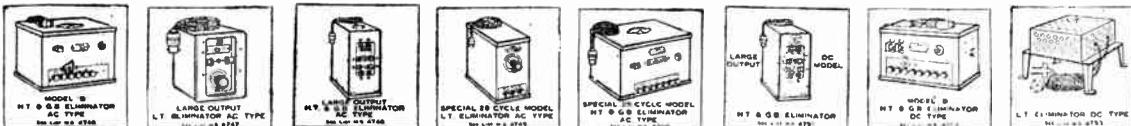
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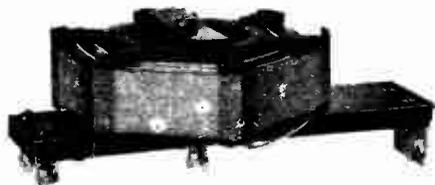
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Coils may be purchased separately or complete
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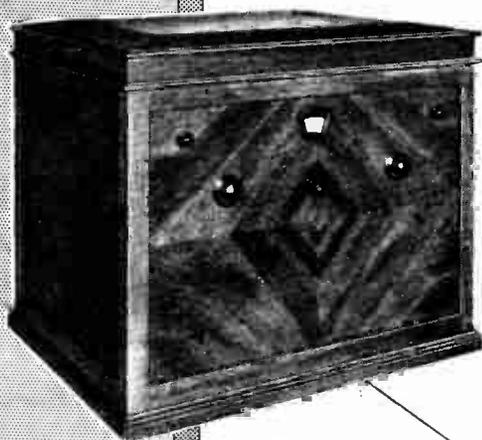
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A Screened Grid Valve is employed in the high frequency stage, and by means of coupled condensers, the aerial and the H.F. coupling circuits are simultaneously tuned by a central geared control knob.

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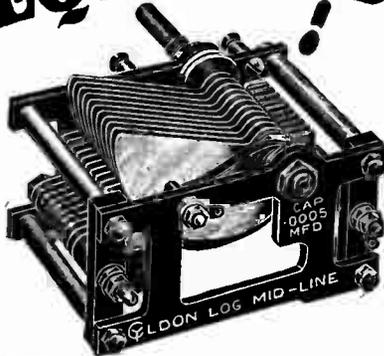
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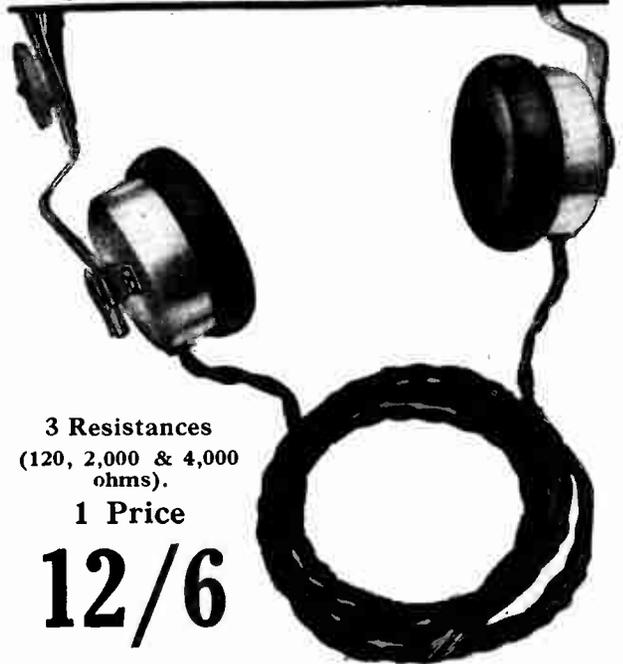
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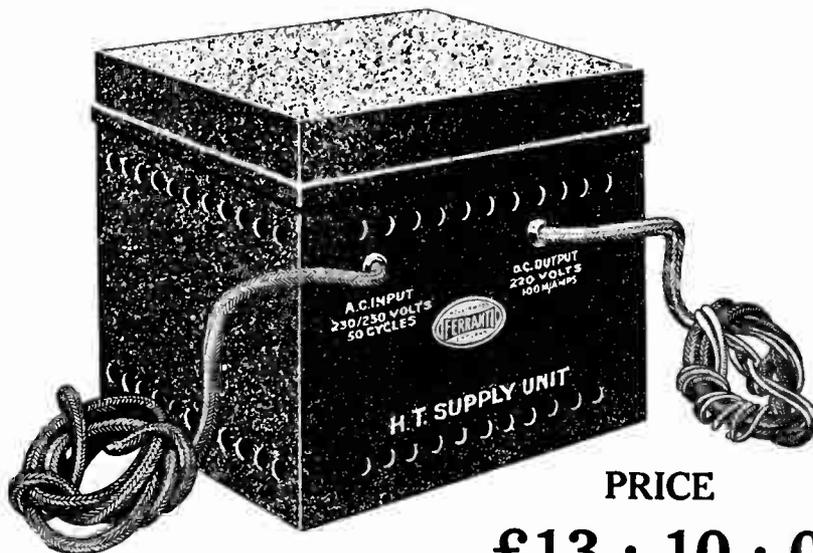
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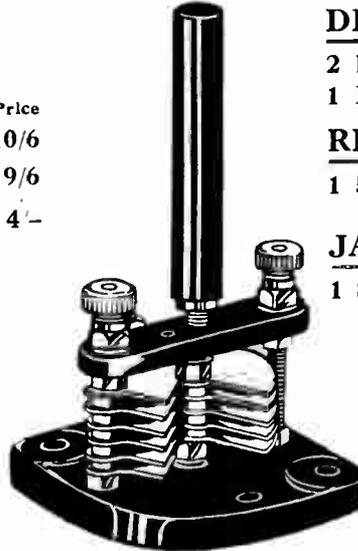
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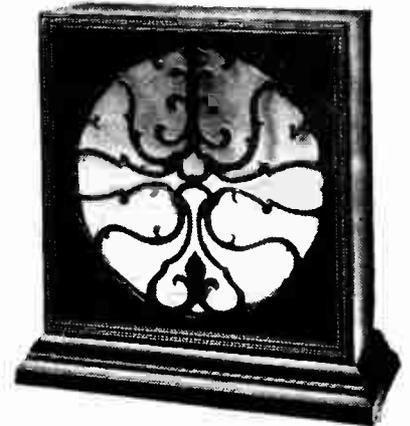
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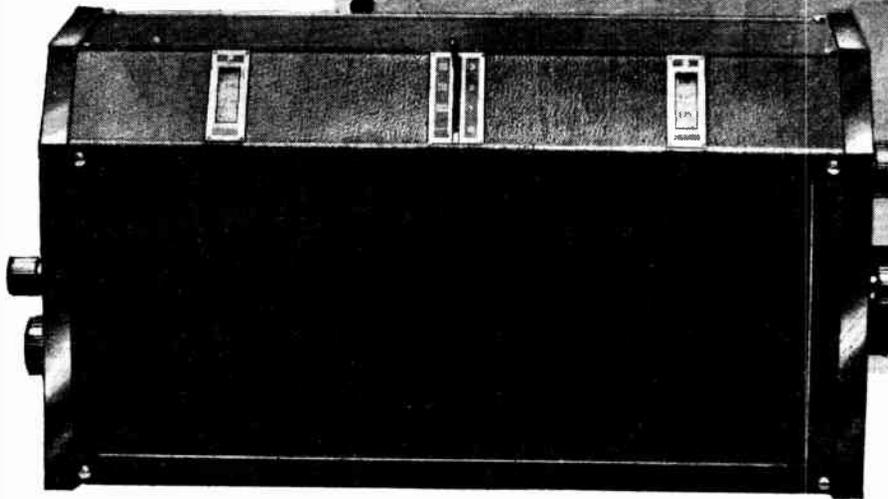
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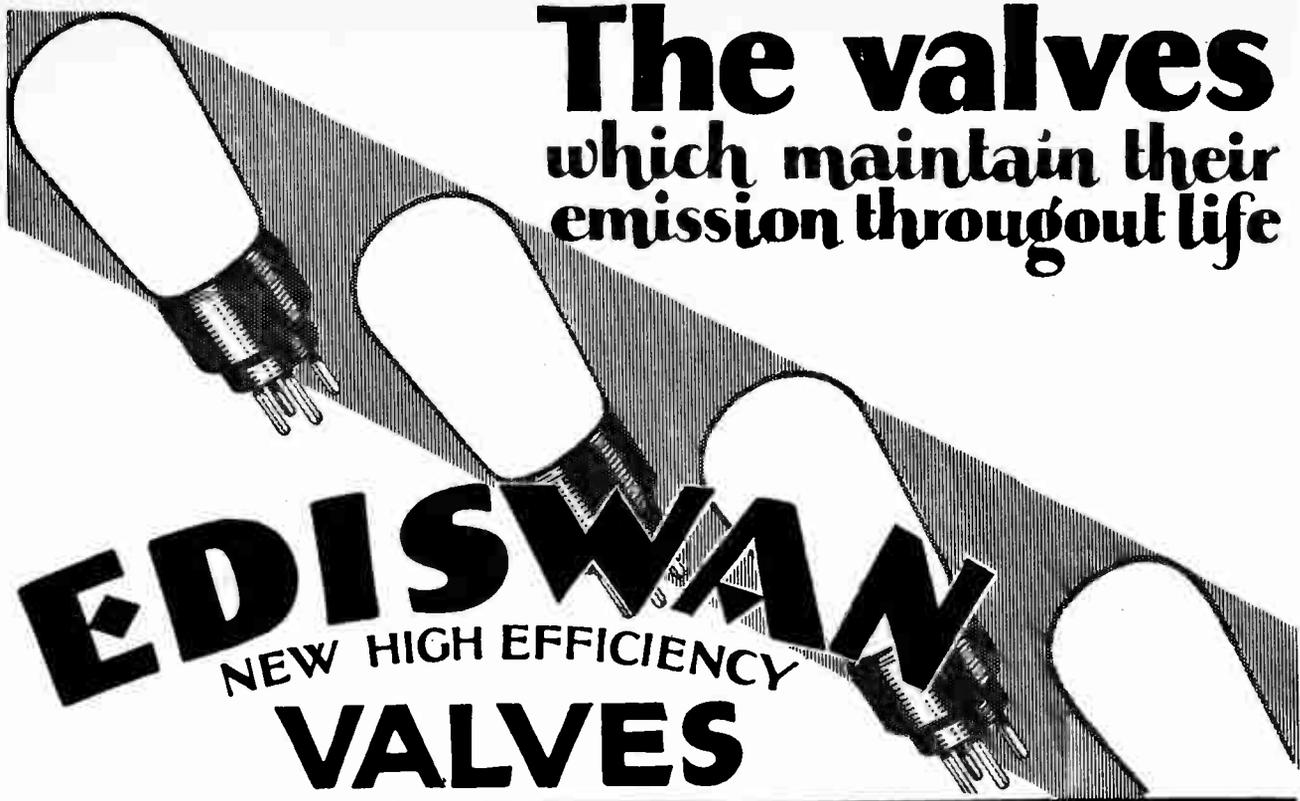
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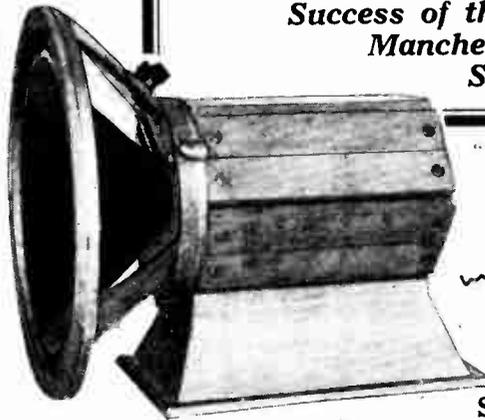
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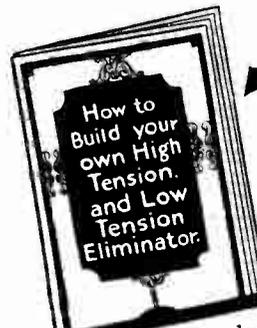
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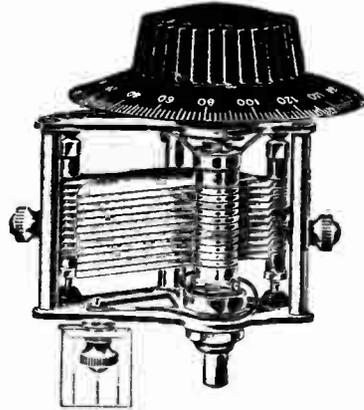
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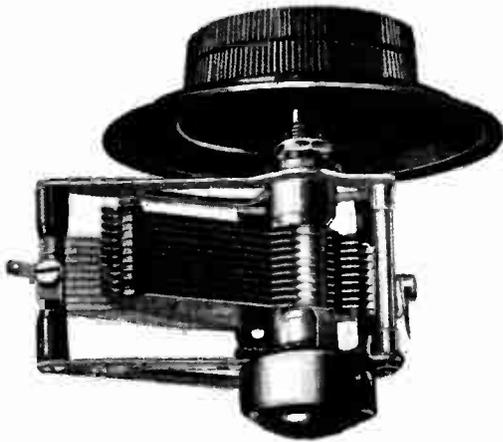


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With specific gravity indicators.

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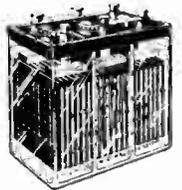
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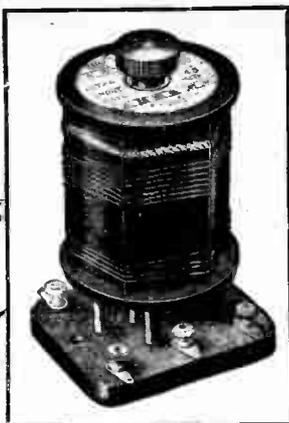
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Incorporating Westinghouse
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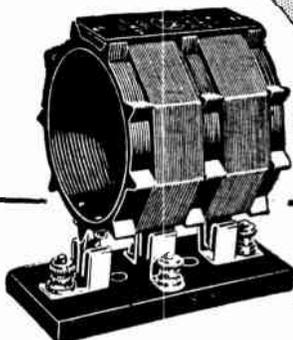


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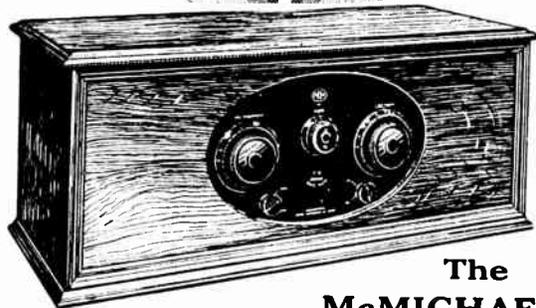
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Price 5/- each.

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Full leaflets and diagrams are available for the making up of this unique Receiver from an assembly of our components, giving equivalent results on all wave-bands. The cost of the whole of the parts necessary to build this set is approximately £8.12.8. (Extras: Valves 58/-. Oak Cabinet 35/-. Loud Speaker to choice.)



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Supplied with three special valves tested with Receiver.

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Price 4/- each.

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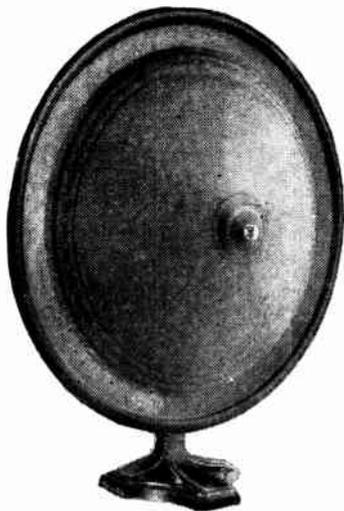
A movable marvel, easy to carry, yet giving reception of unequalled quality. Highly selective, widest range of stations available, ease of control. In beautifully finished figured Walnut Cabinet with Celestion Loud Speaker. Gives the full benefit of the latest screened valves.

Price 35 Guineas (including Royalties and all Equipment).



Perfect reception with "Blue Spot"

Get the best out of your set



MODEL 44.
This attractive model embodies the principle of the free edge cone. Driven by the 4 pole balanced armature unit 66A. Can be supplied complete or as a home constructor's kit which includes handsome oxidized pedestal supplied in two parts ready for assembling and specially prepared 16" cone.

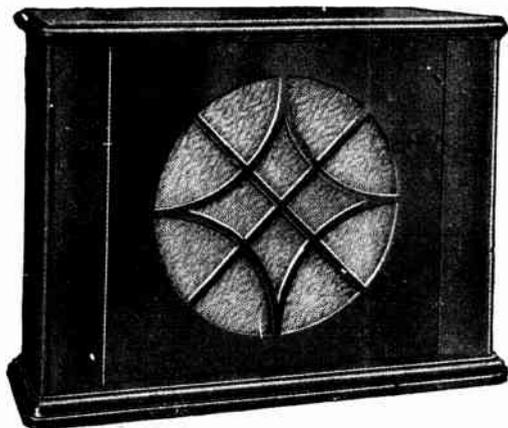
Price either model is £1 17 6

This illustration depicts model 69. An attractively designed mahogany cabinet houses the famous Blue Spot cone speaker, the cone floated on a baffle plate by means of soft leather segments to give equal response over the entire audio range. The famous 66K adjustable driving unit ensures perfect fidelity of reproduction.

Price £4 4 0

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Price £2 2 0 in well-designed case



Blue Spot speakers are as faithful in reproduction as the microphone itself. Listen for the difference. Hear the grand organ thunder in all its majesty—hear the pure even tone of the violin, the fulness of the symphony orchestra.

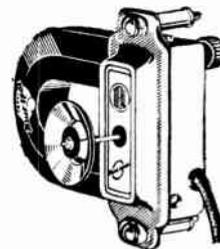
You catch the spirit of the performance from the very first note. It is only the broadcasting you hear, no overtones, or static noises. Test a Blue Spot speaker for yourself at your nearest Stockists.

The new Four Pole Balanced armature Unit which is the secret of the remarkable reproduction of Blue Spot speakers can be obtained as a separate unit for constructors who wish to build a cone speaker to their own pattern that will give results equal to the best models.

The unit is constructed of special magnet steel providing an extremely sensitive action and powerful flux. Supplied complete as illustration with two padded washers on threaded spindle.

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As many of the circuits and apparatus described in these pages are copied by
patents, readers are advised, before making use of them, to satisfy themselves
that they would not be infringing patents.

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PATENT-LAW REFORM.

THE Report of a special Committee appointed by the British Science Guild with Dr. W. H. Eccles in the Chair "to consider what changes could advantageously be made in the British Patent Law" has just been issued from the offices of the Guild, John St., Adelphi. The Report contains recommendations of far-reaching importance both to the inventor and the public.

In our opinion some at least of the suggested reforms are long overdue. Amongst these is a proposal to empower the Comptroller of the Patent Office to hear actions relating to infringement, and to decide petitions and counter claims for the revocation of patents on all the usual grounds of invalidity.

A Confirmation of our Attitude.

Our readers will recollect that we have more than once suggested that a move in this direction would go far to clear away the existing uncertainty of the patent position in the wireless industry. At present the scope and validity of a patent can only be effectively tested

by an action in the High Courts. The expense and time involved in High Court litigation can not lightly be faced by the ordinary manufacturer.

As a result he is frequently compelled either to pay an unjustifiable royalty—or else lose good trade—because of patent claims which could not be substantiated in Court. On the other hand, an inventor of moderate means, who may have secured the grant of substantial letters patent will find his rights ignored because he cannot afford to institute expensive litigation against infringers.

Special Qualifications of Patent Office Staff.

In their recommendation on this point the Committee argue that the County Courts though relatively inexpensive are not equipped to decide patent actions, whilst the technical knowledge and experience of the Patent Office staff render it peculiarly suitable to undertake the additional duties suggested.

Infringement and similar actions would in general only be dealt with by the Patent Office by mutual consent of the parties concerned, and on an agreed understanding as to whether the decision of the Comptroller should be final or subject to an appeal to the Courts. At the same time, provision could be made to enable the poor inventor to cite a powerful infringer before the Patent Office, and to have his claims adjudicated on, in bona fide cases, by this tribunal.

"Short Term Patents."

Another interesting suggestion advanced by the Committee is the institution of a special type of patent to cover minor improvements which, although more in the nature of ingenious design than actual invention, may yet find a wide market in practice. Such "Short term patents" would be issued with little delay and at considerably less cost than the normal patent. Their term, it is suggested, would be limited to a maximum of seven years.

Among other points dealt with are: a stiffening-up of the penalties for making unwarranted threats in connection with patent rights; the possibility of affording some degree of Official assistance at the Patent Office to an inventor when making a search prior to his filing his application; and the extension of the Official search on the Patent Specification to cover all available textbooks, periodicals, and other technical publications generally.

The Report bears ample evidence that the Committee have given long and careful consideration to a peculiarly difficult problem. It is to be hoped that their recommendations will in due course bear fruit in legislative action.



SETS of the SEASON

A Comparative Analysis of This Year's Designs.

THERE are several very real difficulties in the way of visualising in true perspective to-day's tendencies in design as compared with those of last year; the recent introduction and wide adoption of screened grid and pentode valves is likely, in certain cases, to discount the value of the lessons to be learnt from the percentage figures given in the accompanying graphs. For instance, the predominance of three-valve sets and the marked increase in their number might well give rise to the impression that experience has shown that this type of set is the most generally suitable for average needs. It probably is, but it must not be forgotten that this class comprises the particularly happy and popular combination of screened grid H.F. amplifier, triode detector, and pentode L.F. amplifier; this special-

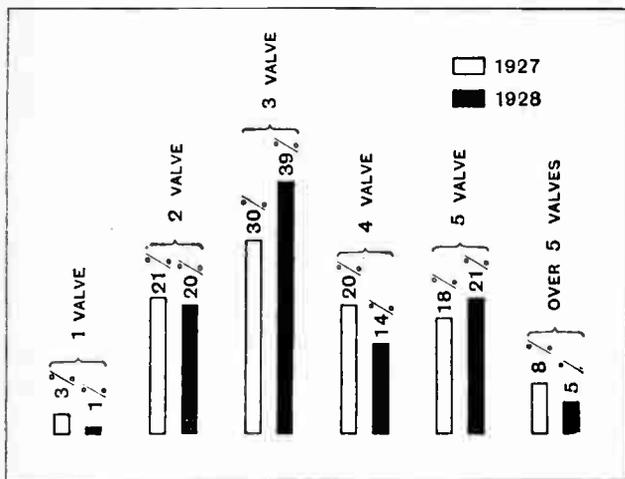
ised arrangement cannot properly be compared with more conventional three-valve circuits, although it automatically falls into the same category.

Advice is cheap, and in no direction is it more likely to be exactly worth its cost than with regard to the choice of a wireless set. This unfortunate state of affairs is due to the profound influence of local conditions and to wide differences in the efficiencies of aerials; without knowledge and even actual experience of these conditions it is fatally easy to offer advice which is, at the best, misleading. One is, indeed, tempted to evade the task of making suggestions to prospective buyers, but there is now such a bewildering array of types, let alone makes, of receivers that it is considered essential, before analysing present practice, to touch briefly on some of the points which should not be overlooked in coming to a decision.

Portable Sets: Advantages and Disadvantages.

Self-contained and portable sets are now offered in such quantities that they may soon outnumber the rival type of equipment which is fitted with an external aerial and (generally) with external batteries (or eliminator) and loud speaker. It would, therefore, seem necessary to decide first whether the advantages of the former type of receiver, such as portability, the avoidance of an external aerial, and general compactness and neatness, are sufficiently attractive to turn the scale against its increased cost. It is a fact that any frame-aerial set must, for equal performance, have a greater number of valves than the other type; its price will therefore be higher, and upkeep expenditure will be heavier.

As to whether the chosen set should include high-frequency amplification is a matter of both geographical situation and requirements. For real long-distance re-



TYPES OF SETS. 1927 and 1928 compared: the three-valve set is more popular than ever.

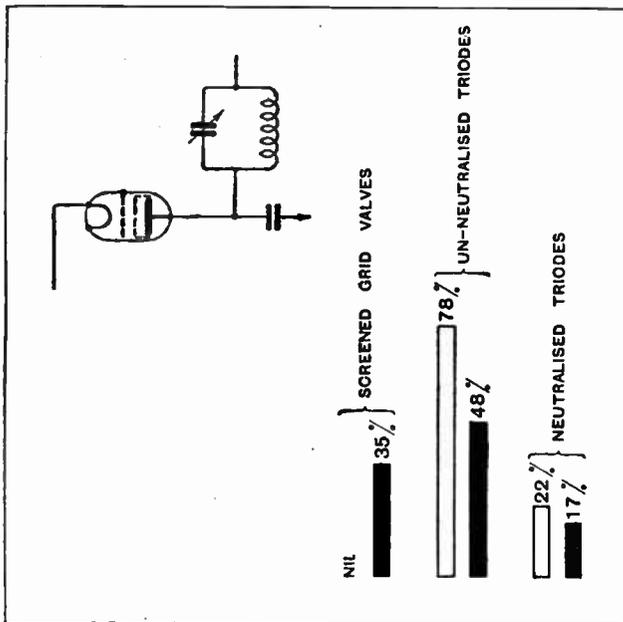
Sets of the Season.—

ception it may be considered as essential, for no set is really satisfactory for this purpose when it depends entirely for its sensitivity on critical adjustment of reaction. Apart from the question of range, it should be pointed out that a tuned H.F. stage confers another benefit, in the shape of selectivity, which cannot so satisfactorily be attained in any other way; those living in the vicinity of a transmitter and wishing to receive an alternative programme are often forced to use it for this reason, although it may not be strictly necessary from the point of view of sensitivity.

Three-valve Sets Gain Ground.

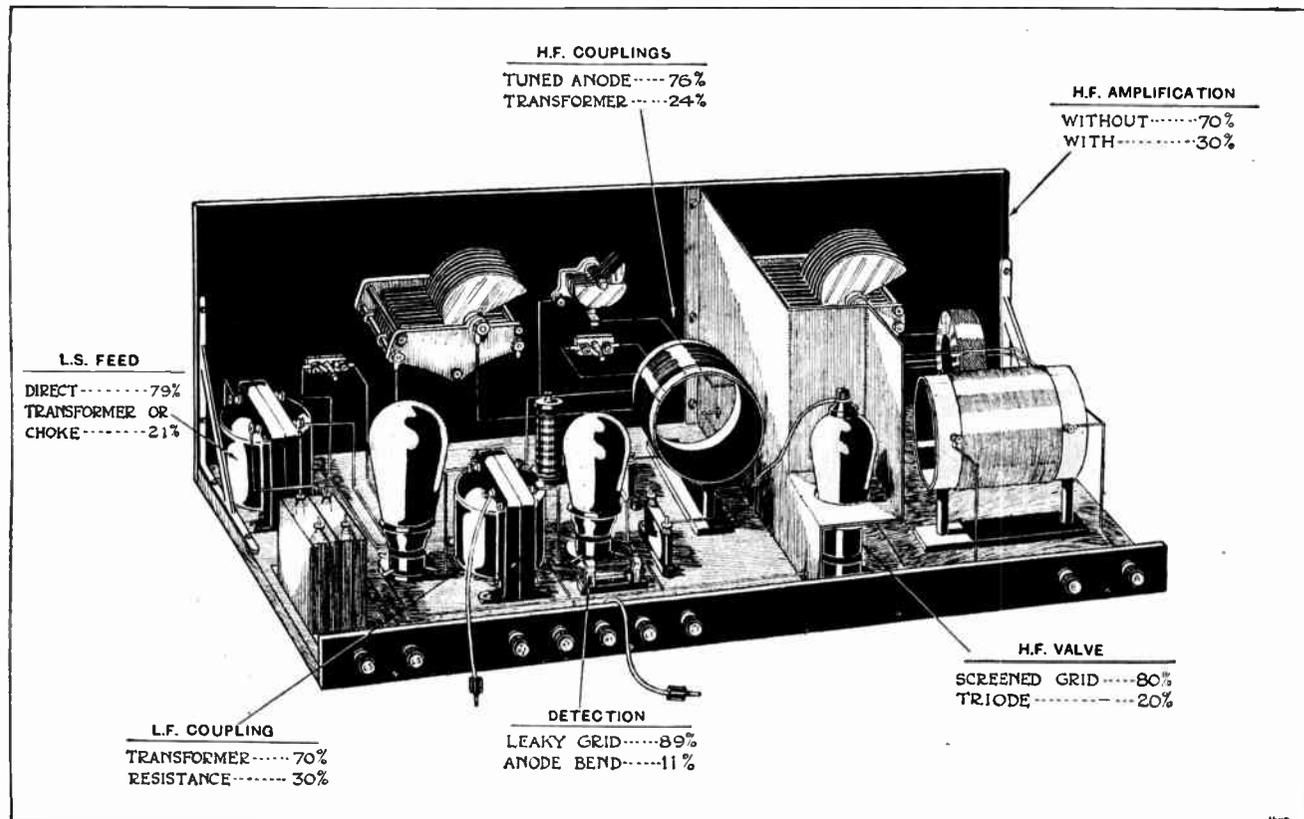
Pentode valves have done much to solve our problems with regard to volume of reproduction, but the fact remains that to achieve an intensity generally described as "realistic" the listener has to budget for an expenditure of energy greater than can economically be drawn from dry batteries or even from H.T. accumulators unless means for recharging them are readily available. Many of us must perforce content ourselves with the output of an ordinary super-power valve with normal H.T. voltage, and, after all, we are likely to be more popular with our neighbours by doing so.

In making an analysis of receivers as a whole, the most striking fact revealed by the first graph is, as already stated, the increased preponderance of the three-valve set, due very largely to the introduction of the shielded valve-triode-pentode receiver, which, in

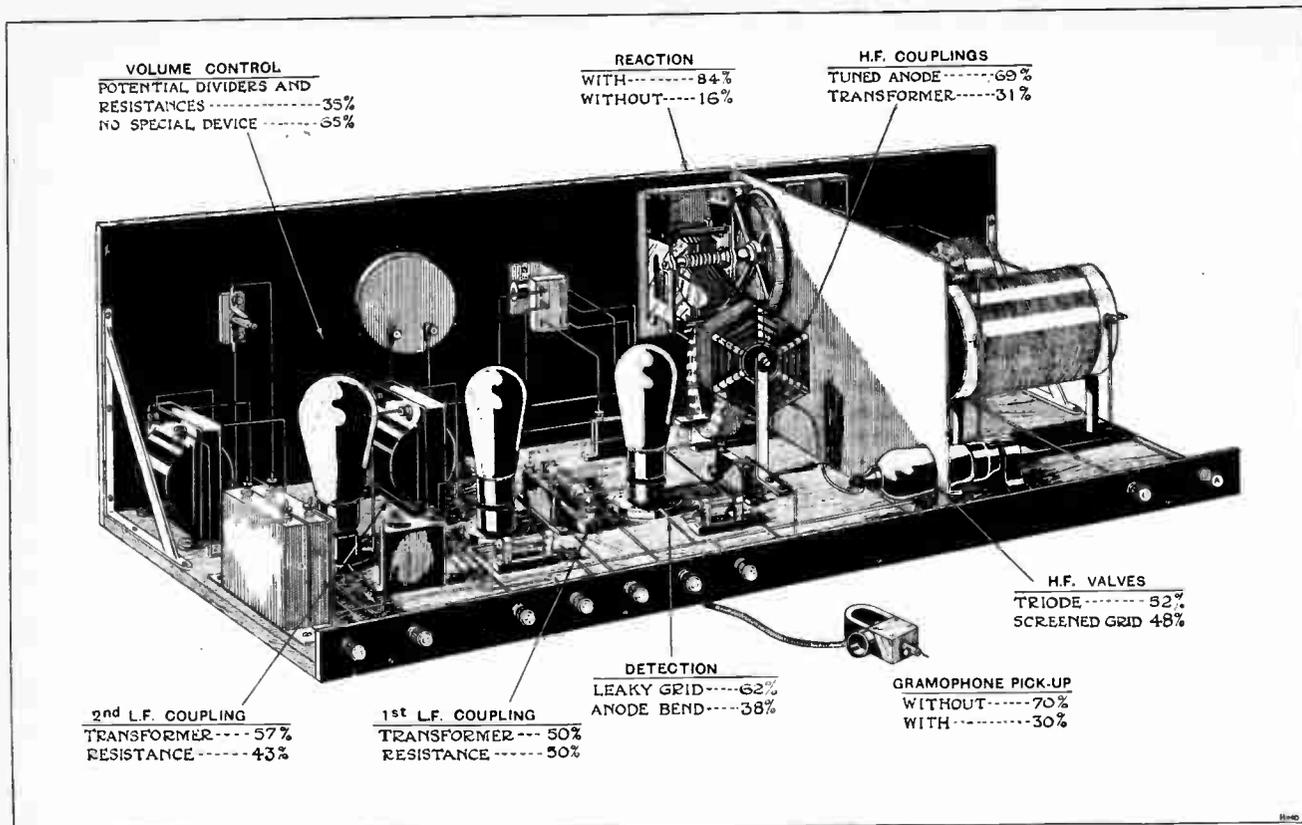


H.F. AMPLIFICATION. The advance of the screened grid valve; last year its application was negligible.

its best form, has capabilities with regard to sensitivity, selectivity, and volume sufficient to satisfy even the more ambitious requirements. As was to be expected, the gains of this classification are largely at the expense



THREE-VALVE RECEIVERS. Resistance-coupled L.F. stages are almost exclusively confined to sets without H.F. amplification.



FOUR-VALVE SETS. Favours are almost equally distributed between three-electrode and screened grid H.F. amplifying valves.

of four- and multi-valve sets. Headphone reception seems to be even less popular, as will be seen from the diminished number of one-valve sets. The comparatively high proportion of five-valve sets is traceable to the wide appeal of this circuit arrangement in the "portable" class; it has not been adopted to any great extent in fixed receivers with outside aerials.

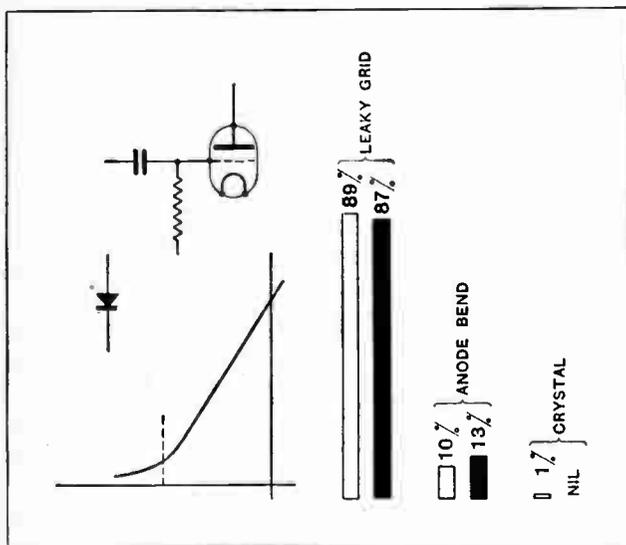
It is on the H.F. side of the receiver that the greatest changes—and the greatest improvements—are seen, as will be evident from the fact that more than half of the amplifying stages included in this year's models make use of screened grid valves or neutralised triodes. The majority of the un-neutralised three-electroded valves are used in conjunction with "aperiodic" couplings in portable receivers.

Anode Rectification Unpopular.

With regard to detection, the apparently negligible gain of the anode-bend system is attributable to the pentode valve; a closer analysis reveals the fact that this method has made some progress in receivers where the new output valve is *not* used. One doubts, however, if it will ever seriously rival the leaky grid condenser method, which requires no periodical adjustment of bias in sets intended for those who demand apparatus calling for the minimum of attention.

The expressed opinion that crystal detection would have a new lease of life in receivers drawing all their energy from the mains seems to have been without foundation, as this form of rectifier, in conjunction with amplifying valves, has not met with favour.

Although less reliance is now placed on reaction as an aid to sensitivity, it will be seen that there is no appreciable tendency to abandon it altogether, in spite of widespread improvements in pure H.F. amplification. The popularity of the capacity control method has increased.



DETECTION. The leaky grid rectifier maintains its pre-dominance.

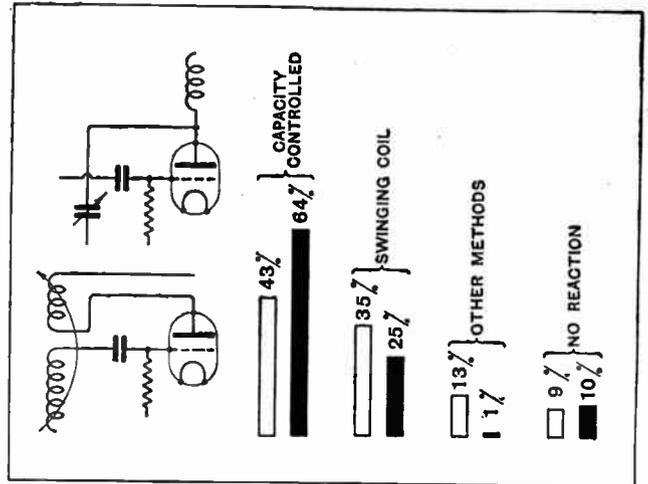
Sets of the Season.—

L.F. transformers retain their lead, helped by the fact that they are particularly suitable for coupling the detector to a pentode output valve. There is a distinct tendency towards the use of "mixed" amplifiers, with a resistance in the first stage, followed by a transformer.

Due largely to an increase in the number of sets which derive at least a part of their energy from the electric light mains, there are more output filters and transformers; it is rather surprising, in view of the publication of the I.E.E. recommendations, that there are still so many directly coupled loud speakers.

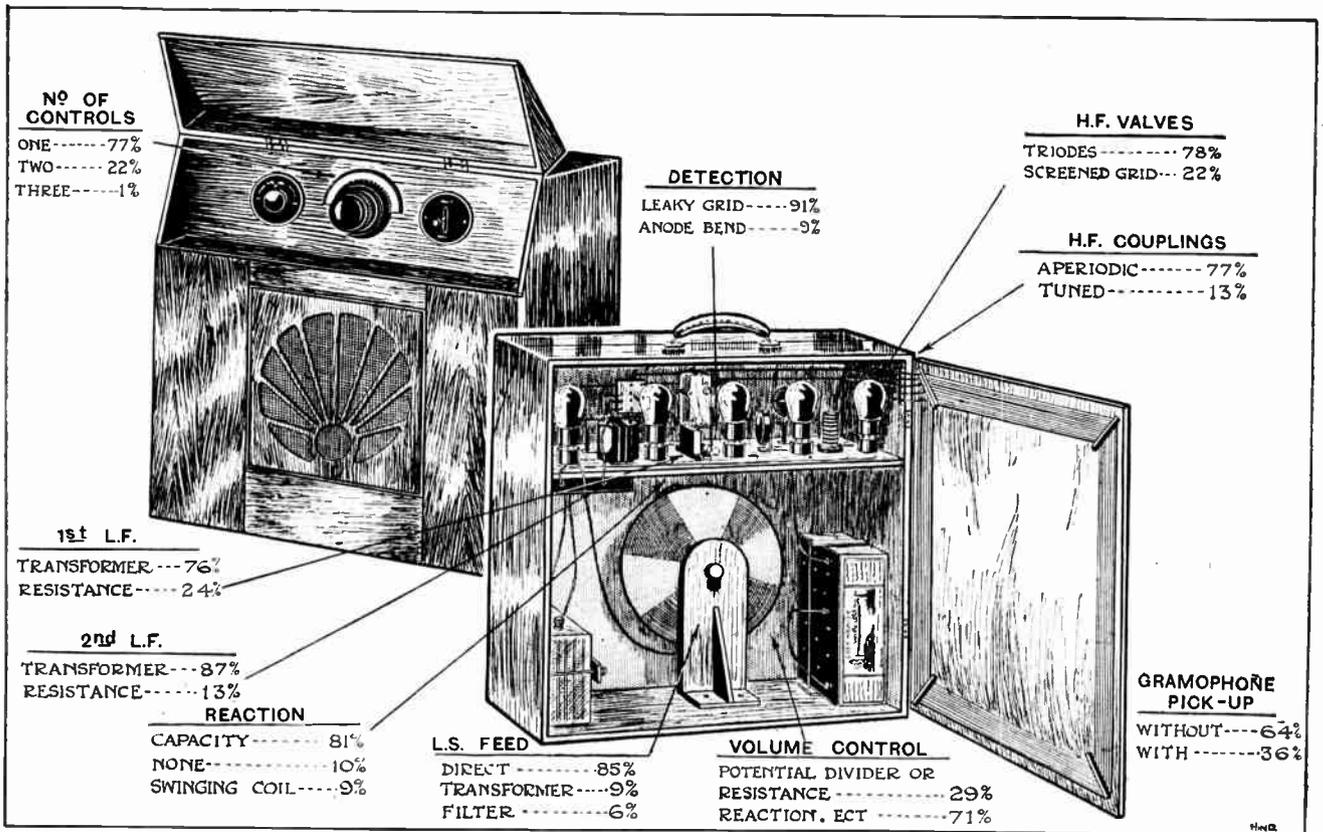
Typical Three-valve Receivers.

Dealing with three-valve sets in particular, we find that detector-L.F. combinations are in the majority, although H.F. amplification is gaining ground, in spite of the fact that its use is almost invariably followed by the addition of a second tuning control. In the "I-V.I" class of set we find that transformer L.F. coupling is almost universal. On the H.F. side it will be observed with interest that the percentage of transformer couplings is much higher than might be anticipated, in view of the increased cost and complexity of this device as compared with the tuned anode method. As for the system of detection used in this class of set, the predominance of the leaky grid method may be attributed to some small extent to the wide use of pentode output valves.



REACTION. Capacity control increases in popularity; the majority of receivers include reaction, in some form.

Turning to the representative four-valve receiver, it is found that the popular H.F.-det.-2 L.F. combination has swept the board; in the H.F. position screened grid and three-electrode valves are fairly evenly balanced, with a slight bias in favour of the latter. In this class there is an increased use of the anode-bend detector. In computing the percentages of H.F. couplings, several sets of American origin which are on the British market

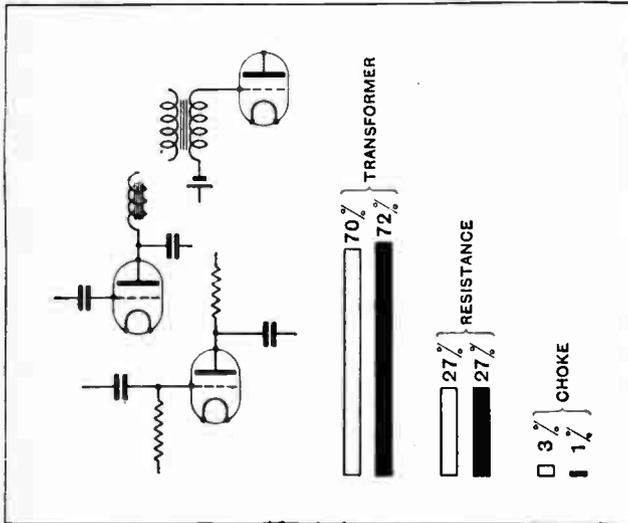


SELF-CONTAINED AND PORTABLE RECEIVERS. H.F. amplifiers with 2 aperiodic stages are still popular, in spite of competition from the screened grid valve.

Sets of the Season.—

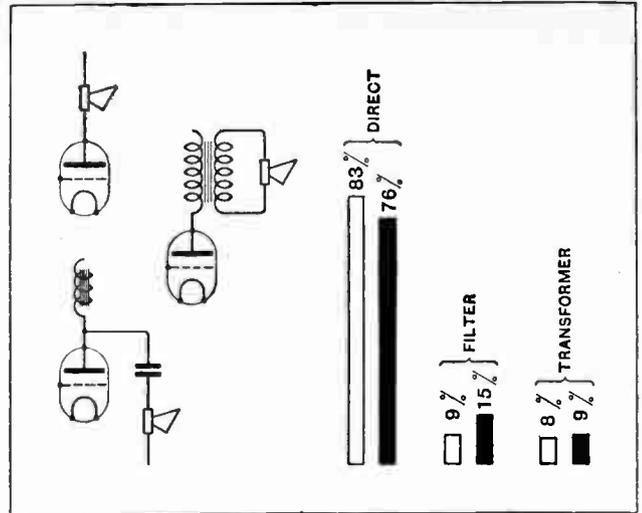
have been taken into account; their inclusion tends perceptibly to increase the proportion of tuned transformer couplings.

With but few exceptions, last year's portable and transportable sets included heavily damped tuned H.F. couplings, or, more often, aperiodic amplification. The former have almost disappeared, but it seems probable that "one knob" tuning, made possible by the adoption of the "untuned" system, is sufficiently



L.F. COUPLING. The relationship between the two principal methods remains practically unchanged.

popular to account for its retention in a large number of receivers. Of course, there are two or three sets with tuned H.F. amplification and a single "ganged" control, but their number is insufficient appreciably to influence the totals. In spite of a perhaps exaggerated and illogical public antipathy to more than one control, manufacturers have not been behindhand in taking ad-



LOUD SPEAKER FEED. Mains operation is responsible for a slightly increased tendency to use coupling devices.

vantage of the high amplification made possible by the use of screened valves with tuned circuits, and have in many cases introduced devices—such as direct calibration—to overcome the possible drawbacks of two adjustments.

There has been a very marked increase in the number of sets in this classification with provision for gramophone reproduction, but no corresponding addition of volume-control devices as compared with last year. The intensity delivered by a loop aerial set when receiving radio signals can almost always be adjusted by swinging the frame towards the position of minimum response, so special controls are hardly essential; this does not hold good when a pick-up is in use. It will often be found, however, that in cases where a control is not provided in the set an external resistance is connected across the pick-up.

Television, by Alfred Dinsdale, with a foreword by Dr. J. A. Fleming, M.A., D.Sc., F.R.S. Pp. 180 with 38 diagrams and 33 half-tone plates. Published by Television Press, Ltd., London. Price 5s. net.

Kurzwellen-Verkehr, by Hans W. Priwin. A handbook for amateur transmitters, including the Morse code, use of abbreviations, and list of German amateur transmitters. Pp. 78. Published by Rothgiesser and Diesing A.G., Berlin. Price RM.1.30.

Empfang auf Kurzen Wellen, by Maufred von Ardenne. A text-book on short-wave transmitters and receivers. Pp. 83, with 79 illustrations and diagrams. Published by Rothgiesser and Diesing A.G., Berlin. Price RM.3.50.

The Motor Cycle Diary, including useful formulæ and tables, cubic capacity tables, monthly summary of running expenses, localities and gradients of the principal test hills, and winners of the Tourist Trophy races since 1907. Pp.

BOOKS AND CATALOGUES RECEIVED.

188. Published by Iliffe and Sons Ltd., London. Price, in leather binding with pencil, 1s. 6d. net.

Ferranti, Ltd., Hollinwood, Lancashire. "True Radio Reproduction," an 88-page art booklet dealing with the theory of L.F. amplification and battery eliminators with special reference to Ferranti products. Also revised leaflets Nos. Wb405, Wb406/2, Wc409, Wc410, Wb411/2, Wb412, Wa416 and Wb404 for inclusion in the "Home Radio Catalogue."

The Radielle Co., Ltd., 18a, Haverstock Hill, Chalk Farm, London, N.W.3. Illustrated catalogue with output curves of "Radielle" battery eliminators for A.C. and D.C. mains.

Electradix Radios, 218, Upper Thames Street, London, E.C.4. Complete 72-page illustrated catalogue of Electradix radio components and ex-Govt. apparatus.

The Engineering Accessories Co., Ripple Works, Trafalgar Street, Burnley, Lancs. Two leaflets describing "Super-fine" H.T. eliminators.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. Illustrated catalogues of B.T.H. radio receivers and the new nickel filament Mazda valves, the latter illustrated with characteristic valves.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3. List No. 928 of Dubilier condensers and radio products.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester. Complete illustrated catalogue of Met-Vick (Cosmos) wireless equipment.

Garnett, Whiteley & Co., Lotus Works, Broadgreen Road, Liverpool. Illustrated catalogue of "Lotus" portable sets.

MAZDA

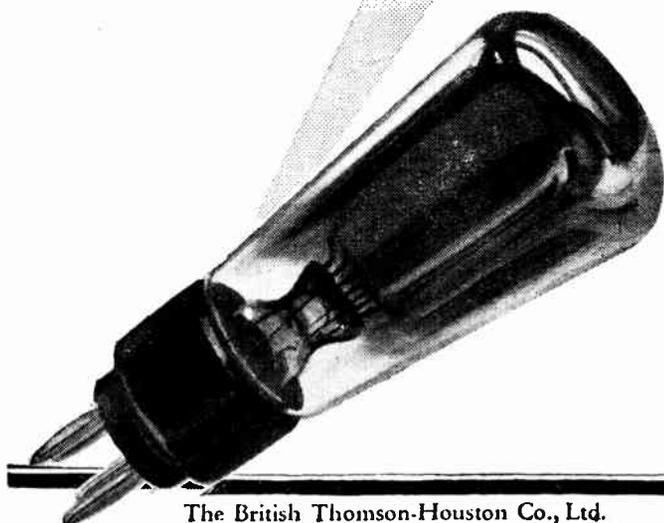
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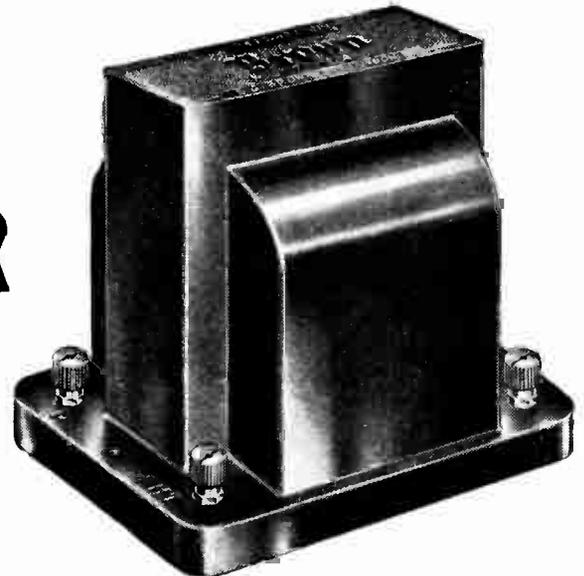
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Directive Broadcast Reception



A Fantasia on Headphones.

I SOMETIMES wonder how much of the popularity of this or that new method or new equipment is due to the newness rather than to the inherent merits of the thing concerned; how much, in fact, we share that amiable weakness of the old Athenians for which they have been so unkindly pilloried in a prominent place. Suppose, for example, that by some strange but by no means unthinkable combination of circumstances, wire telegraphy had been discovered shortly after, instead of a long while before, wireless telegraphy. It is not difficult to imagine how enthusiastically it would have been received. "Here we have a great advance in the technique of communication which is obviously destined to displace wireless telegraphy in all except certain special circumstances where the peculiar advantages of the wireless system outweigh its numerous attendant drawbacks and disabilities. The complete freedom of the new wire telegraphy from atmospheric disturbances, the engaging simplicity and cheapness of the apparatus employed, its ease of control and manipulation, and its unfailing reliability, all combine to mark the new system as the darling of the future . . . etc., etc."

At the present moment the attention of the listening public is focused on the loud speaker, and the efforts of a considerable number of those designers and manufacturers who cater for that public is concentrated on the perfecting and further perfecting of such equipment. (The phrase "further perfecting" is quite legitimate in this connection, for it is well understood by the manufacturers of wireless apparatus that their progress is from perfection to perfection, as distinct from all other kinds of evolution.)

Already a kind of loud speaker aristocracy has been established, so that the owner of the latest "Thumplion Tiger" feels entitled to patronise even those of his

acquaintances who affect a "Klaxton" coil drive, and neither of these privileged classes will care to be seen with persons who are known to harbour in their homes one of those vulgar things with a magnet drive and a horn. As for the man who still clandestinely listens with headphones—he is the "untouchable" of the wireless community.

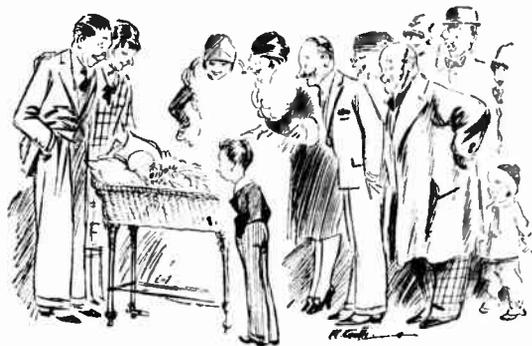
Jealously Guarded Secret.

But now imagine for a moment that head phones had come at the head of this procession instead of at its tail. Suppose that at the recent Wireless Exhibition at Olympia this neat and ingenious listening device had been for the first time introduced to a public already sated with the blare of trumpets and the rattling of cones. I will presume on the tolerance of the Editor of this journal to the extent of writing for him the notice that would have appeared in the special Exhibition number.

"Stand No. 17, Phonette Manufacturing Co.

"The jealously guarded secret of the Phonette Manufacturing Company has been revealed at last, and this firm is to be sincerely congratulated on having produced the sensation of the year at Olympia. Also on having, performed a real social service, for it is not too much to say that their new listening device, to which they have given the name 'Headphones,' removes most of the annoying features that have hitherto been inseparable from broadcast reception.

"The apparatus has a simplicity of conception that leaves one wondering that it has not been thought of before. A 'headphone' consists, in fact, of two miniature and neatly constructed loud speakers of the magnet drive type secured to a band which is worn across the head and so locates the two separate small



"I sometimes wonder how much the popularity of this or that . . . is due to the newness rather than the inherent merits of the thing concerned."

Directive Broadcast Reception.—

loud speakers immediately over the ears of the listener.

"The first and most obvious result of this arrangement is that the reception is entirely confined to the wearer of the apparatus. Think of the inestimable advantage of this from the family and social point of view. Hitherto the intellectual and æsthetic susceptibilities of the family have been at the mercy of the strongest-minded or least considerate member of it.



"A real social service."

Alternatively, persons have constantly found themselves compelled to choose, in the absence of sufficient sound-proof accommodation, between foregoing the desire to hear some particular item in which they are specially interested, on the one hand, and constraining their reluctant associates to have their attention monopolised by a noise which affords them no satisfaction, on the other. We have personal knowledge of at least one family, the members of which are of widely divergent tastes and interests, having little more than a highly developed social conscience in common. Their elaborate and expensive wireless set is, in consequence, scarcely ever in operation.

Solution of Loud Speaker Problem?

"We may be thought to exaggerate in describing the matter as one of great social significance, but we assure our readers that we do not exaggerate. Who can say how many of the growing number of divorce cases which pass through our courts are due to what has hitherto been the impossibility of finding an equitable and mutually satisfactory solution of the loud speaker problem? The phrase "incompatibility of wireless temperament" has, in fact, become disastrously familiar.

"In future each individual listener will be able, so to speak, to consume his own smoke, without making himself a nuisance to his neighbour. No longer need the peace and quietness of our summer gardens be spoiled by the spill-over from Mr. Dogbody's loud speaker next door, nor need our highways any more be punctuated by obtrusive little bursts of wireless noise. This feature of broadcast reception has long been a standing reproach, all the more noticeable in these days when, as a result of, or, some may think, in spite of, the agitation insti-

tuted by the *Daily Wail*, unnecessary noise has been so largely eliminated from our daily life.

"On the æsthetic and technical side the innovation has advantages no less striking. We were given a demonstration of headphone reception, and as far as our ears could judge (and the ear, after all, is the final court of appeal in this matter) the new system has nothing to fear in a comparison with our best loud speakers in respect of acoustic fidelity. There was, indeed, a convincing air of reality about the reproduction. We were astonished to learn that this result can be accomplished without power valves or any of the recently developed poly-odes, and with a modest high-tension of no more than fifty volts. This, of course, is due to the relatively enormous efficiency of the new system. It is no longer necessary to agitate all the surrounding atmosphere, an extravagant process which has, moreover, attendant disadvantages in the matter of distortion arising from local resonances and standing waves. All that is required is the driving of a small, light, and virtually aperiodic connecting rod, joining the diaphragm of the ear-piece to the ear-drum of the listener. Thus an economy of means is effected which can only be compared with the epoch-making advance in wireless telegraphy constituted by the introduction of the beam system.

Definite Advantages.

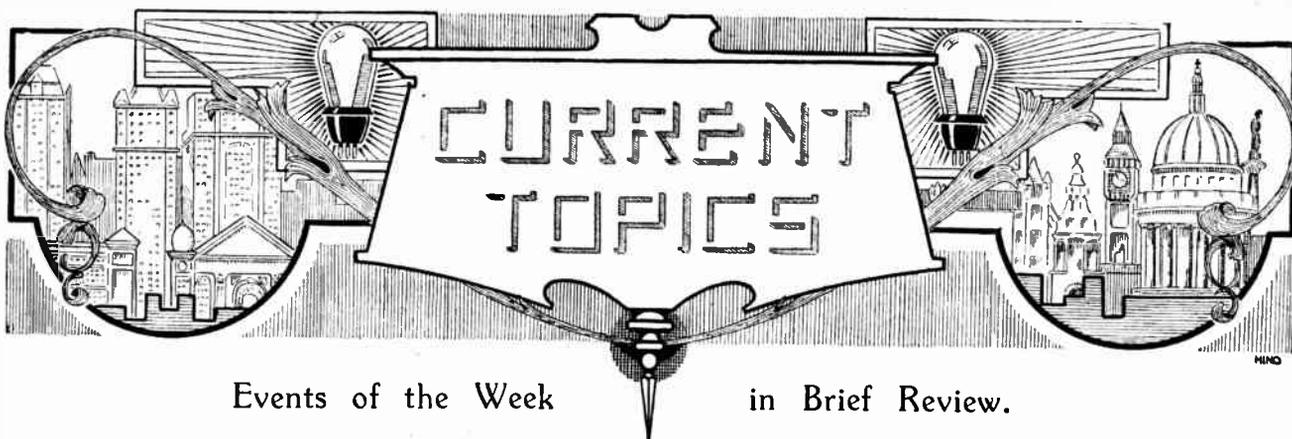
"In addition to this local concentration of the sound energy, the headphone listener has the further advantage of effective acoustic shielding from local disturbances, a feature which is not without its due significance in the domestic scheme. (Think what a blessing it would have been to the unfortunate man in the old story, who married a dumb wife and then rashly caused her to be cured.) To those who would criticise this deliberate isolation as unsocial it can be replied that



"Incompatibility of wireless temperament."

by the simple expedient of slightly displacing one ear-piece it is possible to maintain sufficient contact with the external world for ordinary social purposes.

"It is always rash to prophesy, but we feel that we run little risk in affirming that the new headphone reception is destined to displace loud speakers in all except certain special circumstances, dances, public addresses, and so on, where those very characteristics which are in the ordinary way a menace to social and domestic sanity, become temporarily advantageous." F. M. C.



Events of the Week in Brief Review.

DEUTSCHES RUNDfunk.

German broadcasting is celebrating its fifth birthday. There are now 2,334,253 licensed listeners.

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BELGIAN WIRELESS SHOW.

A wireless section is to be included in the twenty-second annual Belgian Motor Show in Brussels, to be held from December 8th to 19th next.

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UP-TO-DATE JAPAN.

Western innovations marked the enthronement of the Japanese Emperor at Kyoto last week. Descriptions of the ceremony were broadcast through Tokyo and Osaka, and pictures were transmitted for inclusion in the newspapers.

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AUSTRIA 'PHONES AMERICA.

The first wireless telephone service between Austria and America was inaugurated on November 3rd by an exchange of messages between Dr. Seipel, the Austrian Chancellor, and Mr. Kellogg, the U.S. Secretary of State.

The service makes use of the Trans-Atlantic telephone link between Rugby and New York.

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AN EMPIRE TELEPHONE SERVICE ?

A plan to bring the whole of the Empire into wireless telephonic communication with Great Britain is now being considered by the General Post Office. The Governments of the Australian Commonwealth, South Africa, and India have been communicated with and are understood to be giving the question sympathetic consideration.

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BRANDES BROADCASTING FROM HOLLAND.

The Sunday evening broadcasts from Hilversum on 1,071 metres, by arrangement with Messrs. Brandes, Ltd., the well-known wireless manufacturers, have been greeted with great enthusiasm by numbers of British listeners who welcome an orchestral concert which bridges the gap in the Sunday transmissions of the B.B.C. The concerts are given fortnightly between 5.40 and 7.10 p.m., the next being arranged for November 18th.

WANTED: ALL-NIGHT PROGRAMMES!

A South London resident puts in a plea for an all-night broadcasting service from 2LO. He is a night watchman and owns a portable set.

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ELIMINATING "BACK ANSWERS."

An Edgbaston architect has installed microphones in his house so that orders can be given to the cook through a loud speaker in the kitchen.

WIRELESS-CABLE MERGER BILL.

One of the most important debates during the present Parliamentary session will centre round the Wireless-Cable Merger Bill. It is expected that the Bill will be hotly contested.

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QUELLING DISORDER BY LOUD SPEAKER.

Loud speakers have been installed in the Belgian Parliament at Brussels. The microphone is under the control of the President of the Assembly, who, it is understood, will make full use of the apparatus in "shouting down" noisy members!

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PHOTO-TELEGRAPHY SOCIETY.

In view of the growing interest aroused by wireless picture transmission, it is felt that there is a need for a society devoting its activities exclusively to this subject. Such a society is now in process of formation, with headquarters in London, and arrangements are being made for a number of interesting lectures and demonstrations. Readers desirous of fuller information are invited to communicate with the hon. secretary (*pro tem.*) at "Nanterre," Penton Hook, Laleham, near Staines, Middlesex.

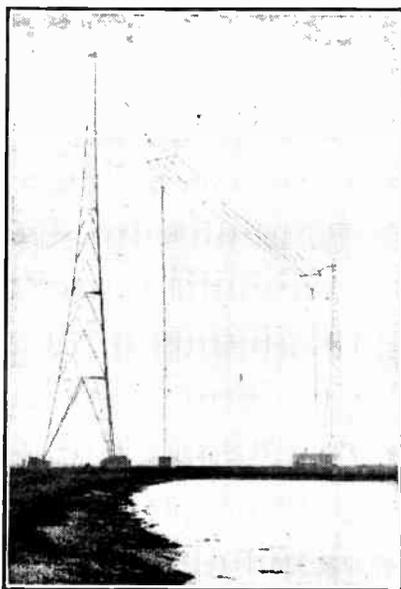
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NO MARKINGS ON WIRELESS PANELS.

That ebonite panels for wireless purposes, if marked with the name of the country of origin, would suffer disfigurement and consequent reduction of value, was one of the main arguments advanced by dealers and importers at a Board of Trade Enquiry on Monday of last week, when, under the Merchandise Marks Act, the India Rubber Manufacturers' Association asked for both an import and sale Order that imported rubber goods should be clearly marked with the country of origin.

The applicants submitted that panels for wireless should be pressed (rolled or stamped) on both sides, and that the envelope or container should also be marked. It was contended that purchasers preferred goods of British manufacture, but that the absence of distinguishing marks made identification difficult.

The importers submitted that the Merchandise Marks Act had been passed



A STATION WITHOUT A WAVELENGTH. Unkind things have been said about Kalundborg, the masts of which are seen above. Designed to work on 1,153 metres, a wavelength banned by the Washington Conference, Kalundborg has at present no official wavelength. It works on 1,680 metres and recently heterodyned 5XX.

MOUNTAIN WIRELESS TESTS.

Experiments in wireless transmission and reception at various heights on the Kazbek Peak in the Caucasus Mountains are being carried out by the Geographical Society of Georgia. Comparative measurements are to be made of signal strength at the foot of the Peak, at heights of 2,400 and 3,600 metres, and possibly at the summit, which is 16,541 feet high.

with the intention of protecting the purchaser in the United Kingdom to the extent of giving him the opportunity to distinguish between British and imported goods where a real possibility of confusion might be shown to exist. The applicants' case was an attempt to use the machinery of the Act to prejudice the respondents in their trade by asking for a Marking Order which in very many cases would have the effect of prohibiting the import of foreign made rubber goods in this country.

At Tuesday's hearing it was announced that the parties had come to an agreement regarding certain points, and that it was agreed that panels for wireless should not be marked.

WIRELESS FOR THE SICK.

Serious epidemics may be expected among school children at Histon (Cambs), a wireless set having been installed "for the entertainment of scholars who may be sick."

THE CAR OF THE FUTURE.

The day when no motor car is considered complete without a built-in wireless set is brought nearer by the enterprise of the Stutz Motor Co. of America, which has just produced a car incorporating a broadcast receiver in the instrument board. It is stated that the set is completely hidden except for the tuning dials and controls. Special shields are provided to eliminate dynamo and ignition noise. The aerial is concealed in the roof, and a miniature loud speaker occupies an inconspicuous place above the front screen.

South African Transmitters.

According to a correspondent in Bloemfontein, amateurs in South Africa are at present fettered with many restrictions. They work on whatever wavelength they choose, and are not very strictly tied down to the power employed. This happy state may, however, be changed if the South African authorities decide to be bound by the new International Regulations. Our correspondent's only complaint is on the subject of atmospheric; he writes, "Let no one at home ever grumble again about static: I have been out here three months in the South African winter with B.C.L. and short-wave receivers, and one is truly in luck's way if one hears any station above 20 metres free from a very virulent form of static." He also states that the shield-grid valve is used by some as a stage of R.F. for short-wave reception as, below 25 metres, the static does not appear to be amplified in the same ratio as the signal.

After November 15th, FO A7L (P. Kraus, Johannesburg) will be working on the 20-21-metre band on Sundays and Tuesdays from 2100 G.M.T., and hopes to get into touch with British stations. FO A3Y (A. S. Innes, Johannesburg) will also be transmitting at about the same time.

COLOURS BY WIRELESS.
Prof. Arthur C. Hardy, of the Massachusetts Technological Institute, has demonstrated a "recording spectrophoto-

mission, and the professor hopes that it will prove useful to dye experts when it is desired to match colours at a distance. The analysis curve gives adequate data for the reconstruction of the colour to the exact shade of the original specimen.

FORTHCOMING EVENTS.

WEDNESDAY, NOVEMBER 14th.
Edinburgh and District Radio Society.—At 8 p.m. At 117, George Street. "Loud Speakers."
Wigan and District Technical College Radio Society.—Lecture on Musical Appreciation, by Mr. Moses Baritz.
Musical Hill and District Radio Society.—At 8 p.m. At Tollington School, Tetherdown N.10. "Members' General Interest Evening."
Tottenham Wireless Society.—At 8 p.m. At 10, Bruce Grove N.19. Demonstration by Messrs. The Collection Radio Co. Institute of Wireless Technology. At 7 p.m. At the Engineers' Club, Coventry Street, W. Lecture: "A Radio Fog Signal Alarm for Ship Stations," by Mr. B. H. J. Kynanton.

THURSDAY, NOVEMBER 15th.
Leyton and Leytonstone Radio Society.—At 8 p.m. At Grove House, High Road, Leyton. Demonstration of "P.M. Nelson" Receiver.
Stretford and District Radio Society.—Annual general meeting.

FRIDAY, NOVEMBER 16th.
South Manchester Radio Society.—At the Co-operative Hall, Wilmslow Road, Didsbury. Auction of Members' surplus apparatus.

MONDAY, NOVEMBER 19th.
Newcastle-upon-Tyne Radio Society.—At 7.30 p.m. At 11, Saviour Row. Lecture: "Quality in Radio Reception," by Mr. C. C. V. Hodgson.
Croydon Wireless and Physical Society.—At 8 p.m. At 5, Altyre Road, East Croydon. An account of Volume Control Experiments, by Mr. Arthur J. Webb, M.A., B.Sc.

meter" to the Optical Society of America. When applied to coloured material, this device supplies a colour analysis curve suitable for picture trans-

BURGLARS AND BROADCASTING.

Although the brotherhood of burglars is experiencing qualms over the projected extension of police wireless facilities, it appears that what Bill Sikes may lose on the roundabouts can be recovered on the swings. An insurance assessor states that burglars have found wireless a useful ally on several occasions, particularly when their victims use headphones. In cutting out extraneous noises headphones help to cover up the little tactical mistakes which are made by even the most experienced burglars, and more than one robbery has recently occurred while householders have been enjoying the broadcast programme.

S.R.S. SW COIL ADAPTION.

With reference to the illustration of an S.R.S. short-wave coil adaption, illustrated on page 475 of our issue of October 3rd, this component is marketed by the Stonehouse Radio Supplies, 54, Union Street, Plymouth, Devon, and not by Messrs. Redfern's Rubber Works, Ltd., as stated.

N.S.F. CONDENSERS.

In connection with the review of these condensers on page 563 of the October 24th issue, it should be noted that the prices of the 0.0005 and 0.0003 capacities are 6s. 6d. and 6s. 3d. respectively, and not 7s. and 6s. 9d. as stated.

TRANSMITTERS' NOTES AND QUERIES.

Japanese Broadcasting Stations.

A correspondent in Yokohama sends us some interesting information about the present and projected broadcasting stations in Japan. Those at present in operation are:—

JOAK Tokio (Shingo), 870 kC (345 metres), 10 kW. to aerial.
JOBK Osaka (Senri), 750 kC. (400 metres), 10 kW. to aerial.
JOCK Nagoya, 810 kC. (370 metres) 1 kW. to aerial.
JODE Keijo, 820 kC. (366 metres), 1 kW. to aerial.
JOFE Hiroshima (Hara), 850 kC. (353 metres), 10 kW. to aerial.
JOGK Kumamoto (Shimidzu), 790 kC. (380 metres), 10 kW. to aerial.
JOHK Sendai (Haramachi), 770 kC. (390 metres), 10 kW. to aerial.
JOIK Sapporo (Tsukisappu), 830 kC. (361 metres), 10 kW. to aerial.

(The names in brackets indicate the location of the respective transmitters.)

During 1929 it is proposed to erect another 10 kW. transmitter at Nagoya, and one of 3 kW. aerial energy at Kana-zawa.

The Japan Broadcasting Association was formed by the amalgamation of three existing companies in the summer of 1926, and the directive board is appointed by the Japan Government Communications Department. It is hoped in the course of time to have a regular network of simultaneous broadcasting throughout the country.

Joint Ownership.

Mr. H. V. Wilkins asks us to state that the amateur station, 6WN, illustrated on page 572 of our issue of October 24th, is owned jointly by H. and L. Wilkins.

New Call-signs and Stations Identified.

6TZ R. Bortonley, Glynwood, Brighouse, Yorks. (In place of old call-sign 6BY). Trans. mits on 5.3, 10.6, 21.2, and 42.4 metres-crystal controlled.
2ANW G. Scott Sessions, 20, Grasmere Road, N.10.
5BC J. Blake, 91, White Hart Lane, Barnes, S.W.13.
2AOU C. C. Partridge, Government House Gardens, R.M. College, Camberley, Surrey.
5HH (ex 6BJ), F. Halden, 5, Frinton Road, Stamford Hill, N.15.
6PA H. C. Page, New Gardens Farm, Teynham, nr. Sittingbourne, Kent. (Change of address).
6UQ H. J. Eaves, 31, Oak Road Cleadle, Cheshire.
6WZ (ex 2BQK), J. McK. Wilkie, 102, Stanley Street, Aberdeen.
2AFB S. West, 33, Regent St., Great Yarmouth, wishes to cooperate with experimenters on 10 metres waveband.
2AUX J. Douglas, 47, Coquet St., Jarrow.

BUYERS' GUIDE, 1928-29.

The "Wireless World" Reference List of Receiving Sets.

CABINET-TYPE RECEIVERS.

ABBREVIATIONS USED IN THE TABLES.—High-frequency Stages: Ap = Aperiodic Interstage Coupling. TT = Tuned H.F. Transformer. TA = Tuned Anode. Detection: LG = Grid Condenser and Leak. AB = Anode Bend. Low-frequency Stages: TC = Transformer Coupled. RC = Resistance-capacity Coupled. Ch = Choke-capacity Coupled. Reaction: CC = Condenser-controlled, generally in conjunction with a fixed coil and H.F. choke. SC = Swinging or Rotary Coil.

Manufacturer.	Trade Name of Set.	Type.	Valves.							No. of Tuning Controls (excluding Reaction).	Re-action.	Price (including Royalties).	Remarks.	
			H.F.	H.F.	H.F.	D.	L.F.	L.F.	L.F.					
Automobile Accessories (Bristol), Ltd., Sion Road, Bedminster, Bristol.	P.D. Melody Two	American type. Cabinet, Oak	—	—	—	LG	TC	—	—	—	One	SC	£ 3 17 6	Pentode valve optional.
	P.D. Melodia Two	" " " Mahogany	—	—	—	LG	TC	—	—	—	One	SC	4 12 6	" " "
	P.D. Melody Three	" " " Oak	—	—	—	LG	TC	TC	—	—	One	SC	5 0 0	" " "
	P.D. Melodia Three	" " " Mahogany	—	—	—	LG	TC	TC	—	—	One	SC	5 15 0	" " "
Automatic Radio Manufacturing Co., Gosford Road, Beccles, Suffolk.	Universal Automatic	" " "	—	—	—	LG	TC	TC	—	—	None	—	26 10 0	With valves and grid batteries, provision for gramophone pick-up.
B.S.A. Radio, Ltd., Small Heath, Birmingham.	B.S.A. 0-V-1	—	—	—	—	LG	TC	—	—	—	One	SC	9 3 0	—
	0-V-2	—	—	—	—	LG	TC	TC	—	—	One	SC	17 1 0	—
	0-V-3	—	—	—	—	LG	TC	TC	TC	—	One	SC	32 6 0	Push-pull.
	1-V-2	—	—	TA	—	LG	TC	TC	—	—	Two	SC	23 14 0	—
	7-Valve	—	—	—	—	—	—	—	—	—	Four	—	69 13 0	*Seven-valve superhet.
	8-Valve	—	—	—	—	—	—	—	—	—	Two	—	60 18 0	*Eight-valve superhet. Push-pull.
Baty, E. J., 157, Dunstable Road, Luton.	Baty One	Skeleton	—	—	—	LG	TC	—	—	—	One	SC	2 15 0	Receiver only.
	Baty Four	Cabinet with cupboard	—	—	—	LG	TC	Ch	—	—	Two	SC	36 0 0	Complete with mains eliminator and distant control.
Bowyer-Lowe Co., Ltd., Letchworth, Herts.	Pentavox 2	Oak cabinet	—	—	TA	LG	TC	—	—	—	One	CC	6 8 9	With valves (Pentode last stage)
	Pentavox 3	" " "	—	—	TA	LG	TC	—	—	—	Two	CC	11 0 0	With valves (screened grid H.F., pentode L.F.).
Brandes, Ltd., Cray Works, Sidcup, Kent.	Brandset IIIA	Oak cabinet table model	—	—	—	LG	TC	TC	—	—	One	SC	7 5 0	With valves, mahogany cabinet, £1 extra.
	Brandset IIIB	" " "	—	—	—	LG	TC	TC	—	—	One	SC	8 17 6	With valves, mahogany cabinet, £1 7s. 6d. extra.
The British Radio Corporation, Ltd., Elm Grove Road, Weybridge, Surrey.	B.R.C. A.C. Mains Five	Cabinet	—	—	—	LG	RC	TC	—	—	One	CC	37 12 6	With valves and mains equipment.
	A.C. Mains Five	" " "	—	TA	TA	LG	RC	TC	—	—	One	CC	50 12 6	" " " (Screened-grid H.F. valves).
	Long Range Five	" " "	—	TA	TA	I.G.	RC	TC	—	—	Three	—	39 5 0	" " "
	Six	" " "	—	TA	TA	AB	RC	RC	RC	—	Two	—	45 0 0	" " "
	Exchange	" " "	—	TA	TA	AB	RC	RC	RC	—	Two	—	61 0 0	" " "
British Thomson Houston Co., Ltd., Alma Street, Coventry.	B.T.H. 2-Stage	Moulded base, cover and panel.	—	—	—	AB	RC	—	—	—	One	CC	5 0 0	*4 switches for 8 stations.
	B.T.H. 3-stage	Mahogany cabinet	—	—	—	AB	RC	TC	—	—	One	CC	9 10 0	With "Mazda" combined 2-stage valve.
	B.T.H. 2-Valve case	" " "	—	—	—	LG	TC	—	—	—	One	CC	4 2 6	With "Mazda" combined 2-stage valve, and L.F. valve.
	B.T.H. 5-stage cabinet	" " "	—	TA	TA	AB	RC	TC	—	—	Three	—	27 15 0	Receiver only.
The Brownie Wireless Company of Great Britain, Ltd., Nelson Works, Mornington Crescent, London, N.W.1.	Brownie 2-V.	Cabinet	—	—	—	LG	TC	—	—	—	One	SC	2 17 6	With "Mazda" combined 2-stage valve, 2-screened grid H.F. valves.
	Dominion Three	" " "	—	—	—	LG	RC	TC	—	—	One	CC	5 17 6	Including 2 coils. Excluding Royalties.
Burndepth Wireless (1928), Ltd., Eastnor House, Blackheath, S.E.3	Screened Ethophone	Metal case	—	—	TA	LG	TC	—	—	—	Two	CC	12 7 0	With valves. Screened grid H.F., pentode L.F.
	Screened Four	Mahogany Cabinet	—	—	TA	LG	RC	TC	—	—	Two	CC	29 16 0	With valves. Screened grid H.F. Extra for double-door cabinet: £2 7s. 6d.
	Empire Screened Four	" " "	—	—	TA	LG	RC	TC	—	—	Two	CC	29 16 0	With valves. Screened grid H.F.
	Ethodyne 7-Valve Super-heterodyne.	" " "	—	—	—	LG	RC	TC	—	—	Two	CC	52 5 6	*Superhet with two frame aerials. Extra for double-door cabinet, £5 7s. 6d.
	Short-wave Mark IV.	Screened mahogany cabinet	—	—	—	LG	RC	TC	—	—	One	CC	31 13 6	With valves. Wave range 12-100 metres.
Burne Jones & Co., Ltd., Magnum House, 296, Borough High Street, London, S.E.1.	Magnum 1929 Screened Five.	Table model	—	TT	TT	LG	RC	TC	—	—	One	CC	22 12 0	With valves.
Cholerton, F., 52, Bridge Street, St. Helens, Lancs.	Magnum Universal 3	" " "	—	—	TA	LG	TC	—	—	—	Two	CC	18 0 0	With valves. Screened grid H.F., pentode L.F.
	Rubophone Super 3	" " "	—	—	TA	LG	TC	—	—	—	Two	CC	10 10 0	With valves only. Screened grid H.F., pentode L.F.
Cook & Co., J. H., 51, Monks Road, Lincoln.	Chellatone	Cabinet	—	—	—	LG	TC	RC	—	—	One	SC	7 15 0	With valves, batteries and loud speaker.
		" " "	—	—	—	LG	TC	RC	—	—	One	SC	7 15 0	" " "
Cooks Wireless Co., Ltd., St. Helens Street, Ipswich.	C.W.C. Popular	Cabinet or table models	—	—	—	LG	TC	(RC)	(RC)	—	One	SC	5 5 0	With valves and batteries, 2, 3 and 4 valve sets as required.
	Standard	" " "	—	—	—	LG	TC	(RC)	(RC)	—	One	SC	to	" " "
	De Luxe	" " "	—	—	—	LG	TC	RC	(RC)	—	One	SC	12 0 0	" " "
	S.G. Three	Table model	—	—	TA	LG	TC	—	—	—	Two	CC	17 17 0	With valves and batteries.
Dew & Co., A. J., 33-34, Rathbone Place, Oxford Street, London, W.1.	Dewola Three	Vignette front cabinet	—	—	—	LG	TC	TC	—	—	One	SC	14 1 6	With valves and batteries.
	Dewola Fidelity Four	Closed type cabinet	—	—	TA	AB	RC	RC	—	—	Two	SC	15 8 0	Receiver only.
		" " "	—	—	—	—	—	—	—	—	—	—	32 8 0	With valves, batteries, and loud speaker.
		" " "	—	—	—	—	—	—	—	—	—	—	43 18 0	With valves, batteries and moving coil loud speaker.

Manufacturer.	Trade Name of Set.	Type.	Valves.							No. of Tuning Controls (excluding Reaction).	Re-action.	Price (including Royalties).	Remarks.
			H.F.	H.F.	H.F.	D.	L.F.	L.F.	L.F.				
Eagle Engineering Co., Ltd., Eagle Works, Warwick.	Chakophone Screened Three.	Pedestal	—	—	TA	LG	TC	—	—	Two	SC	1 s. d. 25 6 0	With valves and batteries. Screened grid H.F.
"	Economy Two	Table mode	—	—	—	LG	TC	—	—	One	SC	4 15 0	Receiver only. Pentode L.F.
"	Junior Series	Pedestal	—	—	—	LG	TC	—	—	One	SC	7 8 0	Receiver only. Pentode L.F.
"	"	Table	—	—	—	LG	TC	—	—	One	SC	4 2 6	Receiver and G.B. battery only.
Edison Bell, Ltd., Glengall Road, Peckham, S.E.15.	Majestic Compact Three	Self-contained Oak case	—	—	TA	LG	TC	RC	—	Two	SC	6 7 6	Receiver and G.B. battery only.
"	"	"	—	—	—	LG	RC	TC	—	One	CC	15 12 6	Receiver only.
"	"	"	—	—	—	—	—	—	—	—	—	9 0 0	extra for mahogany. 17s. 6d., or for Japanese lacquer. £3 10s.
Elleray, Ltd., R., Beacon Buildings, Kendal.	Beacon 2	Table model, American type	—	—	—	LG	TC	RC	—	One	SC	13 13 0	With valves, batteries and loud speaker. Provision for pick-up.
"	Beacon 4	"	—	—	TA	LG	TC	RC	—	Two	SC	18 0 0	With valves, batteries and headphone.
"	Beacon 2	Table model, upright	—	—	—	LG	TC	—	—	One	SC	6 0 0	"
Eriesson-Telephones, Ltd., 67-73, Kingsway, London, W.C.2.	Family Two	Oak case, folding doors	—	—	—	LG	TC	—	—	One	SC	9 14 0	With valves, batteries and loud speaker.
Fada Radio, Ltd., 31, Kingsway, London W.C.2.	Fada 8 (180B)	—	2TT	TT	TT	LG	TC	TC	TC	Two	None	73 2 6	With valves, wave range 200-600 metres.
"	Fada 7 All Electric A.C. (475-C.A.)	—	2TT	TT	TT	LG	TC	TC	—	Two	None	65 0 0	As for Fada 10 A.C.
"	Fada 7 (472-C.A.)	—	2TT	TT	TT	LG	TC	TC	—	Two	None	65 0 0	As for Fada 10 Z.A.C.
"	Special All Electric A.C. (265-C.A.)	—	TT	TT	TT	LG	TC	TC	—	Two	None	41 5 0	As for Fada 10 A.C. } See Portable Section
"	Fada Special (262-C.A.)	—	TT	TT	TT	LG	TC	TC	—	Two	None	41 5 0	As for Fada 10 Z.A.C. }
Falk Stadelmann & Co., Ltd., 83-95, Farringdon Road, London E.C.1.	Cromwell Two	Cabinet	—	—	—	LG	TC	—	—	One	SC	8 18 0	With valves, batteries, headphones and aerial gear.
"	Wolf Three	"	—	—	—	LG	RC	RC	—	One	SC	10 1 0	"
"	Wellington Three	"	—	—	—	LG	RC	TC	—	One	SC	14 13 6	"
"	Waterloo Screened 3	"	—	—	TA	LG	TC	—	—	Two	CC	17 0 0	With valves and batteries. Screened-grid H.F., pentode L.F.
Fallowfield, Jonathan, Ltd., 61 and 62, Newman Street, London, W.1.	Trafalgar Screened 4	Cabinet	—	—	TA	LG	TC	RC	—	Two	CC	55 10 0	With valves and batteries. Provision for eliminator.
"	Corner Cabinet Three	"	—	—	—	LG	TC	TC	—	One	SC	31 0 0	"
Freed Eisemann Radio of Gt. Britain, Ltd., 91, Regent Street, London, W.1.	Neutrodyne NR9	Cabinet	TT	TT	TT	LG	TC	TC	—	Three	—	25 0 0	Receiver only
Galoway, J. & L., Ltd., 38, Mair St., Plantation, Glasgow.	Lyricon 3	Cabinet	—	—	TA	LG	TC	—	—	Two	CC	20 0 0	With valves and batteries. Loud speaker, £2 18s. extra. A.C. battery eliminator in cabinet, £12 extra. Screened grid H.F., pentode L.F.
"	7 V. H.C. (for A.C. Mains).	Console cabinet	—	—	TA	LG	TC	TC	—	Two	CC	99 15 0	With valves, batteries and gramophone pick-up. Screened grid H.F. R.K. moving coil loud speaker.
Gambrell Radio, Ltd., Buckingham House, Buckingham Street, Strand, London, W.C.2.	Table-Model Two (for D.C. Mains).	Crystalline wood cabinet	—	—	—	LG	TC	—	—	One	CC	13 15 0	With valves and eliminator for D.C. mains.
"	(For A.C. Mains)	Oak two-door cabinet	—	—	—	LG	TC	—	—	One	CC	20 0 0	With valves and eliminator for A.C. mains.
"	Table-Model Three (for D.C. Mains).	"	—	—	—	LG	TC	RC	—	One	CC	23 5 0	With valves. Change-over switch for long-waves, and eliminator for D.C. mains.
"	(For A.C. Mains)	"	—	—	—	LG	TC	RC	—	One	CC	29 12 6	With valves. Change-over switch for long waves, and eliminator for A.C. mains.
"	Screened-Grid Four (for D.C. Mains).	Mahogany two-door cabinet	—	—	TA	LG	TC	RC	—	One	CC	32 0 0	With valves. Change-over switch for long waves, and eliminator for D.C. mains (screened-grid H.F.).
"	(For A.C. Mains)	"	—	—	TA	LG	TC	RC	—	One	CC	38 10 0	With valves. Change over switch for long waves, and eliminator for A.C. mains (screened-grid H.F.).
"	Console Five (for D.C. Mains).	Pedestal cabinet	—	TA	TA	LG	TC	RC	—	One	CC	68 0 0	With valves, frame aerial and loud speaker. Two screened grid H.F. valves, and eliminator for D.C. mains.
"	(For A.C. Mains)	"	—	TA	TA	LG	TC	RC	—	One	CC	—	With valves, frame aerial and loud speaker. Two screened grid H.F. valves, and eliminator for A.C. mains.
General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.	Geophone 2-V.	Cabinet type	—	—	—	LG	TC	—	—	One	SC	10 7 6	With valves and batteries. Wave range 280-510 metres.
"	Geophone Victor 3	"	—	—	—	LG	RC	RC	—	One	CC	8 10 0	With valves and batteries.
"	Geophone L. & D., 3-valve.	"	—	—	—	LG	TC	TC	—	One	CC	15 12 6	With valves and batteries. *One-control type. Switch for local and 5XX.
"	Geophone, 3-v., BC 2630	—	—	—	—	LG	TC	TC	—	One	CC	19 12 6	With valves and batteries. Wave range 230-3,100 metres.
"	All Electric Three	Self-contained	—	—	—	LG	TC	TC	—	One	CC	34 7 6	With valves. Power from mains.
"	Receiver and Gramophone Reproducer.	—	—	—	TT	LG	TC	TC	—	Two	—	31 12 6	With valves and batteries.
"	World Wide Screened-grid Four.	—	—	TA	TA	AB	TC	—	—	Two	—	28 0 0	With valves and batteries. 2 screened-grid H.F.
"	de Luxe	Cabinet model	—	TA	TA	AB	TC	—	—	Two	—	39 0 0	With valves and batteries; 2 screened-grid H.F.
"	Six-Valve	—	—	TT	TT	LG	TC	Ch	Ch	Three	—	56 10 0	With valves and batteries.
"	Seven-Valve Super Heterodyne.	—	—	—	—	—	—	—	—	Two	CC	57 10 0	With valves and batteries.
"	Eight-Valve Super Heterodyne.	—	—	—	—	—	—	—	—	Two	CC	70 0 0	*7-v. Superhet. With valves and batteries. *8-v. Superhet.

Manufacturer.	Trade Name of Set.	Type.	Valves.						No. of Tuning Controls (excluding Reaction).	Re-action.	Price (Including Royalties).	Remarks.	
			H.F.	H.F.	H.F.	D.	L.F.	L.F.					
Priestley & Ford, 3-11, Carrs Lane, Birmingham.	"Peeanef" (P. & F.) Three.	Cabinet, walnut panel	—	—	—	LG	RC	TC	—	One	CC	£ s. d. 12 12 0	Or complete with valves and batteries, £16 19s 6d.
W. G. Pye & Co., Montague Road, Cambridge.	Popular Two. No. 222	Cabinet model	—	—	—	LG	TC	TC	—	One	CC	6 0 0	Price includes valves.
	Screened Three. No. 360	" "	—	—	—	TA	LG	TC	—	Two	CC	19 7 6	Fitted with battery compartment. Price includes valve, screened grid H.F. and pentode L.F.
	No. 730	" "	—	—	—	TT	LG	TC	—	Two	CC	16 0 0	Price includes valves.
	No. 720	" "	—	—	—	—	LG	TC	—	One	CC	9 2 6	" "
	No. 740	" "	—	—	—	TT	AB	RC	TC	Two	CC	19 15 0	" "
	No. 830	" "	—	—	—	—	LG	TC	TC	Two	CC	15 0 0	" "
	No. 750	" "	—	—	—	TT	TT	LG	TC	Three	CC	30 0 0	" "
	Contact Mains Receiver	" "	—	—	—	—	—	—	—	—	—	—	—
	No. 730/M/AC.	" "	—	—	—	TT	LG	TC	—	Two	CC	27 10 0	Complete with mains unit
	No. 730/M/DC.	" "	—	—	—	TT	LG	TC	—	Two	CC	24 10 0	" "
	No. 740/M/AC.	" "	—	—	—	TT	AB	RC	TC	Two	CC	35 10 0	" "
	No. 740/M/DC.	" "	—	—	—	TT	AB	RC	TC	Two	CC	30 0 0	" "
	No. 250/M/AC.	" "	—	—	—	—	LG	TC	—	One	CC	22 2 6	" "
	No. 350/M/AC.	" "	—	—	—	TA	LG	TC	—	Two	CC	32 10 0	Complete with mains unit. Screened grid valve.
Radio Supply Co., Superfone Works, Four Oaks, Birmingham.	Superfone Maxum II.	Table model	—	—	—	TA	AB	TC	—	Two	CC	5 5 0	Receiver only. Pentode L.F. optional.
R. I. & Varley, Ltd., 103, Kingsway, London, W.C.2.	Superfone Maxum III.	Table cabinet	—	—	—	* TA	AB	RC	TC	Two	CC	10 10 0	" "
Read Radio, Ltd., 32, Newman Street, Oxford Street, London, W.1.	Country House. Long Range.	Cabinet type	—	—	—	—	—	—	—	Two	—	47 5 0	Price includes valves. " "
	Ultra Short Wave. Model U.S.3.	" "	—	—	—	—	—	—	—	—	—	—	" "
Redcliffe Radio Mfg. Co., 91A, Temple Street, Bristol.	Redcliffe Three	American type cabinet	—	—	—	TA	LG	TC	TC	One	SC	7 13 6	With valves. Pentode L.F.
The Rothermel Corporation, Ltd., 24-26, Maddox Street, London, W.1.	Redcliffe Screened Three	" "	—	—	—	—	—	—	—	Two	CC	18 18 0	With valves, screened-grid H.F., pentode L.F.
Saxon Radio Co., Henry Street Works, Blackpool, Lancs.	Bandbox Neutrodyne	Cabinet type	TT	TT	TT	LG	TC	TC	—	One	—	16 18 0	Excluding Royalties. Wave range 250-550 metres.
	"All-Electric-Three"	Cabinet or pedestal	—	—	—	AB	RC	TC	—	One	SC	11 15 0	Price includes battery eliminator, but excludes valves.
	"Super-Four"	" "	—	—	—	TA	AB	RC	TC	Two	—	9 17 6	Valves and accessories extra. Screened-grid H.F.
	Three-Valve Loud Speaker.	" "	—	—	—	—	LG	RC	TC	One	SC	6 10 0	Valve and accessories extra
	Two-Valve Loud Speaker	" "	—	—	—	—	LG	TC	—	One	SC	5 5 0	" "
Selectors, Ltd., 1, Dover Street, London, W.1.	Short Wave Three	Cabinet	—	—	—	—	LG	TC	TC	One	CC	15 19 0	Price excludes valves and batteries. Wave range 15-100 metres.
Sherman, P., Criterion Works, 12, Criterion Mews, Holloway, London, N.	Claremont II.	Cabinet type	—	—	—	—	LG	TC	—	One	SC	8 10 0	With all accessories, valves, batteries and loud speaker.
Simpler Wireless, Ltd., 55, Cardington Street, London, N.W.1	Simpler Wireless D.C. Model.	Cabinet	—	—	—	AB	*	*	—	One	CC	16 16 0	*Direct coupled L.F. stages. Price includes all accessories and complete mains equipment.
	Simpler Wireless A.C. Model.	" "	—	—	—	AB	*	*	—	One	CC	22 1 0	*Direct coupled L.F. stages. Price includes all accessories and complete mains equipment.
Smith & Son, W. Weymouth, Dorset.	Smith III.	" "	—	—	—	TA	LG	TC	—	Two	—	12 0 0	Screened grid H.F., pentode L.F. Provision for gramophone pick-up.
Stratton & Co., Ltd., Balmoral Works, Bromsgrove Street, Birmingham.	Eddystone S.W. Scientific Three.	" "	—	—	—	TA	LG	TC	—	One	CC	14 10 0	Excluding Royalties. Accessories extra. Screened-grid H.F., pentode L.F. Wave range 14-3,000 metres.
Tutills, Ltd., 7-9, Swan Street Manchester.	1829 N.R.IV.	American cabinet	—	—	—	TA	LG	TC	TC	Two	CC	24 12 0	Screened grid H.F. and push-pull output.
	Chronicle D.R.3.	" "	—	—	—	TA	LG	TC	—	Two	CC	16 10 0	With valves. Screened grid H.F., pentode L.F.
	Gramo Radio	Pedestal cabinet	—	—	—	—	AB	TC	—	One	CC	15 13 6	With valves and batteries, pentode L.F.
	Tinol Pedestal Pentode.	" "	—	—	—	—	LG	TC	—	One	CC	10 13 0	" "
Wathes & Co., Ltd., T. H., 86-88, High Street, Leicester.	Aureola 2V.	Table model	—	—	—	—	LG	TC	—	One	SC	6 6 0	With valves and batteries.
	" 3-V.	" "	—	—	—	—	LG	TC	—	One	SC	10 10 0	" "
	" 2-V.	" "	—	—	—	—	LG	RC	TC	One	SC	10 10 0	" "
	" 3-V.	" "	—	—	—	TA	LG	TC	—	Two	CC	20 0 0	" " Pentode L.F.
	" "	" "	—	—	—	—	—	—	—	Two	CC	20 0 0	" " Screened-grid H.F., pentode L.F.
	" "	Bureau	—	—	—	TA	LG	TC	—	Two	CC	35 0 0	" " with loud speaker.

PORTABLES AND SELF-CONTAINED SETS.

Manufacturer.	Trade Name of Set.	Type.	Valves.							No. of Tuning Controls (excluding Reaction).	Re-action.	Weight.	Dimen-sions.	Price (including Royalties).	Remarks.
			H.F.	H.F.	H.F.	D.	L.F.	L.F.	L.F.						
Æonic Wireless Co., Ltd., Coventry House, South Place, Moorgate Street, London, E.C.1.	Æonic Portable Combined Gramophone and 5 V. Receiver.	Self-contained cabinet	—	Ap	Ap	LG	TC	RC	—	One	CC	lbs. 40	18 × 15 × 10½	£ 35 0 0	With valves and batteries.
	Suitcase Five	Suitcase	—	Ap	Ap	LG	TC	RC	—	One	CC	22	15½ × 12½ × 8½	16 16 0	" " "
	Transportable Five	Self contained cabinet	—	Ap	Ap	LG	TC	RC	—	One	CC	28	16½ × 17½ × 8½	19 19 0	" " " Oak cabinet.
Atkinson C. Creswick, 356, High Street, Bedford.	N.S.5 Rover	Despatch case	—	Ap	Ap	LG	TC	TC	—	One	CC	30	15½ × 12½ × 10½	31 10 0	With valves, etc.
	Universal	"	—	Ap	Ap	LG	RC	TC	—	One	CC	28	15½ × 12½ × 9½	18 18 0	With valves, etc. and pentode.
	Reliance	Transportable	—	Ap	Ap	LG	TC	TC	—	One	CC	40	16½ × 17½ × 7½	32 11 0	With valves, etc., and gramophone pick-up.
	Drawing-Room	"	—	Ap	Ap	LG	TC	TC	—	One	CC	60	—	36 15 0	With valves, etc., and gramophone pick-up.
	Ball Room	"	—	Ap	Ap	LG	RC	TC	—	One	CC	—	—	81 0 0	With valves, etc., and gramophone pick-up. Pentode in parallel, moving coil loud speaker and eliminator.
Automobile Accessories (Bristol), Ltd., Sion Road, Bedminster, Bristol.	P.D. Melody Three Pedestal.	Self-contained model	—	—	—	LG	TC	TC	—	One	SC	—	—	7 7 6	
B. & J. Wireless Co., 2 and 3, Athelstane Mews, London, N.1, Bedford Electrical & Radio Co., Ltd., 22, Campbell Road, Bedford.	All British Super Four	Oak case	—	Ap	Ap	LG	TC	—	—	One	CC	30	15 × 15 × 8½	19 10 0	With valves and batteries. Pentode L.F. Extra for mahogany, £1 1s.
	Peerless Portable	"	—	—	TA	LG	TC	RC	—	Two	CC	30	18 × 17 × 9	25 0 0	With valves and batteries.
	Peerless Resonic Super Duovalve	Aluminium Pedestal Cabinet	—	—	—	LG	TC	—	—	One	SC	—	13 × 7 × 8 × 30	6 5 0	With valves D.C., H.T. eliminator and L.T. accumulator. Pentode L.F.
	R.C. Trivalve	Cabinet	—	—	—	AB	RC	RC	—	One	SC	40	18 × 18 × 14	23 7 6	With valves and batteries.
	"	"	—	—	—	AB	RC	RC	—	One	SC	40	18 × 18 × 14	25 0 0	With D.C. eliminator.
" " " "	Duovalve	Pedestal Cabinet	—	—	—	LG	TC	—	—	One	SC	30	17 × 17 × 30	12 0 0	With valves and batteries.
	"	"	—	—	—	LG	TC	—	—	One	SC	30	17 × 17 × 30	15 10 0	With D.C. eliminator.
	Super Five	Cabinet	—	—	Ap	AB	RC	RC	RC	One	SC	72	24 × 24 × 24	46 10 0	With valves, D.C. eliminator and two L.T. accumulators.
	"	"	—	—	—	—	—	—	—	—	—	—	—	—	With valves and G.B. battery. Battery cabinet extra, £1 15s., screened grid H.F. pentode L.F.
	"	"	—	—	—	—	—	—	—	—	—	—	—	—	With valves, G.B. battery and frame aerial in lid, screened grid H.F.
Bowyer-Lowe Co., Ltd., Letchworth, Herts.	Vox Populi 3	Oak cabinet	—	—	TT	AB	RC	—	—	Three	CC	21	11½ × 24 × 12	20 0 0	With valves and G.B. battery, screened grid H.F. pentode L.F.
" " " "	Vox Populi 4	"	—	—	TT	AB	RC	TC	—	Three	CC	25	11½ × 24 × 12	24 0 0	With valves, G.B. battery and frame aerial in lid, screened grid H.F.
	Gramoradiophone	Combined gramophone and receiver.	—	—	TT	AB	RC	—	—	Three	CC	—	34 × 20 × 34	39 0 0	With valves and G.B. battery, screened grid H.F., pentode L.F.
	"	"	—	—	—	—	—	—	—	—	—	—	—	—	With valves, batteries and loud speaker.
The British Radio Corporation, Ltd., Elm Grove Road, Weybridge, Surrey.	B.R.C. Screened Five Portable.	Portable cabinet	—	TA	TA	LG	TC	TC	—	One	—	35	18 × 14 × 7	30 9 0	
British Thomson-Houston Co., Ltd., Alma Street, Coventry.	B.T.H. Portable	Self-contained	—	—	TA	LG	RC	TC	—	Two	CC	42	—	26 10 0	With valves and batteries. " Mazda " 2-stage combined valve. Screened grid H.F.
" " " "	B.T.H. 5-Stage de Luxe.	Mahogany inlaid pedestal cabinet.	—	TA	TA	AB	RC	TC	—	—	—	184	20½ × 40 × 16½	110 0 0	Complete with valves, loud speaker and amplifier, battery eliminator and 2 screened grid H.F. Last stage has 2 valves in parallel. Provision for gramophone pick-up.
	Burgoyne A	Self-contained	—	Ap	Ap	LG	RC	TC	—	One	CC	26	15 × 12 × 8	21 0 0	With valves and batteries. Wave-range, 250-550 metres.
	" A1	"	—	Ap	Ap	LG	RC	TC	—	One	CC	26	15 × 12 × 8	22 1 0	" " " "
" " " "	" B	De Luxe in Morocco case	—	Ap	Ap	LG	RC	TC	—	One	CC	26	15 × 12 × 8	26 5 0	" " " "
	Screened Portable	Mahogany or crocodile leather	—	—	TA	LG	TC	TC	—	Two	CC	30	16 × 16 × 9	25 12 6	With valves, batteries and loud speaker. Screened grid H.F.
	"	Morocco case	—	—	TA	LG	TC	TC	—	Two	CC	30	16 × 16 × 9	30 0 0	" " " "
Cantophone Wireless Co., Reino House, 310, Regent Street, London, W.1.	Portable Five	Self-contained	—	Ap	Ap	LG	TC	TC	—	One	CC	27	17 × 14 × 7½	31 10 0	With valves, batteries and built-in loud speaker. Pentode L.F. Provision for pick-up.
	"	"	—	—	—	—	—	—	—	—	—	—	—	—	With valves, batteries and headphones.
	Two	"	—	—	—	LG	TC	—	—	One	CC	10	12 × 9 × 5	10 10 0	

Manufacturer.	Trade Name of Set.	Type.	Valves.							No. of Tuning Controls (excluding Reaction).	Re-action.	Weight.	Dimensions.	Price (including Royalties).	Remarks.
			H.F.	H.F.	H.F.	D.	L.F.	L.F.	L.F.						
Forster, G., Carlton House, Regent Street, London W.1.	Advance Portable 5-Valve	Mahogany or oak case	—	Ap	Ap	LG	TC	TC	—	One	CC	lbs. 30	in. 16 × 17 × 9	£ 22 15 0	With valves, batteries and loud speaker. Waterproof cover 10s. extra.
" " "	" " 3-Valve	" " "	—	—	—	LG	TC	TC	—	One	CC	28	16 × 17 × 9	17 15 0	With valves and batteries. Provision for pick-up.
Franklyn, A. G., 3, Boar Lane, Leeds.	Pegasus Four	Self-contained oak case	—	—	—	AB	RC	RC	RC	One	CC	12½	10 × 17 × 12	12 0 0	With valves and batteries H.T. eliminator, £6 extra. Provision for pick-up.
" " "	Pegasus Rover	Mahogany or oak case	*	*	*	AB	RC	TC	—	Two	—	32	17 × 20 × 7	40 0 0	*3-Valve superhet. With valves and batteries. Provision for pick-up.
Galloway, J. & L., Ltd., 38, Mair Street, Plantation, Glasgow, S.W.1.	Galloway S.P. 8-V.	—	*	*	*	*	*	RC	TC	Two	—	16	16 × 10 × 8	39 9 6	With valves, batteries and aerial. *3-Valve superhet.
Garnett Whiteley & Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.	Lotus Transportable	Self-contained, oak model	—	—	TA	LG	TC	—	—	Two	CC	38	15½ × 19½ × 9½	31 10 0	With valves and batteries. Screened grid H.F., pentode L.F. Extra for mahogany or walnut, 21s.
" " "	Lotus Portable	Self-contained	—	—	TA	LG	TC	—	—	Two	CC	35	12 × 15½ × 13	31 10 0	With valves and batteries.
General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.	Gecophone 5-V Portable	Self-contained	—	Ap	TT	LG	TC	TC	—	Two	CC	—	20½ × 14½ × 8½	29 0 0	With valves and batteries.
Gotthob & Co., Ltd., J. L., 15, Crouner Street, Gray's Inn Road, London, W.C.1.	R.S.V.P. Portable V.	Self-contained cabinet	—	Ap	Ap	LG	TC	RC	—	One	CC	28	16½ × 17½ × 8½	19 19 0	With valves and batteries.
" " "	" Screened Grid Four	" " "	—	—	TA	LG	TC	TC	—	Two	CC	28	16½ × 17½ × 8½	25 0 0	" " " Screened grid H.F.
Hart Collins, Ltd., 38a, Bessborough Road, Westminster, S.W.1.	Tourist Portable 5	Oak cabinet	—	Ap	Ap	AB	TC	TC	—	One	CC	29	16 × 16½ × 7	30 0 0	With valves and batteries. Mahogany, £1 extra.
" " "	" " "	Suitcase, crocodile leather	—	Ap	Ap	AB	TC	TC	—	One	CC	24	12 × 14½ × 8½	32 6 0	With valves and batteries. Provision for pick-up.
" " "	Passport Transportable 5	Walnut cabinet	—	Ap	Ap	LG	TC	TC	—	One	CC	28	13½ × 15½ × 7½	21 12 6	With valves and batteries.
" " "	" " "	Suitcase	—	Ap	Ap	LG	TC	TC	—	One	CC	24	12 × 14½ × 8½	21 12 6	" " "
Heath Plugs Ltd., Kennington Cross, London, S.E.11.	H.P.L. Local 3	Self-contained	—	—	—	LG	TC	TC	—	One	SC	20	12 × 12 × 9	15 10 0	With valves and batteries. Wave range 225-550 metres.
" " "	H.P.L. Super 5	"	—	Ap	Ap	LG	TC	RC	—	One	CC	23	18 × 18½ × 6	23 12 6	With valves and batteries Wired for pick-up.
Henderson & Co., Ltd., W. J., 351, Fulham Road, London, S.W.10.	Henderson "O."	Self-contained	—	Ap	Ap	LG	TC	RC	—	One	CC	28	14 × 13½ × 9½	30 0 0	With valves and batteries.
" " "	" " P."	"	—	Ap	Ap	LG	TC	RC	—	One	CC	24½	14½ × 13 × 7½	26 0 0	" " "
" " "	" " R."	"	—	Ap	Ap	LG	TC	RC	—	One	CC	23	15 × 15 × 7½	26 0 0	" " "
" " "	" " S."	"	—	Ap	Ap	LG	TC	RC	—	One	CC	31	17 × 12½ × 9½	28 0 0	" " "
Igranie Electric Co., Ltd., 149, Queen Victoria Street, London E.C.	Neutrosone 7	Transportable	*	*	*	AB	Ch	—	—	Three	—	24	17 × 14 × 11	42 12 0	*7-T. superhet. With valves and headphones. Batteries, frame aerial and loud speaker in containers, £21 extra.
" " "	Universal Portable	Portable	—	TA	Ap	LG	RC	TC	—	One	CC	22½	16½ × 16½ × 9	26 7 0	With valves, G.B., battery, aerial and earth equipment, frame aerial and loud speaker. Screened grid H.F. Extra for battery case and batteries, £7.
Langham Radio, 96, Regent Street, London, W.1.	Transportable V.	Oak case	—	TT	Ap	LG	TC	TC	—	One	CC	36	19½ × 11½ × 15	36 15 0	With valves and batteries. Mahogany case, £1 1s. extra. Provision for pick-up.
" " "	Transatlantic Portable Radio Gramophone.	—	—	TT	Ap	LG	TC	TC	—	One	CC	27½	14 × 14 × 9	36 15 0	With valves and batteries. Provision for pick-up.
Lawrence Radio, 262, Midland Station Approach, Leytonstone, London, E.11.	Atophone	Self-contained	—	Ap	Ap	LG	RC	TC	—	One	CC	24	14 × 14 × 9	22 10 0	With valves, batteries and loud speaker.
Lever, E. J. (Trix), Ltd., 8-9, Clerkenwell Green, London, E.C.1.	Trix Portette	Mahogany case	—	—	—	LG	—	—	—	One	CC	6½	6 × 6 × 8	5 10 0	With valve, batteries and headphones. Kexine covered 10s. 6d. extra. Wave range 250-500 metres.
" " "	Trix Portable 5	Mahogany cabinet	—	Ap	Ap	LG	RC	TC	—	One	CC	28	17 × 15½ × 8½	18 13 10	With valves, batteries and loud speaker. Provision for pick-up. Wave range 250-500 metres.
" " "	" " "	Leather case	—	Ap	Ap	LG	RC	TC	—	One	CC	26	16½ × 15 × 8	19 16 4	With valves, batteries, and loud speaker. Provision for pick-up.
Lindley & Co., 14, Great Queen Street, Kingsway, London, W.C.2.	Lindley Five	Transportable	—	Ap	Ap	LG	RC	TC	—	One	CC	33	18 × 16 × 9	27 0 0	With valves and batteries.
" " "	" " "	Attaché case	—	Ap	Ap	LG	RC	TC	—	One	CC	27	12½ × 15 × 9	19 19 0	" " "
London Electrical Co., 1, Sherborne Lane, King William Street, London, E.C.4.	Lecodyne P.5	—	—	Ap	Ap	LG	TC	TC	—	One	CC	33	18 × 16½ × 7½	28 5 0	With valves, batteries and loud speaker

Manufacturer.	Trade Name of Set.	Type.	Valves.						No. of Tuning Controls (excluding Reaction).	Re-action.	Weight.	Dimensions.	Price (including Royalties).	Remarks.	
			H.F.	H.F.	H.F.	D.	L.F.	L.F.							
London Radio Manufacturing Co., Ltd., Station Road, Merton Abbey, London, S.W.19.	Orphean	Transportable	—	—	Ap	LG	TC	—	—	Two	CC	lbs. 30	in. 14½ × 17½ × 8½	£ s. d. 21 0 0	With valves and batteries. Screened-grid H.F., pentode L.F. Provision for pick-up.
M.P.A. Wireless, Ltd., 62, Conduit Street, London, W.1.	Octroda	Self-contained	—	—	—	LG	TC	—	—	One	CC	20	15 × 19½ × 9	15 1 6	With valves, batteries and loud speaker. Pentode L.F.
" " "	Octroda de Luxe	"	—	—	—	LG	TC	—	—	One	CC	22	15½ × 20 × 9½	20 6 6	With valves, batteries and moving coil loud speaker. Pentode L.F.
McMichael, Ltd., L., Wexham Road, Slough.	Portable Five	Leather case	—	Ap	Ap	LG	TC	TC	—	One	SC	30	15½ × 12½ × 8½	28 7 0	With valves, batteries and loud speaker.
" " "	Super Screen Portable Four.	Walnut case	—	TA	Ap	LG	TC	—	—	One	CC	35	18 × 15½ × 7	36 15 0	" " " " Screen grid
Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.	Marconiphone Model 53	Self-contained cabinet	—	Ap	Ap	LG	TC	TC	—	One	CC	30	18 × 16 × 7½	29 8 0	H.F., pentode L.F. With valves, batteries and loud speaker.
The Nottingham Radio Supplies, 33, Mansfield Road, Nottingham.	Chantecler Transportable III.	Self-contained	—	Ap	Ap	LG	TC	—	—	One	—	—	36 × 20 × 20	19 4 0	Pentode L.F. Complete with valves and loud speaker built in.
The Ormond Engineering Co., Ltd., 199-205, Pentonville Road, King's Cross, London, N.1.	Ormond Console Radio Gramophone R/351.	Self-contained	—	—	—	LG	TC	TC*	—	One	CC	100	37 × 19 × 40	50 0 0	Complete with valves, batteries and Woodroffe pick-up.
" " "	Ormond Leather Portable R/303.	"	—	Ap	Ap	LG	TC	TC	—	One	CC	28	16 × 13 × 9	27 19 10	*Push-pull output. In brown crocodile, complete with valves and all accessories.
" " "	Ormond Cabinet Portable R/203.	"	—	Ap	Ap	LG	TC	TC	—	One	CC	33	18 × 14 × 9	25 8 9	Complete with valves, turntable and all accessories.
" " "	Ormond Pedestal Radio Gramophone R/301.	"	—	—	—	LG	TC	TC	—	One	CC*	80	16 × 18 × 46	45 0 0	Complete with valves and all accessories, including Woodroffe pick-up. *Push-pull output.
Pendona Wireless Co., 3, Edmond Street, Birmingham.	Pandona S.C. IV.P.	Self-contained	—	—	TA	LG	TC	TC	—	Two	CC	30	15 × 19 × 10	24 3 0	Including valves, batteries and loud speaker. Screened-grid H.F., pentode output.
F. D. Philipps, 42a, Catharine Street, Liverpool.	Classic Three	Self-contained	—	—	—	LG	RC	TC	—	One	CC	—	18 × 14 × 10	14 0 0	Price with valves and batteries.
" " "	Classic Screened Three	"	—	—	TA	LG	TC	—	—	Two	CC	—	18 × 14 × 10	16 0 0	Screened-grid. Price with valves and batteries.
Portable Utilities Co., Ltd., The Eureka House, Fisher Street, London, W.C.1.	Orth-o-dyne 3	Portable	—	—	TA	LG	TC	—	—	Two	CC	30	15½ × 12½ × 9½	27 6 0	Complete. Screened-grid H.F., pentode L.F. Wave range, 200-550 metres.
" " "	" 3	Transportable	—	—	TA	LG	TC	—	—	Two	CC	38	17 × 14½ × 12	27 6 0	Complete. Screened-grid H.F., pentode L.F. Wave range, 1,000-1,900 metres.
" " "	" 5	Portable	—	Ap	Ap	LG	TC	TC	—	One	CC	50	15½ × 12½ × 9½	33 12 0	Complete.
" " "	" 6	Transportable	—	Ap	Ap	LG	TC	TC	—	One	CC	38	17 × 14½ × 12	33 12 0	"
Price & Co., Alexander, 11, Hart Street, New Oxford Street, London, W.C.2.	Classic III.	Portable	—	—	TA	LG	TC	—	—	One	CC	27	16 × 16 × 6	17 6 0	Complete. Waverange, 250-550 metres.
Pye & Co., W. G., Montague Road, Cambridge.	No 25	Portable	—	Ap	Ap	LG	TC	TC	—	One	SC	30	8½ × 16½ × 16½	23 10 0	Inclusive of all accessories.
" " "	Presentation Two	Self-contained, type 275	—	—	—	LG	TC	—	—	One	CC	19	15 × 14 × 8	13 0 0	Inclusive of all accessories and Celestion speaker.
R. I. & Varley, Ltd., 103, Kingsway, London, W.C.2.	Mains Receiver	Self-contained	—	—	TA	AB	RC	TC	—	One	CC	—	19½ × 13½ × 15	35 0 0	A.C. } Complete with valves and elim-D.C. } inator. Screened-grid H.F.
Radiocraft Supplies, Ltd., 9, The Arcade, Walsall, S. Staffs.	Peter Pan	Self-contained	—	—	—	AB	TC	—	—	One	CC	—	14 × 8 × 8	5 15 0	Including valves (pentode) and batteries.
" " "	Consol	Transportable	—	—	TA	AB	TC	—	—	Two	—	—	36 × 18 × 18	26 5 0	Complete with valves (screened-grid and pentode), batteries and loud speaker.
Radio Supply Co., Superfone Works, Four Oaks, Birmingham.	Superfone Maxum Portable 5.	Self-contained, mahogany cabinet.	—	Ap	Ap	LG	TC	RC	—	One	CC	—	14½ × 17½ × 8½	26 5 0	With batteries and loud speaker.
Read & Morris, Ltd., Castle Street, Oxford Street, London, W.1.	Boudoir D.C. Three	Self-contained	—	—	—	LG	RC	TC	—	One	SC	—	18 × 14 × 12	23 10 0	Complete with valves and D.C. eliminator.
" " "	Simplicity Mains Two	"	—	—	—	LG	TC	—	—	One	SC	—	16 × 10 × 8½	20 0 0	Complete with valves and A.C. eliminator.
" " "	Melody Master	Self-contained floor cabinet	—	TT	TT	AB	RC	TC	—	One	CC	—	34 × 25 × 24	75 0 0	A.C. mains model with valves and eliminator for M.C. loud speaker
" " "	Lone Star Overseas Four	Self-contained teak cabinet	—	—	TA	LG	RC	TC	—	Two	CC	—	27 × 9 × 14	37 10 0	A.C. eliminator, (12 extra, or including short wave adaptation, £52. Complete screened-grid H.F.
Read Radio, Ltd., 33, Newman Street, Oxford Street, London, W.1.	Reaco	Portable	—	Ap	Ap	LG	TC	TC	—	One	CC	24	—	26 0 0	Complete with loud speaker.
" " "	Real	Transportable	—	Ap	Ap	LG	TC	TC	—	One	CC	—	—	35 2 6	" " " "
Redcliffe Radio Mfg. Co., 81A Temple Street, Bristol.	Redcliffe V.	Portable	—	Ap	Ap	LG	TC	TC	—	One	CC	32	18 × 18 × 7	27 15 0	With valves and Batteries. Pentode L.F. if required.

Manufacturer.	Trade Name of Set.	Type.	Valves.							No. of Tuning Controls (excluding Reaction).	Re-action.	Weight.	Dimensions.	Price (including Royalties).	Remarks.
			H.F.	H.F.	H.F.	D.	L.F.	L.F.	L.F.						
Rees Mace Manufacturing Co., Ltd., 39a, Welbeck Street, London W.1.	Screened Five	Self-contained	—	TA	Ap	LG	TC	TC	—	Two	CC	lbs. 33	m. 17½ × 16½ × 8½	£ s. d. 35 14 0	With valves and batteries, screened-grid H.F.
	Grand Five	"	—	Ap	Ap	LG	TC	TC	—	One	CC	38	20½ × 19½ × 8½	35 14 0	With valves and batteries.
	Medium Five	"	—	Ap	Ap	LG	TC	TC	—	One	CC	30	17½ × 16½ × 8½	28 7 0	" " "
	Baby Grand Five	"	—	Ap	Ap	LG	TC	TC	—	One	CC	30	15½ × 14½ × 8½	26 5 0	" " "
	Pentode Three	"	—	—	Ap	LG	TC	—	—	One	CC	29	15½ × 14½ × 8½	19 19 0	" " " pentode L.F.
Rialton Radio (H. & S. Scott, Ltd 27, Old Bond Street, London, W.1.	Rialton IV.	Portable	—	Ap	Ap	LG	TC	—	—	One	CC	—	12 × 9 × 19	19 19 0	Uses pentode valve.
	Melva V.	Transportable	TA	TA	TA	LG	TC	—	—	Two	—	—	17 × 18 × 9	42 0 0	Three screened-grid stages and pentode. Complete with valves and batteries.
Rideed Cone Co., Ltd., York House, Southampton Row London, W.C.1.	Majestic	Self-contained	—	Ap	Ap	LG	TC	TC	—	One	CC	30	9 × 14½ × 17½	23 10 0	Complete with valves, batteries and loud speaker.
The Rothermel Corporation Ltd., 24-26, Maddox Street, London, W.1.	Rothermel Gembox	Self-contained	—	TT	TT	LG	TC	TC	—	One	—	—	—	25 0 0	A.C. mains operated. Wave range, 250-550 metres.
	Rothermel Showbox	"	TT	TT	TT	LG	TC	TC*	—	One	—	—	18 × 11 × 7½	37 10 0	A.C. mains operated. *Push-pull output. Wave range 250-550 metres.
Royal Radio Co., 4-5, Dorset Mews North, Upper Gloucester Place, London, N.W.1.	Royal 3.	Suitcase Portable	—	—	—	LG	RC	TC	—	One	CC	23	14½ × 14½ × 9	12 12 0	Complete with valves, batteries and loud speaker. Wave range 250-650 metres.
	" 4.	"	—	—	Ap	LG	RC	TC	—	One	CC	23½	14½ × 14½ × 9	13 13 0	" " " "
	" 5.	"	—	Ap	Ap	LG	RC	TC	—	One	CC	24	14½ × 14½ × 9	14 14 0	" " " "
	" 5. De Luxe	"	—	Ap	Ap	LG	RC	TC	—	One	CC	24	14½ × 14½ × 9	15 15 0	" " " " Wave range 250-650 and 950-2,000 metres.
Selectors, Ltd., 1, Dover Street, London, W.1.	Screened Grid Three	Self-contained	—	—	TA	LG	TC	—	—	Two	—	24	7 × 12 × 16½	21 0 0	Complete with valves and batteries. Screened-grid H.F.
	Attaché Case. Five	"	—	Ap	Ap	LG	TC	TC	—	One	CC	28	13 × 13½ × 8½	31 10 0	Complete with all accessories. Provision for gramophone pick-up.
	Cabinet Five	"	—	Ap	Ap	LG	TC	TC	—	One	CC	28	17 × 17 × 7	31 10 0	Price includes all accessories, including cover.
	Super Seven Portable	"	—	—	—	LG	TC	TC	—	—	—	50	18 × 18 × 8	54 12 0	*7-valve super-heterodyne. Provision for gramophone pick-up.
Sherman, P., Criterion Works, 12, Criterion Mews, Holloway, London, N.	Claremont Automatic	Self-contained. Clock or console type.	—	—	—	—	—	—	—	Two	CC	—	—	75 0 0	Four valves 1-v-2. Switches on and off at predetermined times, acts as clock and drives other clocks, automatically charges batteries.
	" III	Self-contained pedestal cabinet	—	—	—	—	—	—	—	Two	CC	16	—	15 10 0	Three valves 1-v-1. Complete with valves, batteries and loud speaker.
	" IV	Self-contained	—	—	—	—	—	—	—	Two	CC	—	—	35 0 0	Four valves 1-v-2. Includes pick-up, gramophone and moving coil loud speaker.
Stratton & Co., Ltd., Balmoral Works, Bronsgrove Street, Birmingham.	Eddystone Scientific Portable Three.	Portable	—	—	TA	LG	TC	—	—	Two	CC	54	15½ × 15½ × 10	26 15 0	Price includes all accessories and loud speaker. Screened-grid H.F. and pentode L.F.
	Nustyle Five	Self-contained set and Gramophone.	—	Ap	Ap	LG	TC	TC	—	One	CC	35	17 × 18 × 10	19 19 0	Complete, with all accessories, and gramophone pick-up, also voltmeter.
Victor Portable Wireless Co., Ltd., Charterhouse Chambers, Charterhouse Square, London, E.C.	Super Six	Self-contained	—	—	—	—	—	—	—	Two	CC	35	9 × 18 × 20	20 0 0	*6-valve super-heterodyne. Price includes all accessories. 2 screened-grid H.F., pentode L.F.
" " "	Victor Three	"	—	—	TA	LG	TC	—	—	Two	CC	32	14 × 16 × 10	17 17 0	Price includes all accessories. Screened-grid H.F., pentode L.F.
	Victor Five	"	—	Ap	Ap	LG	TC	RC	—	One	CC	—	17 × 17 × 8½	16 16 0	Including cover.
Whittingham Smith & Co., 110, Kew Green, Kew.	Portadyne Junior	Self-contained cabinet	—	Ap	Ap	LG	RC	TC	—	One	CC	26	14½ × 12 × 8	19 19 0	With valves and batteries.
	Portadyne F.	"	—	Ap	Ap	LG	TC	TC	—	One	CC	30	17 × 14 × 8½	31 10 0	" " " "
Wingrove & Rogers, Ltd., Arundel Chambers 188-189, Strand, London, W.C.2.	Polar Portable	Wooden case	—	Ap	Ap	LG	TC	TC	—	One	CC	36	17½ × 16½ × 8½	27 6 0	With valves and batteries.
	Polar IIIA	"	—	—	—	LG	RC	TC	—	One	CC	14½	10 × 16½ × 11½	11 18 6	desired. " " Pentode L.F.

1928.



BARCELONA (Radio Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—6.0, Market Report and Exchange Quotations. 6.10, Sextet Selections: Pascalle, Sabor de España (Fuste); Le charme étrange (Ackermans); Romance (Calvo); Waltz, Charmaine (Parés); Selection from Benamor (Luna). 8.30, Advanced French Lesson by Prof. Martin. 9.0, Chimes and Weather Report. 9.5, Exchange Quotations and News. 9.10, Orchestral Concert: March, On the Quarter Deck (Alford); Selection from Gigantes y Cabaludos (Caballero); Ritmos de España (Raurich); Demande et réponse (Coleridge-Taylor); Intermezzo (d'Ambrosio); Czardas (Monti). 10.0, Programme relayed from Madrid, EAJ7.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—3.0, Talk by Prof. Lampe. 3.30, Programme from Hamburg. 4.30, Herr Falkenberg, Talk: An Official's Leisure. 5.0, The "Eternal Source"—Dialogue by Fritz Ramina and a Waterworks Employee. 5.30, Elementary Spanish Lesson. 5.55, Dr. Elias Hurwitz, Talk: The Russian World. 6.30, Herr Haase-Faulenorth, Talk: Genealogy. 7.0, Orchestral Concert: Overture to Jessoada (Spohr); Romance in F Major for Violin (Beethoven); Selection from Czar and Carpenter (Lortzing); Peer Gynt Suite No. 1 (Greig); Overture to Tannhäuser (Wagner); Dance Suite from The Bartered Bride (Smetana); Violin Solo, Zigeunerweisen (Sarasate); Waltz, Wiener Blut (Joh. Strauss). Followed by News and Dance Music from Voxhaus.

BERLIN (Voxhaus) (494 metres); 4 kW.—9.10 a.m., Market Prices. 9.15 a.m., Weather Report, News and Time Signal. 10 a.m., Programme of Gramophone Records. 10.30 a.m., Exchange Quotations. 11.55 a.m., Time Signal. 12.30, Weather Report and News. 1.0, Programme of Gramophone Records. 2.0, Exchange Quotations. 2.10, Agricultural Report and Time Signal. 3.0, Legal Talk by Dr. Karsen. 3.30, Concert from the Kristall-Palast-Lichtspielhaus: Klänge aus Opern; Vision (Gounod); O Lass dich halten, gold'ne Stunde (Jenssen); Nebraska (Revel-Sissle); My Blue Heaven (Donaldson); Ich küsse ihre Hand, Madame (Erwin); Firefly (Nicholls). 4.0, Talk on Music, followed by Orchestral Concert and Advertising Notes. 5.10, Advertising Talk by Max Hansen. 5.30, Dr. Erich Schrader, Talk: War on Rats! 6.0, Wolfgang Schwarz, Talk: War and Peace under Capitalism. 6.30, Kurt Lubinski, Talk: Coming Lands of the East—With Wife and Camera in Siberia. 7.0, "With the Microphone through Berlin," followed by Weather Report, News, Time Signal, Sports Notes and Dance Music. 11.30 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—5.30, Programme for Girls. 6.0, Programme for Children. 7.0, Orchestral Concert. 7.50, Topical Talk. 8.0, Song Recital: Air (Sinding); Min tanke er et maegtig fjeld (Greig); Zueignung (R. Strauss); Der Wandere (Schubert); Air from Hérodiade (Massenet). 8.30, Sig. Stinessen, Talk: Walking Tours and What to Wear on Them. 9.0, Weather Report, News and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—6.20, Time Signal and Weather Report. 6.30, Schubert Recital, relayed from the Bern Münster; Memorial Talk; German Mass; Three Contralto Solos; Choral Selections, (a) Grab und Mond, (b) Sehnsucht; Four Contralto Solos; Wehmüt; Salve Regina; Song of the Spirits over the Water. 8.45, News and Weather Report. 9.0, Orchestral Selections. 9.35, Dance Music. 11.0 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—3.0, Review of Books. 3.30, Orchestral Concert. 5.0, Talk relayed from Gleiwitz (329.7 metres). 5.25, Esperanto Talk by Alfred Hausenke. 6.35, Dr. Eberhard Peter, Talk: Irregular Teeth and their Prevention. 6.50, Legal Short-hand Lesson. 6.50, Talk on Queen Elizabeth. 7.15, Military Concert. Coronation March from Die Folklinger (Kretschmer); Overture to Maritana (Wallace); Two Movements from the Military Symphony No. 11 in G Major (Haydn—arr. Hackenberger); Slavonic Rhapsody (Friedemann); Selections; (Stiebewitz), (a) Hoch Danzig March, (b) Heimatgrüss; Selections (Suppé), (a) Über Berg und Tal, (b) Teufelsmarsch, (c) Morning, Noon and Night Overture, (d) Song, Das Vergissmeinnicht; Waltz on motives from The Count of Luxembourg (Lebár); Selection from The Merry Widow (Lebár). 9.0, Announcements, followed by Dance Music relayed from Gleiwitz. 11.0 (approx.), Close Down.

SATURDAY, NOVEMBER 17th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

BRÜNN (441.2 metres); 3 kW.—3.30, Programme for Children. 4.30, Talk: The Principles of Music. 4.45, German Transmission: Fantasia Op. 159 in C Major (Schubert). 5.15, Weekly Report. 5.55, Programme from Prague. 9.25, Dance Music relayed from Bratislava (300 metres).

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Orchestral Concert from the Palace Hotel. 6.0, Elementary English Lesson. 6.25, Intermediate English Lesson. 6.45, Spanish Symphony (Lalo). 7.0, Gramophone Selections of Dance Music. 8.15, Gala Concert. 9.0, Topical Talk. 9.10, Concert (continued). 10.10, News and Announcements. 10.15, Dance Music by the Orchestra of the Palace Hotel. 11.0 (approx.), Close Down.

BUDAPEST (566.6 metres); 20 kW.—3.45, Time Signal, Weather Report and News. 4.10, Literary Talk. 5.15, Talk: The World of the Biedermeier, with Illustrations. 6.0, Cabaret Concert. 8.0, Time Signal and News. 8.15, Selections by Therese Koszeghy (Vocalist) and Tibor Polgár (Pianist). 8.55, Orchestral Concert. 10.0, Selections of Zizgane Music from the Café Spolarich.

CRACOW (566 metres); 1.5 kW.—4.10, Mr. W. Molé, Talk: Art in the Christian Catacombs. 4.35, Mr. Adam Abdank, Talk: Historical Personages in the Anecdotes of their Period—the XVIIIth Century. 5.0, Programme from Warsaw. 6.0, Miscellaneous Items. 6.25, English Reading by Mr. Jean Stanislawski. 6.55, Time Signal from the Regulatory. 7.0, Agricultural Report. 7.5, Mr. J. Regula, Talk: Review of Foreign Politics during the Last Week. 7.30, Programme from Warsaw. 9.30, Restaurant Concert. 10.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—1.30, Weather Report and Gramophone Selections. 7.20, News. 7.30, Health Talk by Mrs. A. Russell, M.B. 7.45, Irish Lesson by Seamus O'Duinn. 8.0, Pib Uileann by Leo Rowsome. 8.15, Amhrán Ghaedhige by Padraig MacGreinne. 8.30, Selections by the Station Orchestra. 9.0, Talk. 9.30, Programme by the Top Knots Concert Party. 10.0, Opera Selections by Mamie Dingle (Soprano) and the Station Orchestra. 10.30, News, Weather Report and Close Down.

FRANKFURT (428.6 metres); 4 kW.—12.15, Orchestral Concert. 2.5, Programme for Children. 2.55, Hints for the Housewife, by Fini Planes. 3.35, Orchestral Programme of Old Dance Music. In the Interval, Wireless and other Announcements. 5.10, O. W. Studtmann reads from the Novel "On Two Planets" (Lasswitz). 5.30, The Letter Box. 5.45, Ernst Engelbrecht, Talk: Sicily and Tripoli. 6.15, Ing. Schweitzer, Talk: The Economic and Political Importance of Trade Unions. 6.45, Dr. Gallner, Talk: Impressions of the International Congress for Art Education in Prague. 7.15, Gala Concert, followed by Dance Music from Voxhaus. 11.30 (approx.), Close Down.

HAMBURG, Call HA (in Morse), (264.7 metres); 4 kW.—9.15 a.m., News. 10.0 a.m., Programme of Gramophone Records. 11.10 a.m., Weather Report. 11.15 a.m., Exchange Quotations. 11.30 a.m., Concert relayed from Hanover (297 metres). In the interval at 11.55 a.m., Time Signal. 12.10, News. 1.40,

Exchange Quotations. 2.30, Review of Books. 3.0, Illustrated Music Talk by Dr. Wilh. Heintz. 3.30, Programme from Königswusterhausen. 4.30, Request Programme. 5.30, Prof. Walter, Talk: The Development of Social Thought. 6.0, Director Margolis, Talk: The Hamburg Municipal Heating System. 6.55, Weather Report. 7.0, Concert by Child Artists: Edgar Pó-Carloforti (Age 13—Vocalist), Hans Herbert Winkel (Age 13—Pianist), and Horst Thiem (Age 9—Violinist); Songs, (a) The Nightingale (Alabief), (b) The Virgin's Cradle Song (Max Reger); Pianoforte Solos, (a) Romance in F Minor Op. 5 (Tchaikovsky), (b) Prelude in D Sharp Major (Chopin), (c) Novelette in F Major (Schumann); Violin Solos, (a) Concertino in D Major, Op. 54 (Jana Sitt), (b) Minuet (Beethoven), (c) Ständchen (Schubert), Songs (a) Variations (Proch), (b) Last Rose from Martha (Flotow). 8.30, Concert for Brass Instruments: March, Hoch Heidecksburg (Herzer); Overture to Die Fledermaus (Strauss); Waltz, Winter Storms (Fucik); Selections from Cavalleria Rusticana (Mascagni); Minuet (Paderewsky); Army March No. 7. 9.30, Weather Report, News, Sports Notes, and Programme Announcements, followed by Cabaret Concert. 10.50, North Sea and Baltic Weather Reports.

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Programme relayed from the Colonial Institute, Amsterdam, The Tenth Anniversary of the Citizen Guard. 3.40, Italian Lesson. 4.40, French Lesson. 6.10, Orchestral Concert: Prince Methusalem (Joh. Strauss); Waltz, Dynamiden (Joh. Strauss); Mariette Coquette (Anclife); Major and Minor (Schreiner); Mighty like a rose (Nevin); Selection (Dostal); Finale. 6.10, German Lesson. 7.25, Police Announcements. 7.45, Programme organised by the Workers' Radio Society—Concert and Talk. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40 p.m.—12.10, Concert of Trio Music. 2.40, Programme for Children. 5.10, Gramophone Selections. 6.10, Talk by M. v. Roosmalen. 6.30, Catholic Bulletin. 6.40, English Lesson. 7.10, Lesson in Dressmaking. 7.40, Orchestral and Choral Concert, followed by Talk. 10.10, Orchestral Selections from the Royal Cinema, Amsterdam.

JUAN-LES-PINS (Radio I.L.L.) (244 metres); 1.5 kW.—1.0, Orchestral Concert. 9.0, News, Talk for Women and Concert. 10.0 (approx.), Close Down.

KALUNDBORG (1,680 metres); 7 kW.—Programme also for Copenhagen (337 metres).—6.30 a.m., Morning Gymnastics. 10.0 a.m., Weather Report. 11.0 a.m., Chimes from the Town Hall. 11.5 a.m. (approx.), Orchestral Concert from Wivel's Restaurant. 2.0, Programme for Children. 2.30, Orchestral Concert: In the Interval—Recitations by Ingeborg Hagelberg. 5.30, Arthur G. Haaso, Talk: The Copenhagen Fire Insurance. 5.50, Weather Report. 6.0, News and Exchange Quotations. 6.15, Time Signal. 6.30, Dr. M. Neliendam, Talk: The History of the Danish Church. 7.0, Chimes from the Town Hall. 7.2, Talk and Reading on Rome, by Mr. P. A. Rosenberg. 8.0, News. 8.15, Radio Cabaret by Ayoë Willumsen, Erna Schroeder, and Axel Boesen. 9.45, Dance Music by the Orchestra of the Industri Restaurant. 11.0, Chimes from the Town Hall. 11.15 (approx.), Close Down.

KATOWITZ (422 metres); 10 kW.—2.45, Financial Report. 3.0, Concert of Gramophone Selections. 4.10, Music Lesson by Prof. F. Sachsse. 4.35, Children's Letter Box. Programme for Children. 6.0, Announcement. 6.30, Talk by Mr. R. Sumowski. 6.55, Time Signal. 7.0, Mr. K. Rutkowski, Talk: Impressions of a journey to Greece. 7.30, Programme from Warsaw. 9.0, Weather Report and News. 9.30, Dance Music.

KAUFAS (2,000 metres); 7 kW.—3.0, Instrumental Concert: "Ise Mélancholique (Berlin); Overture from the Fir Suite (Bece); Schuscht (Tchaikovsky); Temptation (Jag-Jazz (Lodge); Mädchenstrauß (Faustini); Spanish Intermezzo, Los Banderilleros; Cello solo, Elégie (Fauré); Die Nachtigal (Hofmekler); Valse triste (Sibelius); Fair Women from Valencia (Morena); Poème (Fibisch); Neues Leben-March. 4.15, Agricultural Talk by Herr Strazdas. 4.45, Announcements. 5.30, News. 6.0, Weather Report. 6.15, Aviation

Programmes from Abroad.—

Notes. 6.45, Musical Interlude. 7.30, Mr. J. Slapinskas, Talk: The Co-operation of the People and the Intelligentsia. 8.0, Variety Programme. 8.30, Dance Music and Miscellaneous Items.

LAETI (1,522.8 metres); 35 kW.—4.0, Orchestral Selections: Military March; Valse (Waldteufel); Mephistopheles (Boito); Valse (Melartin). 4.35, Talk. 4.57, Time Signal, Weather Report and News. 5.15, Orchestral Selections from Madame Butterfly (Puccini). 5.40, Talk. 6.0, Programme by Paavo Kiuku (Elocutionist) and Aapo Similä (Vocalist). 6.40, Orchestral Selection. 7.0, Song from The Merry Widow (Lehár). 7.10, Orchestral Selection, Rondo and Caprice (Beethoven). 7.20, Songs (a) La Bayadère (Kálmán), (b) Viennese Waltz (Strauss). 7.30, Orchestral Selection, Overture to The Thieving Magpie (Rossini). 7.45, News in Finnish and Swedish and Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—10.10 a.m., Talks: The Choice of Careers for Girls. 11.10 a.m., Gramophone Selections. 12.5, Orchestral Concert. 1.30, Hints for the Housewife. 2.40, Herr. P. Brüll, Talk: The Basis of Wireless Technology—the Electric Current. 3.0, Talk for Young Men, by Herr C. Schlossmacher. 3.25, Dr. Emmy Wingerath, Talk for Women: The Third Generation of the Feminist Movement. 3.55, Dr. Huber, Talk: Pictures from Ancient Babylon. 4.20, English Lesson by Prof. F. Hase. 4.45, Trio Concert: First Movement from the Trio in C Major (Mickenschreiber); Guitar Solos (Albert), (a) Minuet, (b) Mandolinata, Two Dances in Old Style for Trio (Jaap Kool); Zither Solos, (a) Romance (Mickenschreiber), (b) Waltz Intermezzo (Kollmaneck); Trio Selection, Huldigung (Mickenschreiber). 5.30, Herr W. Stern, Talk: Building and Architectural Problems of Large Towns. 6.15, Talk: Social Problems of Cities. 6.40, Dr. Otto Förster, German Cathedrals. 7.0, Variety Concert: "Birds from my Garden"; "Der Papagei"—Intermezzo (Müller-Schlösser). 9.30 (approx.), News, Sports Notes, Business Announcements, Orchestral Selections and Dance Music. 12.0 Midnight (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—3.30, Concert by the Station Orchestra: Overture to Athalie (Mendelssohn); Selections from Cavalleria Rusticana (Mascagni); In dämmernder Mondnacht (Eluken); Selections from The Mikado (Sullivan); Waltz, In einem kühlen Grunde (Siede). 4.45, Wireless News and Talk. 5.30, Weather Report, Time Signal and Labour Exchange Report. 5.30, Programme from Königswusterhausen. 6.0, Josef Greff, Talk: Psycho-Analysis. 6.30, Prof. Herberg, Talk: Modern Socialism. 7.0, Variety Programme. 9.0, News, Programme Announcements, and Sports Notes. 9.30, Dance Music from the Lunapark, Leipzig.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—7.0, Chimes and Concert by the Station Sextet: Selection from La Tuna de Alcalá (Rivas and Redondo); Selection from The Puritans (Bellini); Selection from El sueño de Pirot (Barrera); Interlude by Luis Medina. 8.0, Dance Music from the Alkazar. 8.25, News and Announcements. 9.45, Weekly Market Report. 10.0, Chimes and Selection from "La Fiesta de San Antón"—Musical Comedy, followed by News. 12.30 a.m. (approx.), (Sunday), Close Down.

MILAN, Call IMI (549 metres); 7 kW.—7.15, Time Signal. 7.17, Announcements. 7.35, Time Signal and Illustrated Talk on Verdi. 7.45, News. 7.50, Concert of Vocal and Instrumental Selections. In the Interval, Reading by Angela Sordini. 9.55, News. 10.0, Musical Selections from the Fiaschetta Toscana. 10.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (290.9 metres), Östersund (720 metres), Sundsvall (545.6 metres).—4.0, Concert of Light Music by Wertheimer's Viennese Orchestra from the Meeth Tea Rooms, Göteborg. 5.0, Programme for Children—"The Swine Herd" (Hans Andersen). 5.45, Selection of Old Time Dance Music. 6.45, Pianoforte Recital from the Works of Greig: Fjälring; The Lonely Wanderer; In the Home Town; Little Bird; Erotica; To Spring. 7.0, Selection of Sea Shanties. 8.0, Topical Talk. 8.45, Dance Music from the Restaurant Riche. 11.0 (approx.), Close Down.

NAPLES, Call INA (333.3 metres); 1.5 kW.—7.30, Wireless Notes. 7.40, Announcements. 7.50, News. 7.55, Harbour Notes. 8.0, Time Signal. 8.2, Concert of Chamber Music and Theatre Music. In the Interval, "Occhi a Lutto"—Comedy (Quintero) and "Banco"—Comedy (Monicelli). 9.0, Review of the

Saturday, November 17th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

Week. 9.50, News. 9.55, Calendar and Programme Announcements. 10.30, Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrunn (500 metres) and Ejukan (448 metres).—5.0, Programme for Children. 6.0, Children's Birthday Greetings. 6.15, Weather Report, News and Agricultural Prices. 6.30, Mr. L. Funder, Talk: Bread. 7.0, Time Signal and Orchestral Concert: Prelude to Lohengrin (Wagner); Selection from Carmen (Bizet); Intermezzo and Drinking Song from Cavalleria Rusticana (Mascagni); Selection from Madame Butterfly (Puccini); Air from Samson and Delilah (Saint-Saëns); Selection from The Nuremberg Doll (Adam); Ballet Music from Faust (Gounod). 8.15, Topical Talk. 8.30, Second Act of the Revue from "Le Chat noir" Cabaret. 9.45, Weather Report and News. 10.0, Dance Music from the Grand Hotel. 11.0 (approx.), Close Down.

PARIS (Ecole Supérieure), Call PPTT (458 metres); 0.5 kW.—6.30, "Radio-Journal de France." 8.0, Talk arranged by the Union des Grandes Associations. 8.15, Talk on Social Hygiene. 8.30, Concert arranged by the Auditeurs de T.S.F., followed by Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—5.0, Pasdeloup Concert. 7.10, Weather Report. 7.30, "Le Journal Parlé."

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Concert: Overture to Surcouf (Planquette); Suite, La Jeunesse joyeuse (Coates). 9.25, News. 9.30, Symphony Concert: Spanish Caprice (Rimsky-Korsakoff); Shylock (Faure); Suite, Mes filles repouvent (Cools); Suite of Viennese Waltzes (Gilsen); Highlanders' March from Scènes écossaises (Godard).

PARIS (Radio-Paris), Call CFR (1,750 metres); 5 kW.—12.30, Concert of Gramophone Selections: Fox-Trot, Just like a Melody out of the Sky, by Paul Whiteman and his Orchestra; Fox-Trot, Because my Baby don't mean "may be" now, by Paul Whiteman and his Orchestra; Song, Ramona, by Chick Emdor; Jeux d'eau (Eavel); Pianoforte Interlude by M. Robert Casadesus; Air from Thaïs (Massenet); Air from Der Wanderer (Schubert); Orchestral Selection from The Flying Dutchman (Wagner), under the direction of Bruno Walter; The Unfinished Symphony (Schubert). 1.0, News and Exchange Quotations. 1.15, Concert (continued). 2.0, Exchange Quotations, Market Prices and Religious Information. 3.45, Dance Music by the Joss Ghisley Symphonians. News in the Intervals. 7.0, Agricultural Report. 7.45, Talk arranged by the Union des Grandes Associations françaises, All the Religious Powers of the World against War. Followed by Market Prices. 8.15, Concert arranged by "Le Matin": Symphony Music; Cello Solos, (a) Adagio and Allegro (Boccherini); Concerto in D Minor (Bach); Selections (de Fiers-Caillavet-Terrasse). News in the Intervals.

POSEN (344.8 metres); 1.5 kW.—4.45, Talk: Scouts. 5.0, Programme for Children, relayed from Warsaw. 6.0, Talk by Mr. Stürmer. 6.25, Advanced English Lesson by Dr. Arend. 6.50, Talk for Women by Mme. Sabina Swidzinska. 7.10, Finance Report. 7.30, Programme from Warsaw. 9.0, Time Signal, Miscellaneous Items, News and Weather Report. 9.30, Cabaret Programme. 11.0, Concert arranged by La Maison Philipps. 1.0 a.m. (approx.) (Sunday), Close Down.

PRAGUE (343.9 metres); 5 kW.—2.45, Programme for Children. 3.10, Programme for Women. 3.20, Public Instruction. 3.30, Pianoforte Recital. 4.30, Public Instruction. 4.40, Talk for Workers. 4.50, Agricultural Report. 5.0, German Programme: Lyrical Poetry during the Ten Years of the Czecho-Slovakian Republic. 5.55, Opera Relay from the National Theatre. 9.0, Time Signal and News. 9.20, Dance Music.

ROME, Call IRO (447.8 metres); 3 kW.—7.29, Announcements. 7.30, Time Signal. 7.45, The

Fourth Act of "La Wally"—Opera (Catalani); Review of Art and Literature by Lucio D'Ambra; Selection from "The Huguenots"—Opera (Meyerbeer). In the Interval, Talk for Women. 9.59, News. 10.0 (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Johnson, from New York. 12.30 a.m. (Sunday), Concert from the Hotel Sagamore, Rochester. 1.0 a.m., Concert from the Onondaga Hotel, Syracuse. 1.30 to 4.0 a.m., New York Relay. 1.30 a.m., "The Park Bench." 2.0 a.m., Symphony in Brass. 3.0 a.m., Lucky Strike Programme. 4.0 a.m., Time Signal and Dance Music from the Hotel van Curier. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—5.15, Concert of Turkish Music. 7.30, Weather Report and Time Signal. 7.40, Concert: Symphony No. 4 (Mozart); Songs: Romance from the Symphony No. 4 (Schumann). 9.0, News and Announcements. 9.10 (approx.) Close Down.

STUTTGART (379.7 metres); 4 kW.—5.0, Time Signal and Weather Report. 5.15, Legal Talk by Herr L. Leibfried. 5.45, Dr. H. von Bronsart, Talk: New Ways of Protecting Plants. 6.15, Dr. H. Wolff; Talk, American Book-keeping. 6.45, Time Signal and Sports Notes. 7.15, Cello Recital by Edmund Kurtz: Sonata (Breveld); Concerto (Haydn); Air (Bach); The Bee (Schubert); Coesca (Granados); Scherzo (Polony), followed by Cabaret Concert: Fox-Trot, Hab' mich Lieb! (Arnold); The Language of Flowers (Benatzky); The Flower Parade (Nelson); Yes, once in the good old times (May); The great love comes only once (May); Fox-Trot, Tabu, "Tommy is not afraid"—Comedy (Tilly Bunzl); Fox-Trot, Ich reiss' mir eine Wimper aus (Raymond); Englein (Knepler); Schlager; Die billige Annette (Benatzky); Humorous Entertainment with Orchestral Interludes, (a) Folies Bergère (Lincke), (b) Waltz, Wine, Woman and Song (Strauss), (c) Pirot March (Bosc), followed by News. 10.30 (approx.), Dance Music from the Pavillon Excelsior.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.45, Concert. 8.0, Exchange Quotations and News. 8.30, Orchestral Concert: Napolitana (Lehár); Le Pantin (Stolz); Parade des petits lutins (Noack); Cinderella's Betrothal March (Rhode); Fête au harem (Prichyral); La Fête des gnomes (Hagen). 8.45, Selections from Lakmé (Delibes). 9.45, Dance and Accordion Music. 10.0, Instrumental Selections: Overture to Poet and Peasant (Suppé); Trumpet Solos; (a) Dans la nuit tranquille, (b) Ivresse d'amour; Mandoline Selection from The Millions of Harlequin (Drigo). 10.15, North African News.

VIENNA (517.3 metres); 15 kW.—3.0, Orchestral Concert: Overture to Djamilah (Bizet); Waltz, Red Roses (Lehár); Fantasia, Gounodiana (Rhode); Song, Wenn die Puszta schweigt (Kálmán); Die Spieluhr (Blauw); Aus Offenbachs Musterkoffer (Urbach); Heineilmännchens Hochzeit—Character Sketch (Köpping); Potpourri, Der Oberstieger (Zeller); March, Heimat, süsse Heimat (Ohlsen). 4.30, Reading from the Works of Selma Lagerlöf, by Hilda Wegner. 5.30, Rudolf Osterreicher, Talk: Music, Composers and the Public. 6.0, Recital of Sonatas, Arpeggione Sonata (Schubert); Cello Sonata in A Major, Op. 69 (Beethoven). 7.5, "Die Kreuzschreiber"—Comedy in Three Acts (Anzengruber), followed by Orchestral Concert and Phototelegraphy Transmission.

VILNA (425 metres); 1.5 kW.—2.10, Concert of Gramophone Selections. 3.10, News in Lithuanian. 3.30, Announcements. 3.45, Talk for Men by Mr. Stanislas Czaplicki. 4.10, Poem Recital from the Works of Jean Wiktor. 4.35, Programme from Warsaw. 5.0, Literary Programme. 5.45, Art Talk by Prof. Julius Kios. 6.10, News. 6.30, Programme from Warsaw.

WARSAW (1,111 metres); 10 kW.—4.10, Talk. 4.35, Talk by Prof. H. Moscicki. 5.0, Programme from Cracow. 6.0, Miscellaneous Items. 6.30, "Radio-Chronique" by Mr. M. Stepowski. 6.55, Time Signal from the Observatory. 7.0, Agricultural Report. 7.5, Mr. B. Winawer, Talk: Wireless Construction. 7.30, "Le Chateau de Czorsztyn" or "Bajomir et Wanda"—Opera (Kurpinsky). 9.0, Aviation Notes. Weather Report, News, Police Announcements and Sports Notes. 9.30, Dance Music from the Oaza Restaurant. 10.30 (approx.), Close Down.

ZURICH (588 metres); 1 kW.—5.0, Programme of New Gramophone Records. 6.0, Chimes from the Zürich Churches. 6.15, Time Signal and Weather Report. 6.17, Orchestral Concert. 7.0, Programme relayed from Vienna. 9.0, Weather Report and News.

Programmes from Abroad.—

SUNDAY, NOVEMBER 18th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

BARCELONA (Radio-Barcelona), Call EAJ1 (244.8 metres); 1.5 kW.—11.0 a.m., Relay of Chimes from the Barcelona Cathedral, followed by Weather Report and Forecast and Aviation Route Conditions. 1.30, Concert of Popular Music by the Iberia Trio and Gramophone Records in the Intervals. 2.45 to 6.0, No Transmission. 6.0, Opening Signal and Stock Exchange Quotations. 6.10, Vocal and Instrumental Concert. Soprano Solos by Maria Teresa Gonzalez; in the Interval from 7.0 to 7.30, Agricultural Notes from the Catalonian Agricultural Institute at San Isidro. 8.40, Sports Notes. 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—Programme relayed from Bern. 7.0, Concert of Latvian Music. Soprano Solos by Johanna Matthaei. 9.15 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—9.30 a.m., Relay of Church Service. 11.30 a.m., Weather Report and Forecast and General News Bulletin. 7.0, Concert by the Bergen Wireless Orchestra. 7.30, Recitation by the Norwegian Actress, Doris Johannessen and Mrs. Jonny Jebsen; "The Wages of Sin," by Hjalmar Meidell. 7.50, Talk on Current Events. 9.0, Weather Report and Forecast, Late News Bulletin and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—7.55 a.m., Chimes, relayed from the Potsdam Garrison Church. 8.0 a.m., Choral and Instrumental Music and Address, relayed from Voxhaus, and followed by Berlin Cathedral Chimes. 1.30 to 2.25, Three Agricultural Talks, relayed from Voxhaus. 2.30, Tales for the Young, from Voxhaus. 3.0, Talk from Voxhaus. 3.30, Musical Programme from Voxhaus. 5.0 to 7.0, Talks, arranged by the "Deutsche Welle," followed by Relay of another German Programme. 9.15, Late News Bulletin and Sports News. 9.30, Dance Music. 11.30 (approx.), Close Down.

BERLIN (Voxhaus) (424 metres); 4 kW.—7.55 a.m., Chimes from the Potsdam Garrison Church. 8.0 a.m., Recital of Choral and Instrumental Music and Address in the Interval, followed by Chimes from the Berlin Cathedral. 1.30 to 2.25, Three Talks for Farmers on Some Practical Hints, The Weekly Markets and Weather Conditions, and The Care of Animals. 2.30, Stories for Young People. 3.0, Talk. 3.30, Instrumental Concert, followed by Advertisements. 5.40 to 7.0, Three Talks. 7.0, Popular Entertainment. 8.15 (approx.), Instrumental Programme. 9.15, Weather Report and Forecast, Time Signal, Sports Notes and Late News Bulletin. 9.30, Dance Music by the Marek Weber Orchestra. 11.30 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—10.0 a.m., Relay of Schubert Centenary Festival (from Vienna). 12.0 Noon, Time Signal and Weather Report and Forecast. 12.5, Concert. 6.29, Time Signal and Weather Report. 6.30, Reading or Talk. 7.30, Concert. 8.10 (approx.), Sports Notes, Late News Bulletin and Weather Report, followed by Musical Programme. 9.35 (approx.), Close Down.

BEZIERS (158 metres); 0.6 kW.—8.30, Sports News. 8.45, Concert arranged by "La Maison Relin," Popular Gramophone Records. 10.30 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—Programme relayed by Gletwitz (329.7 metres). 8.15 a.m., Chimes relayed from Christ Church. 10.0 a.m. (approx.), Catholic Recital of Music with Address. 11.0 a.m., Instrumental Concert. 1.0, Guessing Competition. 1.10, Talk or Literary Selections. 1.35, Hints for Chess Players by Adolf Kramer. 2.0, Children's Corner. 2.30, Agricultural Talk. 3.25, Weather Report, followed by Talk. 7.30, "Schlesische Philharmonie" Concert. 9.0, General News Bulletin. 11.0 (approx.), Close Down.

BRUSSELS (508.5 metres); 1.5 kW.—10.0 a.m., Concert relayed from Vienna in commemoration of the Schubert Centenary. "Gott in der Natur"—Hymn for Choir and Orchestra, executed by the Vienna Academy of Singing and Amateur Musical Society. 5.0, Light Music relayed from the Palace Hotel, Brussels. 6.0, Entertainment for Children by Bonzo and Sylvia of the Théâtre des Enfants. 6.30, Instrumental Music by the Station Trio. 7.30, Le Journal Parlé. 8.15, Vocal and Instrumental Concert by the Station Orchestra and Artistes of Radio-Belgique. 10.15, News Bulletin. 10.30 (approx.), Close Down.

BUDAPEST (556.6 metres); 20 kW.—8.0 a.m., News from the Press and Beauty Notes. 9.0 a.m., Relay of Sacred Music and Sermon. 11.30 a.m.,

(approx.), Concert. 6.40 (approx.), Concert or Relay of an Opera. 9.30, Selections by a Tzigane Orchestra. 10.30 (approx.), Close Down.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres) and Münster (250 metres).—7.5 a.m., Programme Review in Esperanto by Alfred Dormanns. 7.15 a.m., Lute and Guitar Instruction by Oly Wirtzkoort. 7.35 a.m., Esperanto Talk by Alfred Dormanns. 8.0 a.m., Relay of Chimes. 8.5 a.m., Catholic Festival of Music with Address in the Interval. 9.30 a.m., Talk by Fritz Worm on the German Language. 1.30, Talk on Chess by Dr. van Nüss. 3.30, Instrumental Concert. 7.0, "Die Freunde von Salamanca," Musical Play in Two Acts by Schubert; Lyrics by Johann Mayrhofer. Producer: Herr Kühn, Selections by the Zimmermann Choir. Followed by Late News Bulletin, Sports News and Selections of Dance Music. 11.0 (approx.), Close Down.

CORK, Call 8CK (400 metres); 1.5 kW.—8.30, Concert in celebration of the Schubert Centenary. Artists: Signor F. Grossi (Violin); Madame M. Grossi (Pianoforte); and Lucas Bassett (Tenor). 11.0, National Anthem, and Weather Report and Forecast. 11.15 (approx.), Close Down.

CRACOW (568 metres); 1.5 kW.—10.0 a.m., Programme relayed from Vienna in celebration of the Schubert Centenary. 1.0 and 1.20, Two Talks for Farmers. 1.40, "La Chronique Agricole," by Dr. St. Wasniewski. 2.15, Concert relayed from Warsaw. 5.35 to 10.0, Programme relayed from Warsaw. 10.0 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—9.30 to 11.15 (approx.), Programme relayed from Cork. 9.30, Concert on the occasion of the Schubert Centenary, arranged by Signor F. Grossi, assisted by the Augmented Station Orchestra. 11.0, National Anthem and Weather Report. 11.15 (approx.), Close Down.

FRANKFURT (423.8 metres); 4 kW.—Programme relayed by Cassel (252.1 metres). 7.30 a.m. to 8.30 a.m. (approx.), Morning Recital. 11.0 a.m. (approx.), Concert. 12.0 Noon, Report of the Wiesbaden Agricultural Institute. 7.30, Musical or Literary Programme. 9.30 (approx.), Popular Dance Tunes. 11.0 (approx.), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—Programme relayed from Bremen (272.7 metres), Hanover (207 metres) and Kiel (254.2 metres).—7.25 a.m., Time Signal. 7.30 a.m., Weather Report and Forecast and General News Bulletin. 7.50 a.m., Economic Questions of the Day. 8.0 a.m., Legal Hints. 8.15 a.m., Recital of Music. 9.55 a.m. (for Kiel only), Relay of Service from the Kiel University Church. 11.55 a.m., Time Signal relayed from Hanover. 12.5 (for Hamburg and Kiel), Musical Programme. 12.5 (for Bremen), Concert. 12.5 (for Hanover), Gramophone Records. 1.0, Children's Corner by Funkeheinzmann. 2.0, Orchestral Concert. 6.30, Transmission by the Hamburg School of Physical Training. 8.40, Sports News. 8.55, Weather Report and Forecast. 7.0 (approx.), Concert or Play. 9.30, Weather Report and Late News Bulletin followed by Concert of Light Music. 10.50, North Sea and Baltic Weather Report. 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40, Concert of Trio Selections. 2.10, Concert of Vocal and Orchestral Music. 9.40, Musical Selections. 7.40, General News Bulletin and Sports Notes. 7.50, "Lilac Time," by Schubert. 11.0 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40—8.10 a.m. to 9.10 a.m., Relay of Morning Service and Address. 12.10, Concert of Trio Music. 1.10, Talk. 2.10, Concert. 5.0, Relay of Evening Service from Amsterdam (on 1,870 metres): at the Organ, Mr. Jac. v.d. Byl. 7.30 (approx.), Orchestral Concert. 10.25, Epilogue by the Choir, under the Direction of Mr. Jos. H. Piekkers. 10.40 (approx.), Close Down.

JUAN-LES-PINS (Radio LL) (244 metres); 1.5 kW.—1.0 to 2.0, Selections of Light Music. 9.0, Orchestral Concert, followed by General News Bulletin. 10.30 (approx.), Close Down.

KALUNDBORG (1,680 metres); 7 kW.—Programme also for Copenhagen (337 metres).—9.0 a.m., Morning Service, relayed from a Church in Copenhagen. 10.30 a.m. to 10.40 a.m. (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 12.0 Noon to 12.25, The "Radiolytteren" German Lesson. 12.30 to 12.55, The "Radiolytteren" French Lesson. 5.50 (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 6.0, News from the Press. 6.15, Time Signal. 6.30, Talk. 7.0, Relay of the Town Hall Chimes from Copenhagen. 7.5, "The Bird Fancier," Operetta in Three Acts, by M. West and L. Neld, Danish Translation by Kaj Allen and Alfred Kjerulf, Music by Zeller. 8.45, Dance Music, by the Orchestra at the Palace Hotel, Copenhagen, under the Direction of Teddy Petersen; in the Interval, at 11.0, Chimes, relayed from the Town Hall, Copenhagen. 11.30 (approx.), Close Down.

KATOWITZ (432 metres); 10 kW.—1.0, Religious Talk. 1.20, Talk for the Gardener in Silesia. 1.40, Talk for Farmers. 2.0, Weather Report and Forecast. 2.15, Concert, relayed from Warsaw. Selections by the Philharmonic Orchestra. 3.0, Concert of Orchestral Music. 6.0, Announcements. 6.20, Prof. St. Ligon in Humorous Selections. 7.30, Orchestral Concert. 9.0, Weather Report and Forecast, Press Review and Sports News. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.

KAUNAS (2,000 metres); 7 kW.—2.30, Children's Corner. 3.0, Orchestral Concert. 3.30, Transmission for Young People. 4.0, Talk. 5.0, Health Talk by Dr. Jurgejonis. 6.0, Weather Report and Political Notes. 6.15, Programme on the occasion of the Tenth Anniversary of the Independence of Latvia; Talk on Latvia and Concert of Latvian Songs, Poetry and Selections from the Musical Works of Darzia and Vitols. 9.30 (approx.), Close Down.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—8.0 a.m., Concert of Instrumental and Vocal Items, and Address. 10.0 a.m. (Königsberg only), Weather Report and Forecast. 1.30, Talk on Chess Problems by P. S. Leonhardt. 2.0, Spanish Lesson for Beginners by Kurt Metz, Lecturer in Spanish at the Königsberg Technical Institute. 3.15, Concert by the Station Orchestra. 7.5, Concert by the Station Orchestra, conducted by Walter Kelch, and Songs by Frida Weber-Flessburg and Alexander Flessburg. 9.15, Late News Bulletin and Sports News. 9.30 (approx.), Dance Music, relayed from Berlin. 11.30 (approx.), Close Down.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsinki (375 metres).—8.0 a.m., Relay of Church Service. 9.50 a.m., General News Bulletin. 10.5 a.m., Musical Programme. 11.0 a.m., Relay of Church Service in Swedish. 3.0, Concert by the Station Orchestra, conducted by Erkki Linko. 4.0, Talk. 4.25, Concert by the Station Orchestra: Selections from the Operetta, "Paganini," by Lehár. 7.15, Concert. 7.45, Late News Bulletin, given in Finnish and Swedish. 9.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres) and Münster (250 metres).—7.5 a.m., News (in Esperanto) on the Week's Programmes, by Alfred Dormanns. 7.15 a.m., Lute and Guitar Instruction, by Oly Wirtzkoort. 7.35 a.m. to 7.55 a.m., Esperanto Talk, by Alfred Dormanns. 8.0 a.m., Relay of Church Chimes. 8.5 a.m., Catholic Festival of Choral and Instrumental Music, with Address in the Interval. 10.0 a.m., Fritz Worm, Talk: The German Language. 3.30, Vocal and Orchestral Concert. 5.0 to 5.30, Reading: Hope, the Tomcat, by Walter Gutkelch. 7.0, See Cologne Programme, followed by Late News Bulletin, Sports Notes and Dance Music. 11.0 (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—Programme relayed by Dresden (275.2 metres).—7.30 a.m., Organ Recital. 8.0 a.m., Recital of Vocal and Instrumental Music. 1.0, News from the Foreign Press. 1.45, Notes from the German Speaking Union. 2.0, Programme of Light Music. 5.30, Talk. 6.0, Talk. 6.30, Selections of well-known Operettas: The Feiereis Orchestra, conducted by Max Feiereis, and Songs by Otto Maré, of Dresden. 9.0, Sports News. 9.30, Dance Music, relayed from Berlin. 11.30 (approx.), Close Down.

LYONS (Radio Lyon) (291 metres); 1.5 kW.—7.45, Le Journal Parlé with General News Bulletin and Press Review. 8.0, Instrumental Concert. Artists: M. Camand (Violin); Madame Ducharme (Pianoforte), and M. Testanière (Cello); Selection from "Mam'zelle Nitouche," by Hervé. 9.0 (approx.), Close Down.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—Programme relayed by Salamanca (EAJ22) (405 metres).—11.30 a.m., Relay of Concert from El Retiro by the Municipal Band Conducted by Maestro Villa. 2.0, Relay of Chimes and Time Signal. 2.5,

Sunday, November 18th.

Programmes from Abroad.—

Orchestral Selections by the Union Radio Orchestra with interlude by Luis Medina. 3.30 to 7.0, No Transmission. 7.0, Relay of Chimes followed by Music by the Station Sextet. 8.0, The Palermo Orchestra in Popular Dance Music relayed from the Alkazar. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Concert by the Band of the Saboya Regiment, conducted by Don Tomas Romo. 12.0 Midnight, Chimes followed by Dance Music from the Alkazar. The Palermo Orchestra. 12.30 (approx.) (Monday), Close Down.

MILAN (1MI (549 metres); 7 kW.—9.30 a.m. to 10.0 a.m., Vocal and Instrumental Sacred Concert. 11.30 a.m., Time Signal and Concert by the Milan Wireless Quartet. 12.30 to 3.0, No Transmission. 3.0, Opening Signal. 3.5, Concert of Quintet Music. 5.0 to 7.25, No Transmission. 7.25, Opening Signal and Topics of the Day. 7.35, Time Signal and History Talk by C. A. Blanche. 7.45, Sports News. 7.50, Concert devoted to Compositions inspired by Goethe's "Faust." 10.45 (approx.), Close Down.

MOTALA (1380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres) and Sundsvall (545.6 metres).—10.0 a.m., Relay of Morning Service from a Church in Stockholm. 4.55, Chimes relayed from the Stockholm Town Hall. 5.0, Drama by Gerhart Hauptmann. 8.15, Late News Bulletin and Weather Report. 8.40, Musical Programme. 11.0 (approx.), Close Down.

MUNICH (535.7 metres); 4 kW.—Programme by Augsburg (566 metres), Kaiserslautern (277.8 metres), and Nuremberg (241.9 metres).—2.0, Concert. 7.0, "Hanns im Glück," Folk Play in Four Acts by Max Grube and Franz Koppel-Ellfeld. Producer: Rolf Pinnerger. 9.0, Late News Bulletin. 9.30, Relay of a Concert Programme. 10.30 (approx.), Close Down.

NAPLES Call INA (333.3 metres); 1.5 kW.—9.0 a.m., Sacred Recital. 8.45, Children's Corner. 4.0, Variety Concert. 4.30, Time Signal. 7.30, Topical Notes. 7.50, Report of the Harbour Authorities at Naples. 8.02, Relay of an Opera from Teatro Bellini, and in the intervals Selections of Operatic Music. Overture to "Rosamunde" (Schubert) by the Orchestra. 9.0 Sports Notes. 9.55, Calendar and Notes on the Programmes for the next day. 10.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (560 metres), Rjukan (443 metres).—6.15, Weather Report and Forecast and Press Review followed by Literary or Musical Programme. 7.0, Time Signal and Orchestral Concert. 8.30, Weather Report and Press News. 8.45, Topical Talk. 9.30 (approx.), Relay of Dance Music from the Hotel Bristol. 11.0, (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—Programme relayed at intervals by the following stations: Bordeaux PTT (275 metres), Eiffel Tower (2,650 metres), Grenoble (416 metres), Lille (264 metres), Limoges (285 metres), Lyons PTT (480 metres), Marseilles (303 metres), Rennes (280 metres), Toulouse PTT (260 metres).—8.0 a.m., General News Bulletin and Time Signal. 9.25 a.m., International Time Signal and Weather Report and Forecast. 12.0 Noon, Concert arranged by "Les Editions Salabert," and conducted by M. de Buxeuil and M. L. Raiter. 1.0, Economic Report. 1.30, Concert organised by the General Association of French Wireless Listeners, "The Flying Dutchman" (Wagner). 4.0, Pachelbel Symphony Concert relayed from the Théâtre des Champs Elysées and organised by Philips Radio. Conductor: M. Rhené-Baton. 6.30, "Le Radio Journal de France." 8.0, Sports Results. 8.15, Talk arranged by the Union of French Associations. 8.30, Concert organised by the General Association of French Wireless Listeners, followed by Late News Bulletin, Time Signal and Weather Report. 10.30 (approx.), Dance Music by the Orchestra at the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—7.56 a.m., Time Signal on 32.5 metres.—9.26 a.m., Time Signal on 2,650 metres. 7.10 to 7.20, Regional Meteorological Report and Aviation Notices. 7.30, "Le Journal Parlé," par T.S.F., with Talks by its Regular Contributors, including Dr. Pierre Vachet, Detective Ashelbe, and M. René Casalis, on Portez-vous bien; Police Memoirs; and The Day's Sport. 7.58, Time Signal on 32.5 metres. 8.0 to 9.0, Concert, Masques et Bergomasques, First Orchestral Suite, (Gabriel Faure). 10.28, Time Signal on 2,650 metres. 11.15 (approx.), Close Down, with Weather Forecast for Following Day.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections. 8.50, Talk. 8.55, News from the Press. 9.0, Vocal and Instrumental Concert. 9.25, News Bulletin; the Symphony Half-Hour, under the Direction of Prof. Estyle, of the Paris Conservatoire. 10.0, Late News Bulletin. 10.15, Selections of Orchestral Music: "La Rôtisserie de la Reine Pédauque" (Charles Levadé). 11.0 (approx.), Close Down.

PARIS (Radio Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and News from the Press. 8.30 a.m., Instruction in Physical Culture, conducted by Dr. Doffre. 12.0 Noon, Religious Address, followed by Recital of Sacred Music, with Choral Selections by "Les Petits Chanteurs de la Croix de Bois," arranged by "La Vie Catholique." 12.30, News from the Press. 12.45, Concert by the Albert Locatelli Orchestra, with Selection by Bilboquet in the Interval. 4.30, Programme of Gramophone Records, arranged by "L'Industrie Musicale"; in the Interval: News from the Press. 7.0, Talk for Farmers and News from the Press. 7.45, The Radio-Paris Circus. 8.30, Music Hall Concert; in the Intervals: News from the Evening Press and Late News Bulletin. 10.30 (approx.), Close Down.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.0, Sessions Chimes, followed by Divine Service. 7.0, Programme arranged by "Roxy's Stroll," from WJZ, New York. 9.45, Evening Service, relayed from the Shadyside Presbyterian Church; Address by the Pastor. 11.30, Musical Programme, arranged by the Whittall Anglo-Persians, from WJZ, New York. 12.0 Midnight, Session Chimes; Divine Service with Sermon by the Pastor, Dr. E. J. van Etten, relayed from the Calvary Episcopal Church, Pittsburgh. 1.0 a.m. (Monday), National Broadcasting Company Programme from New York. 1.15 a.m., Collier's Radio Programme. 2.15 a.m., The Utica Jubilee Singers, from WJZ, New York. 2.45 a.m., El Tango Romantico, from WJZ, New York. 3.15 a.m., Longue Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 11.5 a.m. to 11.30 a.m., Two Talks for Farmers. 11.55 a.m., Talk by Mr. Winiewicz. 2.15, Concert of Symphony Music, relayed from the Philharmonic Hall at Warsaw. 6.45, Talk. 7.15, Programme in celebration of Ten Years of Latvian Independence. Address by the Latvian Consul at Posen. 9.0, Time Signal. 9.20, General News Bulletin. 10.0, Programme of Dance Music, relayed from the Carlton Restaurant. 11.0 (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—8.0 a.m., Recital of Sacred Compositions. 11.0 a.m., Concert. 12.5, Trade Report. 12.20, Social Announcements. 3.30, Orchestral Concert. 5.0, Programme for German Listeners. 8.0, Time Signal and Late News Bulletin. 9.20, Concert of Light Music. 10.15 (approx.), Close Down.

RABAT Call PTT (416 metres); 2 kW.—12.30, Concert by the Radio Maroc Orchestra. 4.0 to 5.0, Military Music. 8.30, Concert by the Radio Maroc Orchestra and Soloists. 10.30, Relay of Dance Music. 11.0 (approx.), Close Down.

RIGA (526.3 metres); 4 kW.—9.15 a.m., Morning Service, relayed from the Mara Church. 12.0 Noon, Children's Corner. 3.0, Concert by the Station Orchestra, conducted by Arved Parups. 4.0, Talks. 6.0, Concert with Vocalists. 8.0, Weather Report and Forecast, and Late News Bulletin. 8.30, Relay of Dance Music from the Café de l'Opera. 10.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—9.0 a.m., Morning Recital of Sacred Music. 9.45 a.m. to 12.0 Noon, No Transmission. 12.0 Noon, Opening Signal. 12.5 to 1.0, Concert of Trio Selections. 1.0 to 4.0, No Transmission. 4.0, Opening Signal. 4.5, Concert of Light Music. 6.50, Opening Signal, followed by News of the Day. 7.45, Concert by the Grand Symphony Orchestra: The Sixth Symphony in F Major, Op. 68 (Pastoral), (a) Allegro non troppo, (b) Andante mosso, (c) Allegro, (d) Temporale, (e) Allegretto. 9.50, Late News Bulletin. 10.15 (approx.), Close Down.

SCHENECTADY Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—6.30 to 7.0, Programme arranged by the United Radio Corporation. 8.30, Recital of Organ Music from the Union College Memorial Chapel, Schenectady; Organist, Elmer Tidmarsh. 9.0, Men's Conference, arranged by the Bedford Branch of the Y.M.C.A., with an Address by Dr. S. Parkes Cadman, relayed from Brooklyn, N.Y. 10.30, Acousticon Programme from New York. 11.0, Stetson Parade and American Legion Band, relayed from Boston, Mass. 11.30, Programme of Music from New York. 12 midnight, "Old Company's" Programme, with Reginald Werrenrath, Baritone, from New York. 12.30 a.m. (Monday), Evening Entertainment from the Capitol Theatre, New York. 2.0 a.m., Lecture, "Our Government," by David Lawrence, Editor of the "United States Daily," relayed from Washington, D.C. 2.15 a.m., Atwater Kent Programme from New York. 3.15 a.m., Correct Time. 3.17 a.m., Broadcast of Experimental Television. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (424.8 metres); 1 kW.—2.0 to 3.0, Concert of Light Orchestral Selections, and Gramophone Records. 9.30, Orchestral Concert with Vocal Items. 11.0, Flamenco Songs and Dance Music by the Seville Orchestra. 11.30 (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—3.30, Concert. 4.30, Local Market Prices. 5.15, Selections of Turkish Music. 7.30, Weather Report and Forecast and Time Signal. 7.40, Talk on the History of Music. 7.55, Concert by the Station Orchestra. 9.0, Late News Bulletin. 9.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—Programme relayed by Freiburg (577 metres). 10.15 a.m. (approx.), Concert of Instrumental Music. 11.0 a.m. (approx.), Concert of Orchestral Selections, followed by Gramophone Records. 1.0, Children's Corner by Funkheinzelmann. 5.0, Time Signal and Sports News. 5.15, Talk. 6.45, Time Signal and Sports News. 7.15 (approx.), Concert or Play, followed by Musical Programme, Late News Bulletin and Sports News. 10.0 (approx.), Close Down.

TALLINN (408 metres); 2.2 kW.—8.0 a.m. (approx.), Relay of Church Service. 1.0, Concert of Instrumental Music. 6.0, Orchestral Concert. 9.0 (approx.), Close Down.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.30, Weather Report and Forecast and Local Market Prices for Toulouse. 12.45, Concert of Orchestral Music. 1.0, Time Signal (Carillon). 1.45, Press News. 8.0, Prices of Cereals and News from the Fournier Agency. 8.15, News from the Press. 8.30, Concert. 9.5, Concert arranged by "L'Association des Commerçants Radio-Électriciens du Midi." Selections from Cavalleria Rusticana, Opera in One Act by Mascagni. 10.15, "Le Journal sans papier" with News from North Africa, followed by Late News Bulletin. 10.30 (approx.), Close Down.

VIENNA (517.2 metres); 15 kW.—Programme relayed by Graz (357.1 metres), Innsbruck (294.1 metres), Klagenfurt (272.7 metres) and Linz (254.2 metres). 9.20 a.m., Recital of Organ Music. 10.0 a.m., Relay of Programme from the Grosse Konzerthausaal, on the occasion of the Schubert Centenary Celebration by the Austrian Federal Government. "Gloria" from the Mass in A Flat Major. 2.15, Experimental Transmission of Pictures. 3.0, Concert of Orchestral Music. 6.30, Vocal and Instrumental Concert, followed by Musical Programme and Experimental Transmission of Pictures. 10.15 (approx.), Close Down.

VILNA (435 metres); 1.5 kW.—10.0 a.m., Relay from Warsaw. 1.0 to 2.0, Programme relayed from Warsaw. 1.0 to 2.0, Three Talks on Agriculture. 2.15, Orchestral Concert. 4.20, Talk. 5.0, Concert. 6.0, Talk in Lithuanian. 7.30 to 10.30, Programme relayed from Warsaw. 7.30, Concert of Light Music. 9.0, Aviation Route Report and Weather Forecast. 9.5, News from the Polish Telegraphic Agency. 9.20, Sports Notes and Police Report. 9.30, Dance Music relayed from the "Oaza" Restaurant, Warsaw, under the direction of W. Rozkowski. 10.30 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—10.0 a.m., Programme relayed from Vienna. Concert in celebration of the Schubert Centenary by the Vienna Academy of Singing the Amateur Musical Society and the Vienna Symphony Orchestra. 1.0, Agricultural Talks. 2.0, Weather Report and Forecast. 2.15, Programme of Instrumental Music. 4.20, Talk. 7.30, Concert. 9.0, Aviation Route Conditions and Weather Forecast. 9.5, Late News Bulletin. 9.20, Police and Sports News. 9.30, Dance Music by the Orchestra of the "Oaza," conducted by W. Rozkowski. 10.30 (approx.), Close Down.

BROADCASTING BY WIRED WIRELESS.

The Underlying Principles of the System Fully Explained.

IN wired wireless or carrier-wave telephony high-frequency oscillations developed by some suitable type of high-frequency generator, such as a valve transmitter, are modulated by microphone currents and the resulting modulated oscillations, instead of being radiated into space from an aerial as in radio telegraphy, are introduced into a land-line circuit along which they are transmitted as electro-magnetic waves. The possibility of transmitting electric waves was known long before the days of radio telegraphy, but it is only comparatively recently that the development of wireless technique has made the technical application of the transmission of fairly high-frequency currents along wires or cables a practicable means of making fuller use for communication purposes of existing telephone or power lines. One of the more recent suggested applications of wired wireless is the broadcasting of programme matter over existing wire networks without interfering with the main services for which the wires are intended. In view of the increasing demands continually being made on an overcrowded ether, the provision of further channels for broadcasting without further congesting the ether has obvious attractions, and the object of the present article is to review the possibilities of wired wireless for this purpose.

As most readers of *The Wireless World* are, no doubt, aware, when a speech sound or a musical note falls on a microphone electrical currents of complicated wave form are produced in the circuit connected to the microphone. These currents can be regarded as built up of a number of simple alternating currents having the form of sine-waves, and having various amplitudes and frequencies, according to the nature of sound under analysis. In the case of speech the important components lie in a band of frequencies between about 100 and 3,000 cycles per second, while in the case of music they lie in a wider band of between 50 and, perhaps, 7,000 to 8,000 cycles.

The amplitude and frequency of the more important components making up the sound of a long "O," for example, are shown in Fig. 1. If high-frequency oscillations from a continuous wave transmitter are modulated by this sound spoken into a microphone, the resulting complex wave form produced is composed of simple components lying in two groups, known as the upper and lower side bands, symmetrically arranged on either side of the frequency generated by the transmitter, *i.e.*, the carrier-wave frequency.

The amplitude and frequency of the components present are represented in Fig. 2. It will be clear from this chart that the effect of modulation is to provide a complex signalling wave which contains a group of components which bear the same relation to each other, as do the components present in the original telephone

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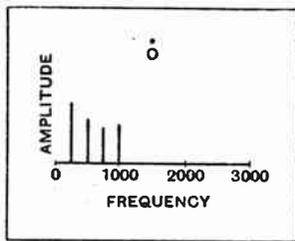


Fig. 1.—The amplitude and frequency of the more important components making up the sound of a long "O."

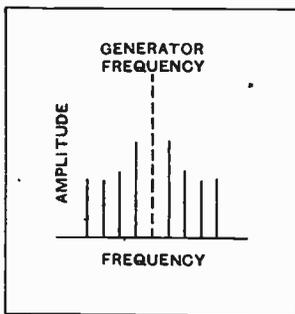


Fig. 2.—When a carrier wave is modulated the upper and lower side-bands are symmetrically arranged on either side of the frequency generated by the transmitter.

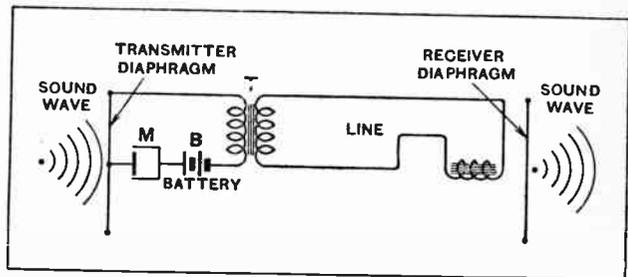


Fig. 3.—Representation of an elementary telephone circuit.

currents. Modulation is, therefore, really nothing more than a translation of the original telephone frequencies to another part of the frequency scale. For reception, the modulated carrier-wave must be demodulated so that the current acting on the diaphragm of the receiving telephones or loud speaker once more occupy their proper place on the lower end of the frequency scale. This, in ordinary broadcast radio telephony, is, of course, done by the detector.

Carrier-wave and Ordinary Telephony Compared.

The relationship between ordinary telephony and carrier-wave telephony for wired wireless is illustrated in Fig. 3. In Fig. 3 sound waves are shown falling on the diaphragm of a simple carbon microphone M, energised by a D.C. battery B, and coupled to the line by a transformer T. The D.C. energising current cannot reach the line while the alternating components due to the sound waves, induced into the line by the transformer T, and passing through the field windings of the receiving telephone, are causing vibrations of the diaphragm.

With carrier-telephony the D.C. battery B may be supposed to be replaced by an A.C. generator, which produces a high-frequency carrier-current. A second transformer T₁ and the demodulator are introduced at the receiving end (Fig. 4). The carrier current itself, being an alternating current, is introduced into the line by T₁ but is suppressed by the demodulating arrangement in the receiving circuit coupled to the line by T₁. Except that currents of high frequency are transmitted over the

Broadcasting by Wired Wireless.—

line, it will be seen that in principle there is no difference at the generating end between ordinary and carrier-wave telephony. In fact, communication at ordinary telephony frequencies can be regarded as a particular case of carrier-wave working by considering the energising D.C. as being a carrier-current of zero frequency.

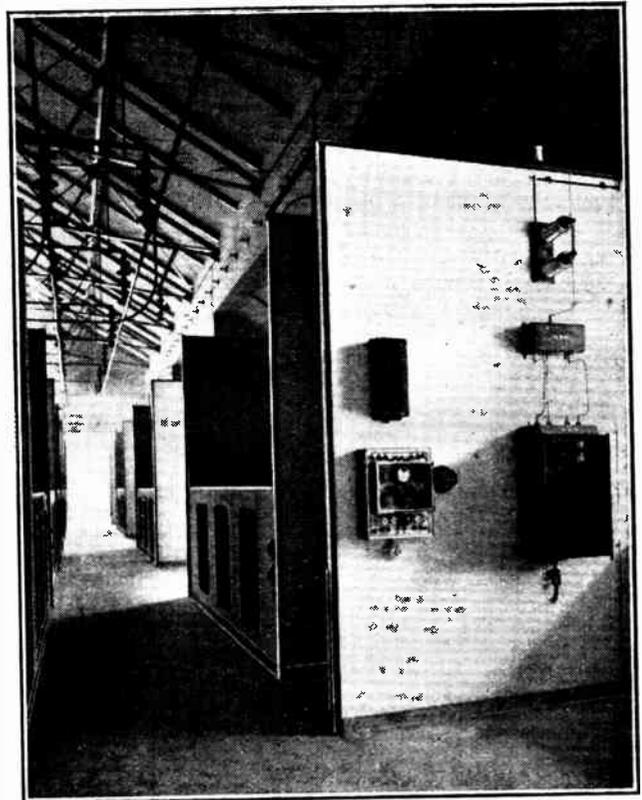
It will be seen from the above that there is no real difference between the mode of transmission of the high frequencies used in carrier-wave working and currents of ordinary telephonic frequencies. It has often been suggested that the carrier-waves on the land line circuits for some reason do not suffer the same transmission losses as the lower frequency currents. There is no justification either on theoretical or practical grounds for this view. As a matter of fact, the attenuation of the higher frequency currents is greater than that of the low frequency currents owing to the increased effective resistance of the wires and to increased leakage effects. As compared with ordinary telephony frequencies, higher generating power must be employed or "repeaters" must be inserted at more frequent intervals. Much less power is, of course, required than for ordinary radio telephony, since the waves are guided along the wires instead of being radiated in all directions into space.

Interference on Long Waves.

It follows from what has been written above that carrier-wave working between two fixed points offers no special advantages over ordinary telephone working. Carrier-wave working, however, by employing a different range of frequencies, provides by selective tuning the possibility of using the same land-line network, simultaneously for more than one communication, just as the use of various wavelengths allows this to be done in the ether.

Owing to the attenuation on land lines of the higher frequencies, already referred to, about 30,000 cycles per second is regarded at present as the upper limit of fre-

system for the control of their operation and for the notification of switching instructions, etc. The Bell Telephone System, for example, has used several carrier channels on the pole-line telephone system from Chicago to Harrisburg, a distance of 750 miles, and between Harrisburg and Detroit, a distance of 596 miles. More



A German power station where speech currents are superimposed on supply lines.

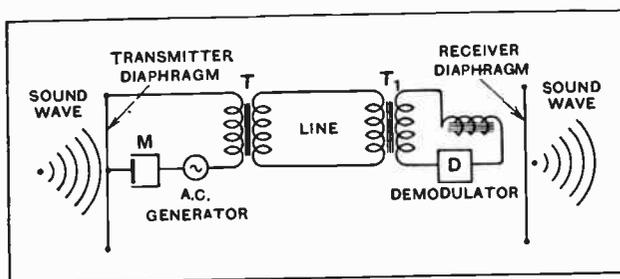


Fig. 4.—The essential components in an elementary carrier-wave telephone circuit.

quency available for carrier-wave working. This frequency corresponds to a wavelength of 10,000 metres, so that the upper limit lies well within the frequencies used for high-power radio stations, and the difficulty of cutting out interference of such stations sometimes arises.

In America and Central Europe wired wireless or carrier-wave working has been applied to a considerable extent both for the purpose of making better use of existing telephone circuits and also along overhead high-voltage power lines for providing a communication

recently the submarine cable between the Island of Catalina and Los Angeles on the mainland has been fitted for carrier-wave working. Catalina always seems in the forefront of communication developments, as before the cable was laid, its traffic with the mainland was dealt with by the first public radiotelephony link to be operated—the second being the transatlantic service from Rugby. To deal with seasonal summer traffic, arrangements were made in 1926, whereby it was possible to provide over the two single conductor cables a total of fourteen telephone channels in addition to two telegraph channels, all capable of being worked simultaneously. In Germany many carrier-wave channels are in use. In this country it is understood that the B.B.C. and the Post Office experimented some years ago between Plymouth and London with a carrier telephone for "simultaneous broadcasting." The transmission is stated to have given good quality, but the experiments were discontinued on account of interference caused by high-power radio stations. In America carrier-wave telephony on overhead power lines has given very successful results.

Except for one or two isolated experiments in America

Broadcasting by Wired Wireless.—

and Germany, the use of wired wireless for broadcasting has not been developed. In Staten Island (U.S.A.) a broadcasting service, it is believed, has been carried out over the lighting mains of the local supply company with a transmitter generating 250 watts. The receiving apparatus loaned by the company could be plugged into the supply by a simple arrangement. The radius covered by the system is 10 kms. The receiving apparatus was hired by the Supply Company at 2 dollars per month for telephone sets, and 5 dollars for loud speaker sets. In Germany the opera performances at Munich were for a time broadcast to subscribers over the telephone system, but this was apparently done on ordinary telephonic frequencies and was not, therefore, properly an example of wired-wireless distribution. An experiment in true wired-wireless distribution was, however, made at Rositz, where the programme of the Liepzig broadcasting station was transferred to the distributing system of an electrical generating station.

Although there have been few commercial applications of wired wireless to broadcasting, nevertheless the Western Electric Co. of America have worked out in detail and patented (Brit. Pat. 192,359) a complete system for the purpose. The methods proposed allow several broadcasting programmes to be superimposed on a telephone system so as not to interfere with the use of subscribers' circuits for ordinary telephonic communications. The method depends on the introduction in the lines of carefully designed selective apparatus known as filters, unless the proposed differentiation of frequencies is wide enough to allow selection by ordinary tuning circuits. Before describing, therefore, the arrangements for introducing the broadcast transmissions into the line system it will be desirable to describe briefly the various varieties of filters employed, on the successful use of which satisfactory working would depend.

The Importance of Filters.

The three main types of filters, together with their transmission characteristics, are shown in Fig. 5. Fig. 5(a) represents what is known as a "low pass filter." This filter causes considerable attenuation to frequencies above a certain value, depending on the sizes of coils and condensers used in it. It transmits freely, however, all frequencies below the critical value with little loss. Such a filter can, for example, be designed to pass all frequencies below, say, 10,000 cycles, but impose a high impedance to all frequencies above this value. Fig. 5(b) represents a "high pass filter." By properly choosing the inductances and capacities such a filter can be designed to pass all frequencies above, say, 10,000 cycles and cut out those below this value. Fig. 5(c) represents a "band filter," which passes fre-

(To be concluded.)

quencies within a specified range equally without loss, but cuts out all other frequencies both below and above this range.

It will be seen from the chart of Fig. 2 that all the components necessary for the transmission of any sound are present in either the upper or lower side band, and with suitable arrangements at the demodulating end the transmission of the carrier-wave itself and one or other of the side bands is not essential. The cutting-out of one side-band and the carrier-wave at the transmitting end is not difficult, and the method is used in the present transatlantic telephony service. For speech the transmission of both side-bands occupies 6,000 cycles, while if one side-band is eliminated 3,000 cycles is occupied. If, therefore, one side-band is suppressed the number of possible channels available for different communications for carrier-wave working between zero and 30,000 cycles is doubled. A suitable gap of 1,000 to 2,000 cycles must be left between the carrier groups,

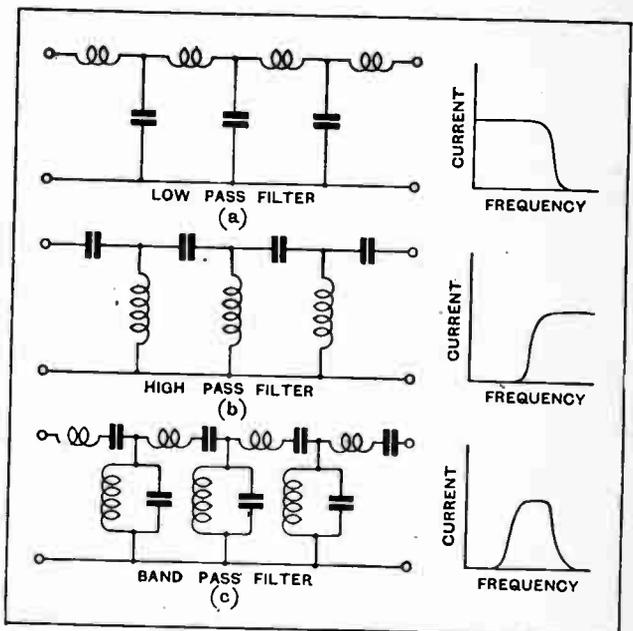


Fig. 5.—Three main types of filter employed in wired wireless. Their main transmission characteristics can be seen from the graphs on the right.

and we see, therefore, that in addition to the ordinary telephony band about eight carrier single side-bands can be got in, or four channels in which both side-bands are employed. Since the satisfactory transmission of music requires each side-band to occupy at least 6,000 cycles, only two additional music channels are available between the frequency limits at present considered feasible for carrier-wave working, if both side-bands are transmitted, or four if only one side-band is employed. O. F. B.

"THE WIRELESS WORLD" OLYMPIA SHOW COMPETITION.

Next week's issue will contain an illustrated description of the apparatus which has won first place in the ballot. A list of the successful exhibits was published in our last issue.

USEFUL DATA CHARTS. (NO. 16.)

Time Constant of Grid Leak and Condenser.

If in the circuit of Fig. 1 a charge be given to the lower plate of the condenser it will leak away through the resistance and the potential of the plate will fall exponentially from its initial value to zero

The time required for the potential to fall to $\frac{I}{2.718}$ of its initial value is called the Time Constant T and we have the simple relation $T=RC$.

Blocking in Speech Amplifiers.

The above phenomenon is of interest in amplifiers where the signal from the plate of a valve is impressed through a grid leak and condenser on the grid of the following valve. Under the action of an excessively strong signal the grid potential may swing to a positive value: grid current will flow, and at the end of the signal the grid will be left with a high negative potential. This potential will decrease as in Fig. 1 by discharge through the grid leak, and until it has returned to an almost normal value the valve will be

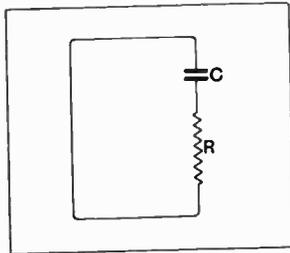


Fig. 1.—If a charge be given to the lower plate of the condenser C, it will slowly leak through the resistance R; meanwhile the plate potential will fall.

working on the lower bend of its characteristic, and will be *paralysed*. This is the phenomenon known as blocking—a momentary or intermittent cessation of sound.

Compromise Necessary.

The abac gives the time constant when the values of grid leak and condenser are known. A second scale

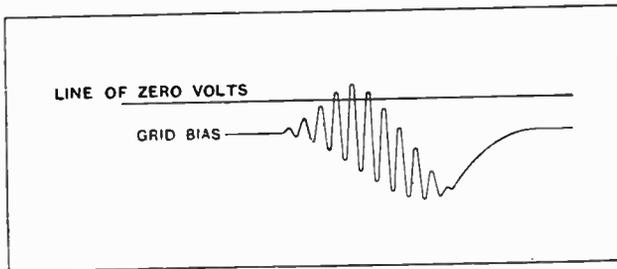


Fig. 2.—A strong signal makes the grid potential negative and time is required for return to the initial value.

is also provided on the middle line giving the time required for the shock potential to fall to 0.1 of its initial value: this time is the time constant multiplied by 2.4.

The time constant and consequently the blocking

effect are reduced by making R or C small: but, as was mentioned in the discussion of abac No. 15, such small values lead to inefficient transmission of signals from one valve to the next, and so a compromise must be arranged. It was shown in that discussion that the efficiency of transmission V/E , i.e., $\frac{\text{signal applied to grid}}{\text{signal from plate of preceding valve}}$ is equal to

$$\frac{R}{\sqrt{R^2 + X^2}} \text{ i.e., } \sqrt{1 + \left[\frac{I}{R.C.2\pi f} \right]^2}$$

and so at any given frequency V/E depends only on RC, which is the time constant.

In Fig. 3 the broken curve gives the relation between the efficiency and the time in which a disturbance falls

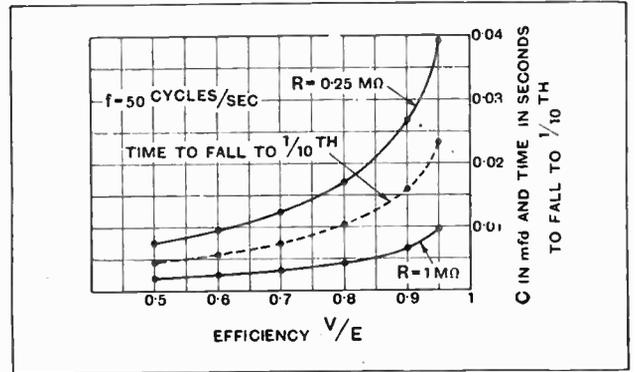
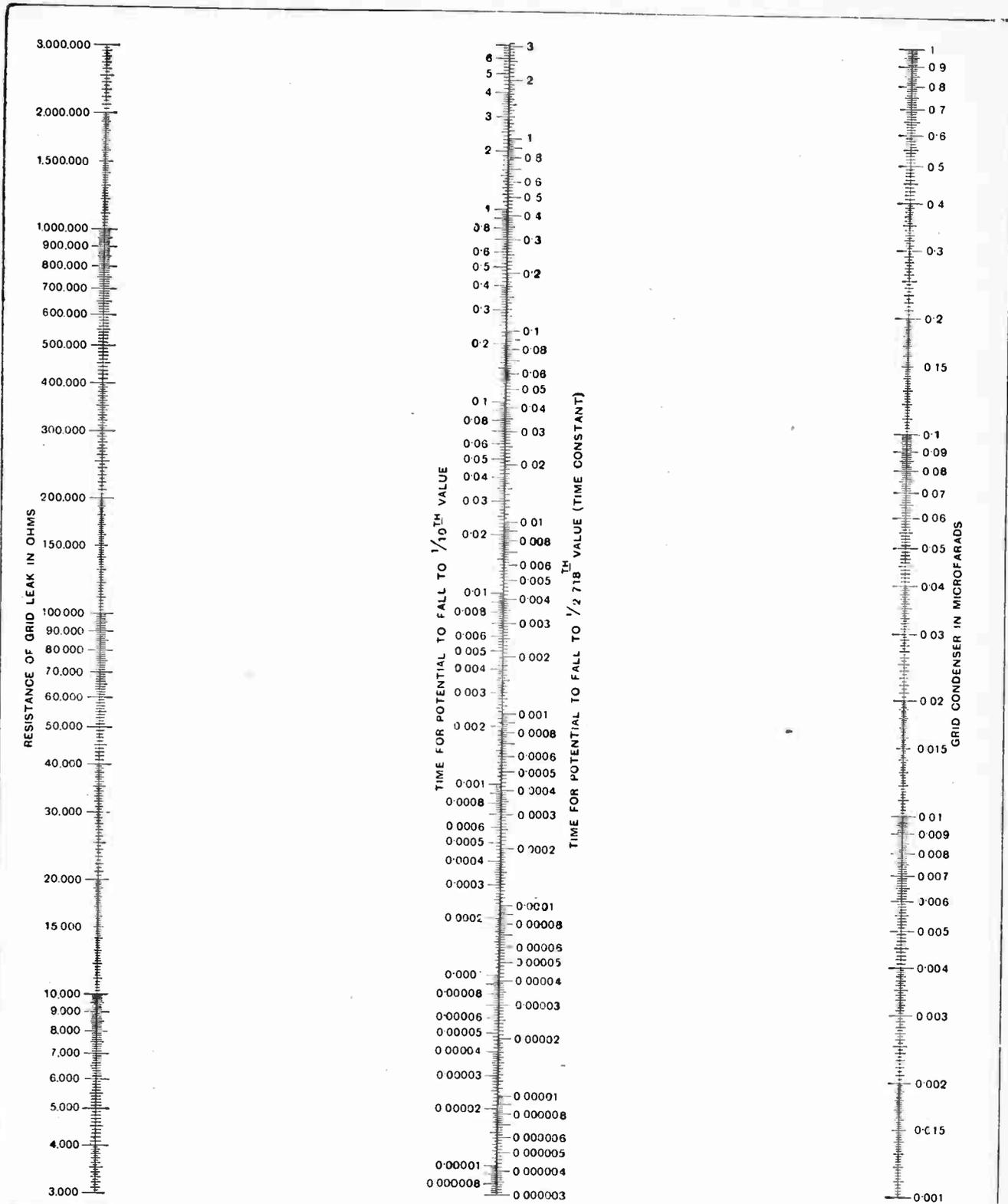


Fig. 3.—The broken curve gives the relation between the efficiency and the time in which a disturbance falls to one-tenth its initial value. The solid line curves give the values of C for 1 and for 0.25 megohm leaks.

to 1/10th its initial value. It is difficult to assign the value at which blocking will become noticeable, since so much depends on the magnitude of the shock, but we shall not be far wrong in taking the figure 0.015 second. This corresponds to an efficiency of 90%. The full curves give the values of C for grid leaks of 1 and 0.25 megohm, copied from the discussion on abac No. 15

Summary.

It appears then that at 50 cycles/sec the efficiency should not exceed 90% lest blocking should take place: at higher frequencies the efficiency will of course be greater since the impedance of the grid condenser will diminish. Suitable combinations are $R=1$ megohm, $C=0.0065$ mfd, or $R=0.25$ megohm, $C=0.026$ mfd, which are included in the general result, megohms \times microfarads = 0.0065: a larger product may cause blocking; a smaller one gives unnecessary loss of efficiency for low notes.—R. T. B.



TIME FOR POTENTIAL TO FALL TO 1/10TH VALUE

TIME FOR POTENTIAL TO FALL TO 1/2 718TH VALUE (TIME CONSTANT)

TIME CONSTANT OF GRID LEAK AND CONDENSER

W. W. A8AC

Nº 16



By Our Special Correspondent.

English Programmes from the Continent.—Anxiety at Geneva.—The "Eastbourne Effect." — A Birthday Night.—B.B.C. and 5SW.—Future of the Relays.—Discussion Groups.

British Programmes from Abroad.

Savoy Hill is maintaining a dignified calm in the face of proposals to establish a "British" broadcasting station abroad. At the present time there seems to be no legal bar to the institution of such a station; in fact, there is nothing new in the idea, for many readers may remember the English flavour permeating the original transmissions from The Hague which were conducted in 1922 under the auspices of a British newspaper before the B.B.C. was born.

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A Question of International Law.

I cannot help feeling, however, that the institution of a station abroad to supply people in another country with a service which the laws of that country would not permit at home introduces questions of considerable gravity. The situation immediately reveals the absence of any international law on the subject, but the time may come when action may be necessary, possibly by the League of Nations.

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Geneva is Anxious.

It is believed that the organisation which proposes the introduction of this British service "somewhere in France" is prepared to use any power up to 100 kW. What an awkward neighbour! I am not surprised that the Union Internationale de Radiophonie is watching the course of events with some asperity.

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Wanted: An Etheric Policeman.

The Geneva scheme is being sorely tried nowadays. In those chaotic days before the scheme materialised, all (or nearly all) the nations of Europe were filled with a zealous fervour for the new plan which promised so much. And for a time after the introduction of the scheme, the different stations displayed a conscientiousness which was obviously too intense to last. The first fine frenzy is departing, and it looks as if Geneva will have to assume the rôle of etheric

policeman, possibly with a 1,000 kilowatt station which could bark terrible warnings into the ears of offenders and jam their signals if the offence continued.

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"Eastbourne Effect."

What a pity it is that Eastbourne is so far from London. If it were a little nearer the B.B.C. might buy up the Grand Hotel and make it the headquarters of British broadcasting. They would then know that they possessed at least one perfect studio on their own premises.

This is what I was thinking two Sundays ago when listening to Tom Jones' orchestra and to the singing of Miss Margaret Bannerman. The lounge of the

Grand Hotel at Eastbourne is nearer acoustic perfection for broadcasting purposes than any other place that the B.B.C. have tried in the last six years. The Chenil Galleries might be classed as second.

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That Mysterious Formula.

Before the architects of the new Broadcasting House get busy I would advise them to take return tickets to Eastbourne. Having found the Grand Hotel, let them sip comforting liquid in the lounge until the other clients have gone, when they can boldly whip out tape measures and, with the kind permission of the genial management, set to work to discover the "Eastbourne effect." When



EVOLUTION IN STUDIO DESIGN. The new orchestral studio at the Copenhagen broadcasting station, with accommodation for a large audience. The music of Denmark is to have a special place in the programmes of European stations to-day (Wednesday).

they have found the mysterious formula, let them hie them back to London and rebuild a replica of the Eastbourne lounge in Langham Place.

Many Happy Returns!

The broadcasting craze has now lasted six years and to-day marks the anniversary of that auspicious day in 1922 when 2LO sent forth its first signal. (By the way, what was that first signal? Was it a word, and, if so, who said it, and what was it?)

To-night we are to have a staff birthday programme from 10.20 to 11 o'clock. Some surprises are promised.

An Empire Broadcasting Service.

On the question of the future status of 5SW, the B.B.C. refuses to be drawn beyond previous declarations that the transmissions are purely experimental and insufficiently developed to warrant the inauguration of a "service."

In reply to my remark that the transmission of the London programme from 5SW constituted a "service" in the eyes of many people, an official at Savoy Hill said that the choice of the 2LO programme was only incidental. "This programme is used," he said, "because it is desirable that the material for such prolonged tests as those from 5SW should be varied more than the ordinary stock-in-trade of experimental transmissions."

"When the technical difficulties have been so far overcome that a broadcast overseas 'service' of even approximate regularity is possible, the whole subject must and will be reviewed in the light of what experience has disclosed as to the nature of the demand for it and the financial and other conditions for meeting it."

Plain Questions.

That the tests have been so "prolonged," as admitted by the B.B.C., is one of the reasons why the time seems ripe to ask the perfectly reasonable questions: "Are the experiments meeting with success? If so, what are you going to do about it?"

An answer to these questions is the sort of statement that is required, and unwillingness to make such a statement suggests all sorts of disconcerting possibilities which may have no basis of fact.

Good Night . . . and Good-bye.

The closing down of the Nottingham relay station seems to have engendered a mysterious dread in other districts now served by stations of the same calibre. Rumours have spread abroad in Plymouth and Hull, and in the latter city popular feeling reached a peak value a few nights ago when a certain announcer closed down with the remark: "Good-night and good-bye"

Groundless Fears.

"Great Heavens!" a lot of people appear to have said. "Nottingham over again, only more so!" (for if Hull closed down the nearest main station would be Manchester). Happily enough, there was no cause for palpitation for the

simple reason that the announcement had been misinterpreted. The particular announcer was, I understand, about to take up duties elsewhere, and he chose that same pathetic form of farewell as was used by Mr. Eric Dunstan two years ago on leaving 2LO for India.

Why Nottingham Closed Down.

For the present, at all events, the relay stations are safe. 5NG was closed down for the special reason that Nottingham lies well within the service area of 5GB. This is not the case with other relay station areas, and I am definitely informed by the B.B.C. that no relay station in the north will cease functioning until the Northern Regional station is working. And even then, if the new station fell short of technical expecta-

FUTURE FEATURES.

London and Daventry.

- NOVEMBER 18TH.—A Schubert Concert.
- NOVEMBER 20TH.—A Dickens Recital by Sir Thomas Hughes.
- NOVEMBER 23RD.—B.B.C. Symphony Concert, relayed from the Queen's Hall, Daventry Exp. (5GB).
- NOVEMBER 19TH.—Scenes from "Les Cloches de Corneville," by Planquette.
- NOVEMBER 20TH.—A programme of Schubert's Chamber Music.
- NOVEMBER 24TH.—A Vaudeville Programme.

Cardiff.

- NOVEMBER 19TH.—Bristol Post Office Staff Concert.
- NOVEMBER 24TH.—A Bristol Popular Concert.

Manchester.

- NOVEMBER 22ND.—A Concert by Present Students of Manchester Royal College of Music.

Newcastle.

- NOVEMBER 19TH.—"The Seventh Heaven," a Chinese Fantasy, by Frank Cochran and Dion Titheradge. Music by Arthur Wood.

Glasgow.

- NOVEMBER 23RD.—A Recital of Nonsense and Nursery Songs by Alexander D. Carmichael (baritone).

Aberdeen.

- NOVEMBER 20TH.—"Impertinent Waves," presented by the Radio Concert Party.

Belfast.

- NOVEMBER 19TH.—"The King of Zenna," a radio drama, written specially for broadcasting by Edwin Lewis.
- NOVEMBER 20TH.—Opening of New Town Hall, Ballinmena, by His Grace the Duke of Abercorn.

tions, the relay stations would survive just as the present main stations would survive in similar circumstances.

Delay in Common Wavelength Scheme.

Incidentally, I hear that the relay stations are unlikely to adopt the common wavelength scheme, originally planned for this month, until early in the New Year. Not all the stations are ready for the change, their engineers not being at all satisfied that efficient working would be secured without further alterations to the apparatus.

How many readers have noticed that Leeds has jumped up the wavelength scale by at least 8 metres? There has recently been a good deal of Continental heterodyning on Leeds' 277.8 metre wavelength, but the station seems to have countered it by moving up to about 285 metres.

Don't Turn Out the Light!

Those who wish to hear a real bair-raiser of the macabre type should tune in to 2LO on Tuesday, December 4th, when the dramatised version of "The Monkey's Paw," by W. W. Jacobs, will be broadcast.

All who have read the story will agree that "The Monkey's Paw" is a masterpiece among tales of horror. To those who are over-sensitive I would say: "Keep the lights up!"

Too Much Gaelic.

"When in Turkey, do as the turkeys do," is a sentiment which finds little support in Aberdeen. It appears that 2BD has been a little too zealous in its attempts to meet the needs of the Gaelic-speaking fraternity, with the result that Aberdonians are beginning to suffer from earache.

The Sassenachs who have recently tuned in to Aberdeen have merely imagined that these northern latitudes are peculiarly favourable to atmospherics.

Group Psychology.

The discussion group idea seems to be gaining in popularity and the B.B.C. believes that there are now several thousands of these coteries scattered about the country. Believing that there are many enthusiasts who would derive more benefit from the talks if they listened in the company of others, the Corporation has issued some hints on the formation of groups and how they should be conducted.

How to Run a "Group" Discussion.

"The best discussion takes place," says the B.B.C., "when there is someone present who has come prepared to open it by saying a few words immediately after the lecture. . . . The method of discussion must at first be experimental, e.g., in some cases a short discussion might take place *before* the lecture, as well as *after* it. . . . Every group should appoint one of its number to act as a correspondent with the lecturer."

If the talks become too interesting some of the speakers will get more correspondence than they bargained for.

First Appearance of National Chorus.

The recently formed National Chorus of 250 voices will make its first public appearance on November 23rd, when it is to take part in the performance of Granville Bantock's new choral work, "The Pilgrim's Progress," at the Queen's Hall. This has been specially composed for the Bunyan tercentenary, which is to be celebrated by the B.B.C. in its symphony concert, and the libretto is based upon Bunyan's work. Professor Bantock will conduct the concert, and the vocalists will include Enid Cruickshank, Gladys Palmer, Megan Tellini, Trefor Jones, Norman Allin, and Harold Williams.



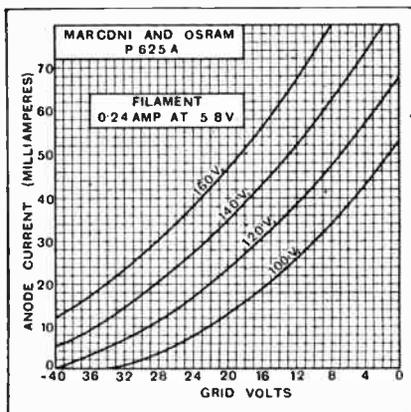
Marconi and Osram
Power Valves.

THE general improvement in valves was one of the most important features of the Radio Exhibition, and the new power valves in particular are likely to produce a marked change in the quality of reproduction obtainable from the ordinary domestic receiving set. A few years ago the L.S.5A, a comparatively high-priced valve designed to withstand anode voltages seldom used in the home, was the only available valve for superlative loud speaker reproduction. Then came the D.E.5A, which gave the equivalent of L.S.5A quality at a volume sufficient for the average

P 625A.

CHARACTERISTICS AT ZERO GRID BIAS AND 100 VOLTS H.T.

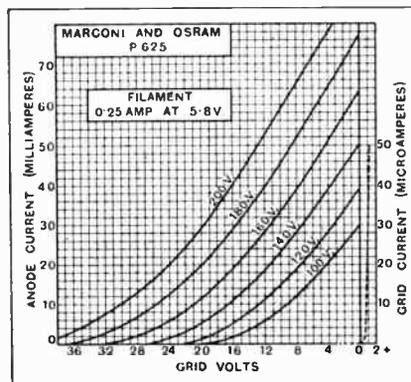
P 625A.	Amplification Factor.	A.C. Resistance. (ohms.)	Mutual Conductance (mA per volt).
Maker's Rating .	3.7	1,600	2.3
Specimen 1	3.86	1,430	2.7
Specimen 2	3.57	1,660	2.15
Specimen 3	3.23	1,370	2.35



Average values under amplifying conditions.
 Amplification Factor = 3.6.
 A.C. Resistance = 1,920 ohms.
 Mutual Conductance = 1.87 mA/volt.

P 625.
 CHARACTERISTICS AT ZERO GRID BIAS AND 100 VOLTS H.T.

P 625.	Amplification Factor.	A.C. Resistance (Ohms).	Mutual Conductance (mA per volt).
Maker's Rating .	6	2,400	2.5
Specimen 1	4.65	1,750	2.65
Specimen 2	5.56	1,920	2.9
Specimen 3	5.91	2,080	2.85



Average values under amplifying conditions.
 Amplification Factor = 5.
 A.C. Resistance = 2,080 ohms.
 Mutual Conductance = 2.4 mA/volt.

room and required a filament current of only 0.25 amp. This valve came to be regarded as the standard output valve, and was largely responsible for the creation of the present critical attitude of the listening public towards the question of quality of reproduction. Now we have the "P" type valves which, for the same filament current, give power outputs six or seven times greater than the D.E.5A.

Of the three valves under review, the P 615 is best suited to the requirements of the average listener. The A.C. resistance is well matched to the impedance of the best moving-coil and cone loud speakers, and the

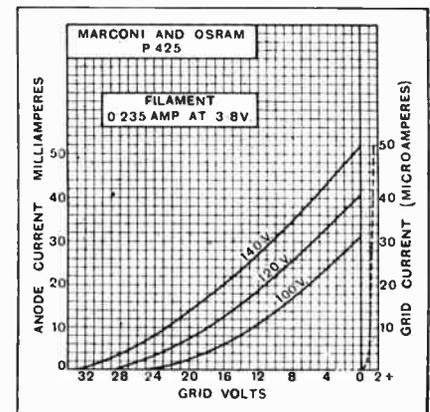
high amplification factor enables the full output to be maintained with a comparatively low input; this property is reflected in the low grid bias values required for various H.T. voltages. A further advantage of the high amplification factor is that amplification can be thrown away in the earlier stages of the receiver, if necessary, in the interests of quality, without sacrificing volume.

The valve can be used for anode voltages up to 250, provided that the grid bias is adjusted properly and that the anode current does not exceed 24 milliamperes. In the valves tested the anode current was rather in excess of the makers' rating, and,

P 425.

CHARACTERISTICS AT ZERO GRID BIAS AND 100 VOLTS H.T.

P 425.	Amplification Factor.	A.C. Resistance (Ohms).	Mutual Conductance (mA per volt).
Maker's Rating .	4.5	2,300	1.95
Specimen 1	3.15	2,380	1.45
Specimen 2	4.08	2,270	1.8
Specimen 3	3.01	1,960	1.55



Average values under amplifying conditions
 Amplification Factor = 4.0.
 A.C. Resistance = 2,530 ohms.
 Mutual Conductance = 1.56 mA/volt.

Valves We Have Tested—

as might be expected, the mutual conductance was even better than the remarkably good rated value of 2.5 mA. per volt. Supplied with 200 volts from a mains unit, wonderful volume and quality was obtained with a moving-coil loud speaker, and there can be no reservation in recom-

P 625A.

H.T.	Grid Bias.	Anode Current (mA).	
		Maker's Rating.	Measured.
100	-13.5	14	23
140	-21	22	33
180	-30	28	—



Osram P 425 super power valve.

P 625.

H.T.	Grid Bias.	Anode Current (mA).	
		Maker's Rating.	Measured.
100	-6	10	16
150	-12	14.5	23
200	-18	19	31
250	-24	21	—

Nevertheless the available power output is only about 10 per cent. less than the P 625. In general, the anode current should be derived from the mains or accumulators rather than dry-cell batteries.

Where the filament supply is four instead of six volts, the P 425 should be used. Although not such a good valve as the P 625, its output when supplied with the maximum H.T. voltage of 150 is nevertheless about twice that of the D.E. 5A. The anode current taken is well within the capabilities of the larger type H.T. bat-

P 425.

H.T.	Grid Bias.	Anode Current (mA).	
		Maker's Rating.	Measured.
100	-9	11	15
125	-12	15	24
150	-16.5	17	26

mending the installation of this valve in any receiver deriving H.T. current from the mains. If there is no alternative to the use of dry-cell H.T. batteries, the anode voltage should be limited to 150 volts and only the super-capacity type of battery is permissible.

The P 625A is rather a special valve, and is intended for use with large input amplitudes or where the impedance of the loud speaker is exceptionally low. The mutual conductance is 2.3 as compared with 2.5 for the P 625, and the maximum anode voltage is restricted to 180.

teries, and these can be used economically if supply mains are not available.

The remarkable improvement in the characteristics of these valves is due to the special coated filament, which should be treated with care to ensure long life. In no circumstance should the grid bias be adjusted without first switching off the H.T., and the grid bias voltage should be checked from time to time and the cells renewed if necessary in order that the anode current may be kept well within the rated maximum value.

LONGER LIFE FOR H.T. BATTERIES.

A Simple Way of Using D.C. Mains for the Output Stage.

THERE must be many listeners who, although they have direct-current mains in the house, have for financial reasons refrained from investing in a battery eliminator, but have remained faithful to the dry battery as provider of anode current. Using a dry battery, it is hardly an economical proposition to employ a "super-power" valve in the output stage, on account of the large current drawn by these valves, so that the user of batteries is limited, if expense is a serious consideration, to valves having an impedance not less than about 6,000 ohms.

Solving the H.T. Problem.

Now that cone loud speakers of various types are becoming more and more generally used, it is being found that a "super-power" valve is really essential for their satisfactory operation; what, then, is the user of dry batteries to do? If he invests in a "super-power" valve he will find the life of his high-tension batteries becomes very short, while if he keeps to the small power valve he has to put up either with a very small output or with overloading on all the louder passages.

Although dry batteries are most uneconomical where

heavy currents are required, for small currents they are just the opposite; if only some 5 milliamperes is required, there is no cheaper or better source available. If, bearing this in mind, the circuit-diagram of any standard four- or five-valve receiver is examined, it will be seen that all the difficulties of current supply are bound up with the output valve. The earlier valves take an average of perhaps 1 to 2 milliamperes apiece—even less in the case of a resistance-coupled amplifier—and this is well within the power of the dry battery to supply. It is the output valve which consumes the bulk of the current, taking perhaps some 12 to 15 milliamperes. If there are direct-current mains in the house it is possible to take advantage of this distribution of current between the valves of the set, and, without going to the expense of buying or making up a battery eliminator to draw from the mains the current required for the last valve only, leaving the rest to be supplied, as before, by the dry battery.

A battery eliminator for D.C. mains consists chiefly of a smoothing circuit to remove the ripple that would otherwise cause hum in the loud speaker. If it is decided to feed the last valve only with plate current

Longer Life for H.T. Batteries.—

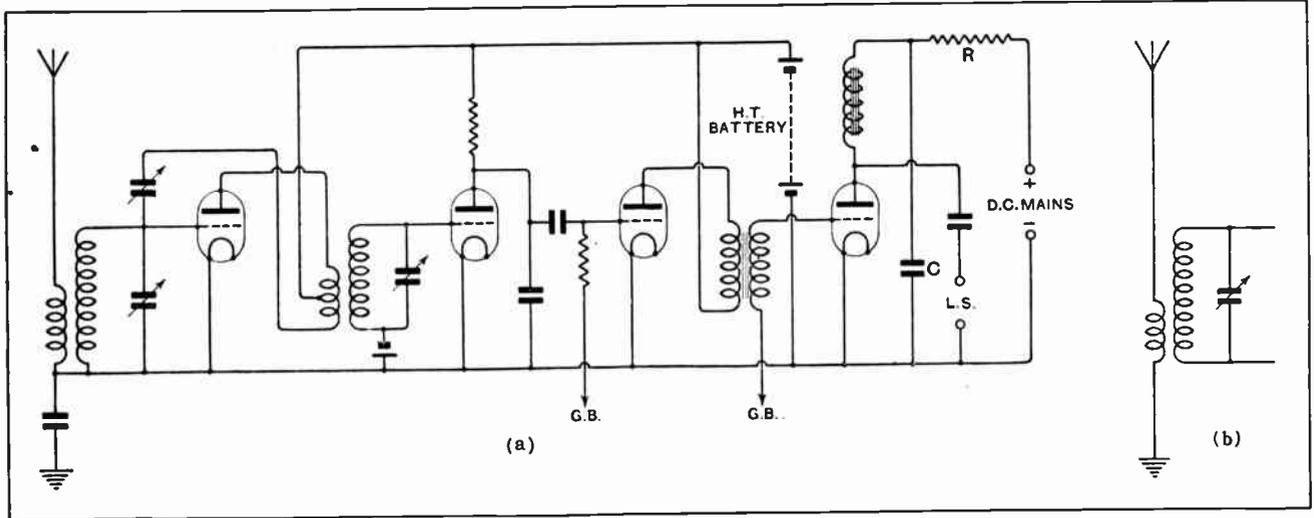
from the mains, the need for smoothing practically disappears, because the unsmoothed current is introduced into the receiver at such a point that it is not amplified by the valves. In consequence the amount of hum heard in the loud speaker is so small that it is not likely to cause annoyance to anyone.

In supplying the output valve from the mains, it will usually be necessary, for the sake of securing a reasonable valve life, to break down the original voltage, which may be from 200 to 250 volts, to some 160 volts, which is about the highest value that it is safe to employ. This can most economically be done by the introduction

For one output valve the resistance may be wound with 40-gauge Eureka wire, which has a resistance of 37 ohms per yard; for two valves 38-gauge Eureka, resistance 23.8 ohms per yard, will be more suitable.

Avoiding a Double Earth.

The arrangement suggested is indicated in the diagram given, which shows a four-valve receiver to which this system is applied. The condenser C will probably be of assistance in reducing any slight traces of hum that may be heard in the loud speaker, but it need not be regarded as an extra component, as it will already be in position on most receivers.



An eliminator without complications. How to supply the output valve from D.C. mains.

of a series resistance, which, for "super-power" valves, may have the following values; a plate current of approximately 12 milliamps. per valve is assumed.

Mains voltage.	Resistance (ohms). One output valve.	Resistance (ohms). Two output valves.
200	3,500	1,700
210	4,000	2,000
220	5,000	2,500
230	5,600	2,800
240	6,400	3,200
250	7,600	3,800

If the circuit of the set is such that the filaments are earthed, it will be necessary to insert a condenser in the earth-lead as shown to prevent the supply mains from being short-circuited or illegally earthed; this condenser must be capable of withstanding continuously the full supply voltage. If, as in the small diagram, the filaments are not earthed, this condenser may be omitted, in which case the provision of the resistance R becomes the sole outlay in installing as near an approach to free anode current as one may reasonably hope to find for so small an initial cost.

A. L. M. S.

New Headquarters.

Owing to the rapid expansion of Slade Radio (Birmingham) it has been found necessary to seek more commodious accommodation at the Parochial Hall, Erdington, where the last meeting, on Oct. 25th, was held, the Mullard Valve Co. giving a demonstration of screened-grid, pentode and other valves.

The Society held its second whist drive and dance on Tuesday, Oct. 23rd. This was a great success and there was a full attendance.

Hon. Secretary—Mr. H. Clews, 52, St. Thomas Rd., Erdington, Birmingham.

Long Life in Accumulators.

Valuable advice on how to cherish an accumulator was given by Mr. Burnett, of Messrs. Fungstones, at the meeting of the Bee Radio Society on Oct. 23rd. The speaker emphasised the small details in accumulator maintenance which make such a difference, and explained why so many accumulators do not last as long as they should.

Later in the evening Mr. Porter, of Messrs. McMichael, Ltd., demonstrated the Screened

NEWS FROM THE CLUBS.

Dimie Three, and showed the fascinating possibilities of a receiver employing a screened-grid valve, detector and pentode.

Hon. Secretary, Mr. A. L. Odell, 171, Trancmere Rd., S.W.18.

Popularity of Coil-driven Loud Speakers.

That the moving-coil loud speaker is gaining in popularity was shown during a discussion at the meeting of the Wembley Wireless Society on November 2nd, when it was revealed that a number of members were installing moving-coil instruments. In a talk on the subject, Mr. Crowther said that it was wrong to imagine

that moving-coil loud speakers required a tremendous power to operate them; quite satisfactory results had been obtained in a small room with an ordinary two-valve set.

Mr. Comben demonstrated a receiver entirely operated from the A.C. mains. It was noticed that there was an absolutely silent background, no "mains hum" being present.

Hon. Secretary: Mr. H. E. Comben, B.Sc., 24, Park Lane, Wembley.

A Pentode Demonstration.

The general public was well represented at the last meeting of the Edinburgh and District Radio Society on November 5th, when Mr. F. E. Henderson, of the General Electric Co., Ltd., lectured on "Osram Screened Grid and Pentode Valves." The lecturer gave a convincing demonstration with a Pentode valve in the power stage, though it was discovered that a cone speaker of high resonance gave better results with an ordinary valve.

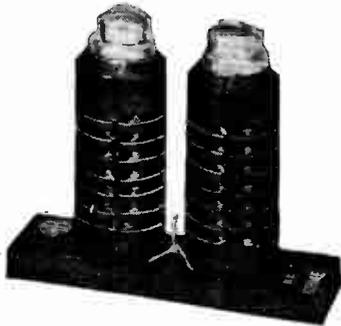
Hon. Secretary: Mr. E. I. Robertson, 10, Richmond Terrace, Edinburgh.



A Review of Manufacturers' Recent Products.

McMICHAEL BINOCULAR CHOKE.

Although of conventional appearance, the McMichael binocular choke is quite unique inasmuch as an iron core is used for the purpose of increasing inductance.



McMichael Binocular Junior H.F. choke; D.C. resistance 270 ohms.

The makers have had wide experience of the use of iron-cored H.F. circuits, and their latest application of this principle would appear to have many points in its favour. In the first place the D.C. re-

sistance of the winding is reduced to 270 ohms as fewer turns are required to obtain the necessary inductance. Secondly, the field of choke is more compact as the lines are concentrated in the iron. Finally, the coupling between the two sections of the choke is increased and there is no trace in the impedance curve of the objectionable kink usually associated with binocular chokes.

It would appear that the H.F. resistance is above the average, for the peak value of impedance does not exceed 178,000 ohms. This property is no disadvantage as the 1,600 metre wavelength is quite close to resonance and the choking effect is correspondingly increased. In general the choke should not be used for wavelengths above 1,700 metres unless the external circuit capacity exceeds 8 micro-mfd. Turning to the medium broadcast waveband we find that the choking effect is well up to standard. Actual values are as follow:—

Wavelength (metres).	Impedance (ohms).
200	13,500
500	48,200
1,600	176,000

The choke is unusually compact, the

overall dimensions being 2½ in. x 1½ in. x ¾ in. It is made by Messrs. L. McMichael, Ltd., Slough, and the price is 4s.

"REALISTIC" LOUD SPEAKER.

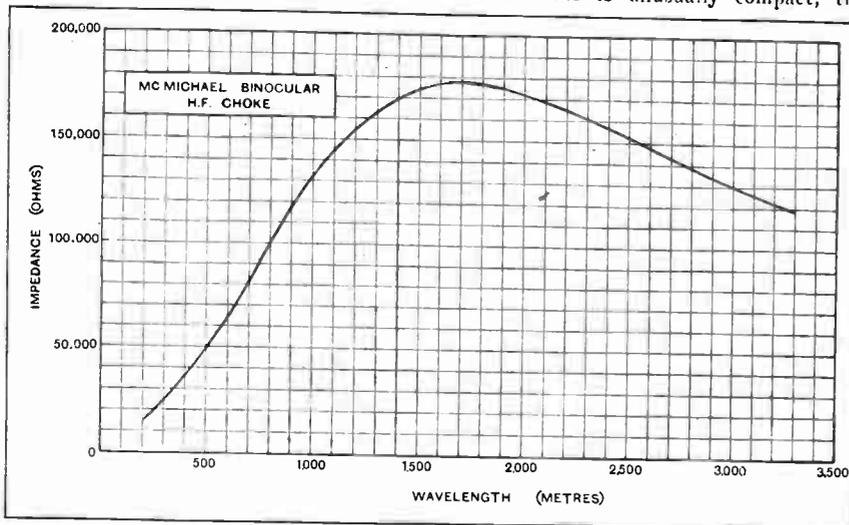
This instrument is notable for the ingenious construction of the diaphragm, which is entirely constructed of thin veneer wood. The sections are joined together to form a flared cone which is comparatively rigid at the centre and in-



"Realistic" loud speaker with flared diaphragm.

creases in flexibility towards the periphery. It is claimed that the rigid centre gives good reproduction of the high notes, and that the flexible edge ensures correct balance in the lower register. The middle register is also well reproduced, as was proved by a test on a high-quality amplifier. The diaphragm is driven by an adjustable movement, which gives good sensitivity when correctly adjusted.

The price is £3 10s., and the makers are Messrs. W. H. S. Vincent, 72, Penton Street, Islington, London, N.1.



Impedance curve of McMichael Binocular Junior choke; external capacity 8 micro-mfd.

"CYLANITE."

This substance is made in the form of sheets 1/32in. in thickness, and presents the appearance of highly polished ivory. When used to cover the fronts of ebonite, metal or three-ply panels it should greatly enhance the appearance of a receiving set. It can be engraved quite easily, and can be used for translucent dials and in a variety of ways which will at once occur to the minds of home constructors. The price of this material, which is obtainable from Messrs. Marsh and Wright, 5, Royal Arcade, Weymouth, is 2s. per square foot.

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A POCKET SOLDERING OUTFIT.

The "Soldmeta" pocket soldering outfit costs 2s. 6d., and is made by Messrs. Elmesan (London), Ltd., 66, Victoria Street, London, S.W.1. It contains a miniature soldering iron with detachable handle, a tin of "Soldo" soldering compound, a tin of flux, a stick of solder, a small fuel tray, and a supply of "Meta" solid fuel. The latter is a pure white organic chemical which burns with a flame similar to methylated spirits and leaves no ash. The fuel is sold in the form of bars, and one-quarter of a bar is sufficient to heat up the iron and make several wiring joints. 100 bars cost 2s. 9d.



"Soldmeta" pocket soldering outfit.

The "Soldo" compound consists of a mixture of granular solder and flux, and it was found possible to tin the iron, which was not previously clean, by merely heating it and dipping it in the compound.

The complete outfit measures only 3in. x 4in. x 1in., and is easily carried in the pocket.

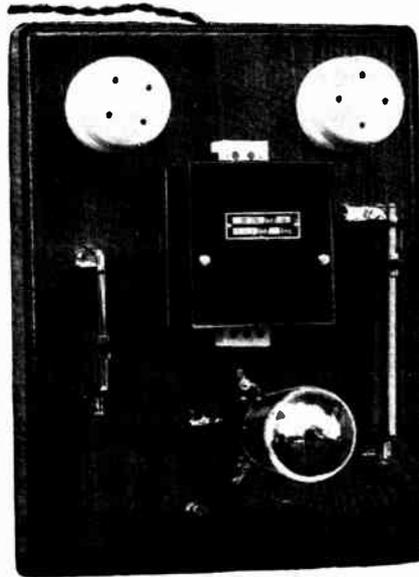
o o o o

THE BRAYTON TRICKLE CHARGER.

It is still thought by many people that in order to charge H.T. accumulators from A.C. mains it is necessary to incur an expenditure of several pounds in the purchase of a suitable charger, the greater part of this cost being entailed by the necessity of a power transformer of suitable design. It is, however, possible to construct a trickle charger in which the only transformer used is one of the small, inexpensive type for the sole purpose of lighting the filament of the rectifying valve. The actual recti-

fying circuit is in direct connection with the mains, thus effecting a saving in the price of a power transformer; this in no way detracts from the efficiency of a charger.

The "Brayton" instrument, which is of this type, is actually sold as a set of parts, but since they are all mounted ready for attachment of a few simple connections, one is practically buying a complete instrument.



The "Brayton" Trickle Charger.

A point worthy of note is that, owing to the provision of a variable wire-wound resistance, the charging current can be smoothly varied, and, moreover, arrangements are made so that some resistance is always in circuit, thus safeguarding the rectifying valve.

The price of the instrument complete, except for the addition of a few wires, is only 30s. In addition, an ordinary half-wave rectifying valve is required, although quite good results may be obtained by the use of an ordinary small power valve. On actual test, the figures for charging rate and mains consumption, as given by the makers, were found to be accurate.

The manufacturers are Messrs. P. M. Braidwood, Somerset Road, New Barnet.

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WEARITE ANTI-CAPACITY SWITCHES.

It will be seen from the photograph that the design of these switches follows well-tried practice. The switch lever is provided with ebonite rollers, which serve to push over the contact blades and hold them in position. The contact blades and points are rigidly fixed in a high-quality machined ebonite block, which entirely insulates them from the U-shaped frame. A soldering tag is fixed to the frame for earthing if necessary.

No special metal is used at the contact points, but the movement of the blades

gives a slight wiping action, which ensures a perfect contact. The construction of the switches as a whole is excep-

Wearite anti-capacity switches.



tionally robust, and unfailing reliability over long periods is assured.

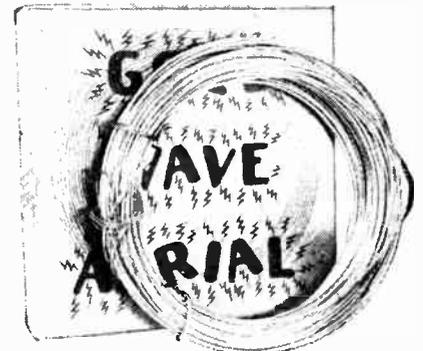
The switches with U-shaped frames are made in two- and three-position types, with from two- to five-way contacts, and the prices range from 6s. to 12s. A modified type with L-shaped frame is made in the two-position form only, with contacts from one-way to four-way. The prices of this type are lower, and range from 3s. 6d. for the one-way to 6s. for the four-way switch. The makers are Messrs. Wright and Weaire, Ltd., 740, High Road, Tottenham, London, N.17.

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GOLD WAVE AERIAL.

This aerial, which is of American origin, is made up of seven strands of 24 S.W.G. wire. The base metal alloy is made from electrolytically deposited metals of the purest quality, and each strand is heavily plated with pure gold, which effectively prevents corrosion.

The aerial should prove a boon to coastwise listeners who are troubled with corroded aerial wires due to the salt in suspension in the atmosphere. It is also probable that there will be an improvement in the amount of background noise when this aerial is used for short-wave reception, as there is less possibility of electrolytic action among the strands.



"Gold Wave" aerial wire which is plated with pure gold.

The price of the 100ft. aerial is 12s. 6d., and the agents in this country are Messrs. Horace Soley and Co., Ltd., 3, Jewin Street, London, E.C.1.

The Editor's Mail



The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

RANGE V. QUALITY.

Sir,—A cat may look at a king, but whether it may suggest the addition of milk to the monarch's diet is not on record. It seems to me that your diet is painfully lacking in metaphorical milk. Week after week you describe for us sets which will receive, under favourable conditions, the characteristic noises of the kangaroo in its native surroundings. Razor-sharp-tuning is becoming such a fetish that presently we shall receive nothing but the tuning note, and be thankful to get that, without using condensers geared a million or so to one.

Before making my suggestions let me hasten to say, before half the readers of *The Wireless World* say it for me, that I do not know what I am talking about. But it does seem to me that the ideal in sets is one which will receive the local station and Daventry with a sufficiently large factor of safety and, at the same time, with the best possible quality available at the present day. By the operation of one switch I should like to render such a set sufficiently selective and sensitive to receive a mere two or three foreign transmissions.

Surely this can be done. It cannot be necessary to lose all our high notes by sharp tuning and then to deceive ourselves by deliberately removing the bass.

May I ask whether you cheat yourself at Patience?

Chadwell Heath,
October 24th, 1928.

R. W. BLOUET.

[Patience is not one of our hobbies!—Ed.]

PICTURE BROADCASTING.

Sir,—It is surprising to me that the B.B.C. should decide for or against any form of picture broadcast without consulting the public which finds their funds

I suggest a referendum on the following lines:—

"Do you, as a subscriber to wireless services, desire the B.B.C. to include broadcast of:—

- (1) Still pictures?
- (2) Television?

Personally I think it is wasting our money to transmit pictures, however perfect, the like of which can be bought in evening papers at one penny per dozen

Television may have imperfections at present but is obviously the eventual home requirement, and the B.B.C. should remember that amateurs have taught them many a lesson—why not let them have a chance at improving television reception?

London, N.3.

E. J. CRAMPTON.

October 20th, 1928.

VALVE CHARACTERISTICS.

Sir,—With reference to the common practice of valve manufacturers to publish the impedance values for their valves with zero H.T., I should like to suggest that it would be far more useful to constructors and experimenters if the impedance figures were given for some definite value and grid bias.

It is, of course, possible to use the same valve under various conditions of H.T. and grid bias, but there are certain average conditions which apply in the majority of cases for which impedance values might usefully be given. For example, a first L.F. valve is quite commonly operated with about 100 volts on its plate and 3 volts negative bias, so that if the impedance of such a valve were given for this condition, and also if the same valve is suitable for use as a grid leak rectifier, with 2 volts positive bias, the impedance values would be a real value,

whereas now they are only useful for very rough guidance to differentiate between one type of valve and another.

This difference in valve impedance between operating and static conditions probably accounts for the valve impedance figures given by certain manufacturers with their performance curves not agreeing with the published characteristics of the same valves.

It has been suggested that the reason why valve characteristics are not published under the H.T. and grid bias conditions normally used is that the variations in the characteristics of individual types are then far greater than they are when measured with zero bias.

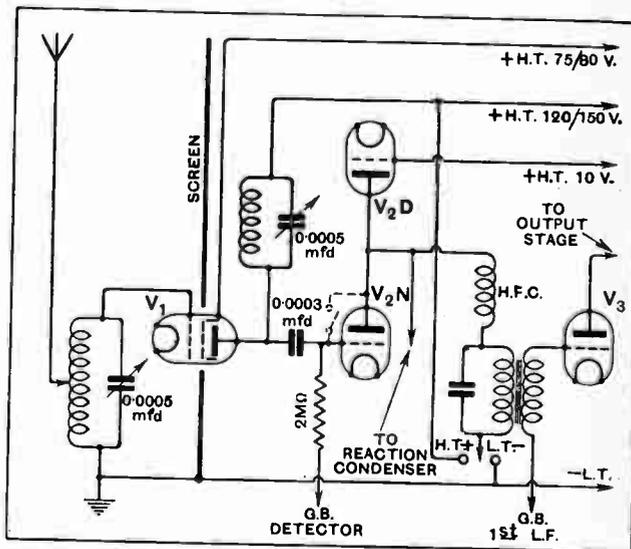
Perhaps this matter may be of sufficient interest to your readers to throw some light upon it.

J. BAGGS.

DIODE AS RECTIFIER.

Sir,—With reference to Mr. J. W. Stacey's letter in *The Wireless World* of October 10th, I am in entire agreement on the merits of the diode as a rectifier.

Unfortunately, it is only suitable when preceded by one H.F. stage, for the local station, so I have constructed my set to use diode, anode-bend or leaky-grid rectification by a very simple arrangement, as will be seen from the diagram.



To use anode bend or detector a suitable valve is inserted into valve-holder V2N (normal), and the primary of the L.F. transformer is plugged into the socket connected to +H.T.

No valve is placed in valve-holder V2D (diode), but even if one was accidentally placed in it no harm would be done.

The grid bias is adjusted for anode bend or leaky grid as required. To use diode rectification, the valve is removed from V2N. The primary winding of the L.F. transformer is plugged into the socket connected to -L.T., and the grid and plate sockets of valve-holder V2N are shorted by means of a plug made of two valve legs in a piece of ebonite $\frac{1}{8}$ in. apart and connected together (or in a piece of metal).

The valve is then inserted in valve-holder V2D.

No reaction is possible when using the valve as a diode, but this is unnecessary, as at 100 miles (Salisbury) from 5GB and 5XX both come through at ample strength, using screened grid H.F. diode (R.C.C. type valve), L.F. (D.E.L. 610 type), and push-pull, using L.S.5A. with 300 volts H.T.

Needless to say, all filaments are connected in parallel, as usual, with the usual 35 ohm. variable resistance in filament of screened grid valve for volume control.

All who try this will (or should) be delighted with the results, and at any time the set can be used without alteration as a normal long-distance receiver.

Salisbury.
Oct. 15th.

J. B. KELLAR.

5SW—AN APPRECIATION.

Sir,—I wish to express appreciation of the programme regularly received here in North Brazil on short-wave from 5SW.

At Manaus, 1,000 miles inland and situated near the River Amazon, as well as the seaports we call at, three valves are sufficient to work a reed-drive cone speaker at moderate volume. The other officers and I are disappointed that no news items are broadcast, but expect that this is due to the restrictions of newspaper concerns.

The extra two hours' programme after midnight of gramophone records means that we can now listen until 9 p.m. here instead of 7 p.m. The strength of signals does not vary much during the evening programme, but the 12.30 p.m. to 1.30 p.m. transmission is practically unreadable on any day.

I shall not "grouse" about there being no broadcasting on Saturdays or Sundays, as the transmissions are still experimental, but can only hope that a daily service will soon be in full swing.

Manaus, Brazil.
Oct. 8th, 1928.

A. H. MASON.

5GB.

Sir,—What about 5GB? Reading the correspondence of Mr. E. Baynes with the greatest astonishment, I should like to tell you the reverse of the matter. 5GB is called here in Holland "The standard of comparison," as it is coming in almost faultless. I am listening on two types of loud speakers, one of the balanced armature type with 17in. cone, and the other a moving-coil instrument made to *Wireless World* specifications. But I can hardly find a mistake in the transmission of 5GB. It is still better than 5XX. Hilversum is a clear station, it is true, but often unsuitable for moving-coil work. The studio in which the Hilversum concerts are given is a small concert hall. Only trio and speech is given in a draped studio. My circuit is a screened-grid H.F. valve, anode-bend detector, one-stage resistance, and one transformer-coupled L.F. with Philips R.C.C. and transformer, and a super-power valve in last stage. I hope to be able to help you in finding out the cause of it, which is, I think, of local atmospheric nature.

Amsterdam-C, Holland.
October 29th, 1928.

J. A. C. WIGMAN.

WHY IS IT?

Sir,—I think most of us will agree with "Watt Sisname's" letter "Why Is It?" in your issue for October 31st, but what can be expected when the country is flooded with blue prints of more or less camouflaged Det. 2Lr' circuits with high-sounding names, reaction on aerial being, of course, *ad lib* (very much so).

I have by me as I write one of these blue prints which claims for the circuit 49 stations on the loud speaker, using an indoor aerial! Excellent. I presume the quality of reception is not strained but droppeth as the gentle rain from Heavyside's.

But surely somewhere there must be one more lone voice calling, and when constructors with good outside aeriols go all out to make it the half century, the result can be heard to perfection on any good moving-coil speaker within range.

All this after *Wireless World's* excellent and long-continued work on neutralised circuits.

I don't think the man who oscillates really deserves "Watt Sisname's" creosote treatment; it seems to me he is deliberately encouraged to do so for advertisement purposes.

Birmingham.
Nov. 1st, 1928.

T. W. TURBERVILLE.

CONTROL ROOM.

Sir,—You will earn the gratitude of all by continuing to press for the suppression of the individual who mars many musical items. His performances are as distressing as those of the organist whose foot is for ever pumping the swell pedal.

T. A. CLEMENTS.

Fortis Green, N.2.
Nov. 1st, 1928.

SHORT-WAVE RECEPTION.

Sir,—This morning at 7.30 I picked up 2ME (Sydney) on 28.5 metres at amazing strength—R8 easily—no fade, not even high speech. I held it for an hour and heard a test with AGB (Germany) and the children's corner from 2FC and market reports.

It was evening in Australia, of course. I wonder if you can do anything to get them to broadcast on this wave length when the test matches are on. It beat anything I have ever had from 3LO by miles, and I was using the *W. W.* Empire set, of course, only that I have now added another valve, resistance-coupled. I shall be interested to hear if this has been reported by anyone else.

Ipswich.
October 15th, 1928.

W. J. COLLINS GARRARD.

TRANSMISSION QUALITY.

Sir,—I should like to raise the question among your readers as to the relative quality of the B.B.C.s transmissions from 2LO and 5XX.

My experience is that the high notes are very much weaker relative to the low ones in 5XX's transmissions than in 2LO's, and that on nine days out of ten the sibilant sounds in speech are almost absent in Daventry's output—and by no means always present in 2LO's.

Now, I want to know whether my receiver is at fault or whether the variations are commonly experienced by other listeners?

For 5XX I use two tuned circuits, one of which is decidedly flat, and no reaction, so it does not seem likely that I am losing my high notes from too sharp tuning.

If the difference is really in the two transmissions, surely something ought to be done about it, for if the frequency characteristic of the amplifier is "cooked" to suit Daventry, reproduction is all wrong from 2LO, and *vice versa*. Thus one cannot get good reproduction from both stations.

Crowborough, Sussex.

A. K. GORDON.

October 26th, 1928.

STANDARDISATION.

Sir,—The letter from "H. L. S." published in your issue of October 3rd is most timely. He has, however, only touched the fringe of matters. Lack of standardisation in form or nomenclature is exhibited in many other components. Take low frequency transformers for example. We have some with terminals close to baseboard, and others which attempt to make the grid to anode leads soar to unknown heights; we are snowed under with different ratios which may mean anything (very little is said about primary impedances and maximum anode current permissible).

Those who have wondered what capacity the average fixed condenser has *when screwed to the baseboard* must be legion! The same applies to grid leaks which have lost their original features.

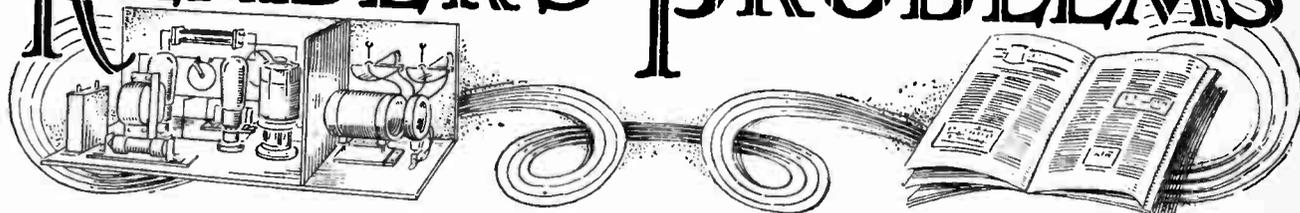
Variable baseboard resistors are now quite common, but how often is the value in ohms visible or engraved deeply enough to withstand constant usage?

I have given up wondering whether H.F. chokes are going to be made to lie down or stand up; the position at present seems to be stalemate. I suppose the classic example of absence of uniformity was the design of the early S.G. H.F. valves, now happily rectified. As for those unfortunate enough to possess special valve holders suitable for these, well—a good idea would be to soften the ebonite and use it as a cap to stop the humming of antimicrophonic valves!

W. A. E. ROWETT.

St. Austell, Cornwall.
October 9th, 1928.

READERS' PROBLEMS



"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below. These must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Doubtful Detection.

The detector valve of my receiver seems to function equally well whether the lower end of the grid leak is connected to L.T. -, L.T. +, or left free. Does this indicate that something is wrong, and, if so, how should I proceed to trace the trouble?

We expect you will find a leakage across your valve holder, or possibly the valve itself is soft. As far as the first is concerned, you should be able to test with a pair of phones and a dry battery, while the valve may be tested in the manner described on several occasions in this journal.

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Anode Bend for Volume.

Your advice as to the best type of detection for my projected receiver would be appreciated. I intend to concentrate on reception of the local station (only two miles away), from which I get very loud signals, as my aerial is a good one. For this purpose I am limiting myself to two valves; is it a fact that the anode-bend rectifier will give much greater volume than the leaky grid method?

J. A.

Situated as you are, it is more than possible that the H.F. voltage developed across a tuned aerial coil will amount to six volts or more. Under these conditions, it is certain that a properly arranged bottom-bend detector will deliver a greatly increased audio-frequency voltage to the L.F. amplifier, as compared with the other method.

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Bias for A.C. Valves.

An indirectly heated A.C. valve is used as an anode-bend detector in my four-valve receiver; as I should like to make provision for exact adjustment of its grid bias, will you please tell me how a potentiometer may be connected? As alternating current is used for heating, it will clearly be impossible to use the conventional method applied to ordinary valves.

L. S. R.

We suggest that the method shown in Fig. 1 will be the most convenient for you. As you will see, a potentiometer in conjunction with a single dry cell is

used to bridge the gaps between tapings on the grid bias battery.

Although the current taken from the potentiometer cell will only amount to

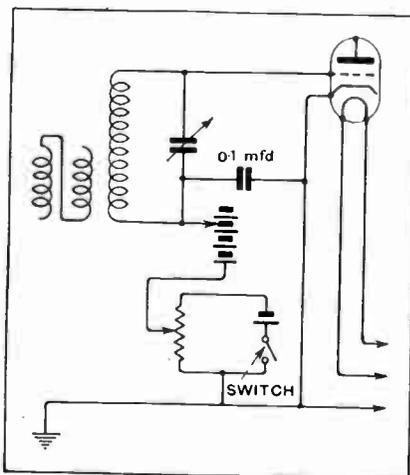


Fig. 1.—Detector grid bias of an indirectly-heated valve may be critically adjusted by adding a potentiometer and dry cell.

a few milliamps, it is desirable to fit a switch in the position shown in order to prevent wastage.

RULES.

(1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."

(2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.

(3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.

(4.) Practical wiring plans cannot be supplied or considered.

(5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

(6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

Very possibly you will find it more convenient to connect two cells instead of one across the potentiometer, as by these means you will obtain a wider range of control.

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An Excessive Resistance.

In accordance with a suggestion made in your journal some time ago, I have been trying to use my voltmeter as a milliammeter. I find, however, that when it is connected in the H.T. negative lead signals are distorted, and a high-pitched whistle is produced. Can you explain this effect?

W. R.

At the time the suggestion to which you refer was published a large number—perhaps the majority—of moving-coil voltmeters used by amateurs had a resistance of about 60 ohms per volt. Even this comparatively low value renders them unsuitable for current measurements in many instances, although very useful indications can be obtained in some circuits. Nowadays many voltmeters have a resistance of 200 ohms per volt, which is, of course, an advantage as far as their normal function is concerned, but they are generally not suitable for measuring milliamperes. In your particular case the trouble is undoubtedly due to the fact that the resistance of the meter, being common to the anode circuits of all the valves, is acting as an inter-stage coupling, and is producing low-frequency reaction.

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A Dangerous Substitution.

My two valve reflex receiver has given good results for two years, but I am now thinking of trying to improve matters by fitting more modern valves. Which type do you recommend? The set comprises a dual valve followed by a leaky grid detector.

R. C. J.

Circuits of the kind you describe are apt to lack stability when used with valves having infinitely better characteristics than those for which they were originally designed, and we would hesitate to recommend you to attempt to improve matters by fitting ultra-efficient modern valves. It will be safest to choose types with characteristics not widely differing from those specified by the designer.

Volts Wanted.

I have just completed an eliminator for my four-valve set (which works excellently when supplied with H.T. from batteries). Results with the eliminator are altogether disappointing; it is impossible to get signals even from my nearest station, which is forty miles away, at reasonable loud speaker strength. I notice, however, that immediately after switching off the H.T. supply the strength of signals rises momentarily almost to a normal level. Can you suggest what is likely to be wrong?
B. C. R.

We think it certain that your eliminator is not delivering a sufficiently high voltage to the anodes of some of (or possibly all) the valves. When you switch off the mains it is quite possible that the collapse of the magnetic field in your smoothing chokes will give rise to a momentary increase in voltage. We recommend you to measure the voltage outputs available; a simple method of doing this was discussed in an article entitled "The Eliminator Output," in our issue of May 2nd.

Selectivity and the Potentiometer.

I seem to remember having read that the potentiometer used for adjusting the bias of an anode-bend detector will serve to increase the selectivity of the set. Is this correct, and, if so, how is the method applied?
W. St. H. E.

The statement to which you refer is correct as far as it goes, but the operation of a potentiometer cannot be regarded as a certain cure for poor selectivity, although it is often very helpful when a desired transmission is heard through a background of signals from a nearby station. In these circumstances the right procedure is to increase the negative potential of the detector grid beyond the point which gives best rectification until the local signals disappear. Provided that the amplitude due to the required signals is sufficiently great, these will still be heard, but at reduced strength.

A Safety Production.

I noticed a statement in a wireless textbook to the effect that it is advisable to connect the negative end of the H.T. battery to the positive L.T. terminal, in order that the pressure of the latter battery may be applied to the anodes. Looking through my back numbers of "The Wireless World," I find that this plan is followed only in one receiver (the "Everyman Portable"). Is there any reason why one should not take advantage of the few extra volts obtainable from the L.T. battery in this way?
W. S.

At the time when H.T. batteries were much more expensive than they are now, and when lower anode voltages were commonly applied, it was desirable to obtain "free" voltage wherever possible, and it was for this reason that the plan was recommended. Its principal disadvantage is that an accidental short-circuit or

misconnection is more likely to result in damage to the valve filaments than is the other arrangement, where L.T. — is connected to H.T. —.

With reference to the lightweight portable receiver you mention, it seems probable that the small gain in voltage resulting from the other form of connection is justified in this particular case.

A Grid Circuit Modification.

Will you please show me how a gramophone pick-up may be connected to the "Kilo-Mag Four" receiver, preferably by the use of a plug and jack?
H. A. H.

A pick-up may best be connected to this receiver by inserting it in the grid circuit of the detector valve. The connections of a jack are as shown in Fig. 2; of course, the pick-up will be joined

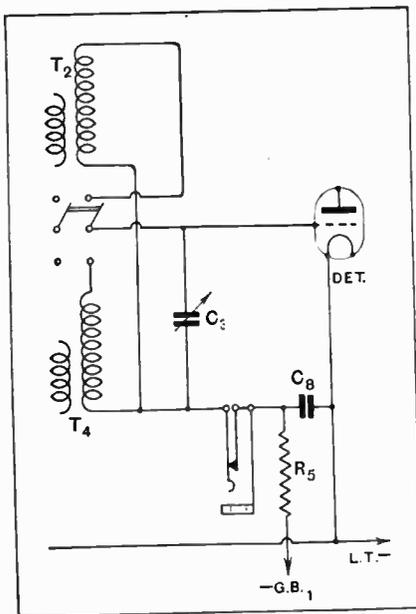


Fig. 2.—Adding a gramophone pick-up to the "Kilo-Mag Four."

to a plug. When using the receiver for gramophone reproduction, the value of grid bias applied to the detector valve must be halved, as it now becomes an L.F. amplifier.

Range of the "A.C.3."

I am considering the construction of the "A.C.3" receiver described in your issue of September 5th, and would be obliged if you could tell me how many stations should be received here. I am ten miles from the local station.
C. T.

We fear that it is impossible to give a definite answer to questions of this sort, in the lack of an intimate knowledge of your local receiving conditions. If these conditions are good, we think that you ought to be able to receive the majority of transmissions, which are sufficiently free from interference; the set in question can fairly be described as

highly sensitive, as it includes a high magnification H.F. stage. Although there is but one L.F. amplifier, a valve of high efficiency is used in this position.

Its selectivity should be sufficient to prevent undue "spreading" of your local station.

A New Valve.

Is the P.M.4DX valve suitable for use as a detector in the "Megavox Three" receiver?
R. B.

Yes, this valve replaces the P.M.4D, which was originally recommended, and is equally suitable.

Anode Resistances and Short Waves.

I am going to make a detector-L.F. set for short-wave reception, and should be glad to know if it would be possible for me to use an existing R.C. unit, in which the anode resistance has a value of 0.25 megohm.
F. T. R.

As a short-wave set of the kind you propose to make will inevitably include grid circuit detection, and will rely mainly for its sensitivity on reaction, we consider that a coupling resistance of the large value proposed would be unsuitable. We recommend you not to exceed some 100,000 ohms as a maximum.

Flat Tuning.

My "Standard Four" receiver is giving very fair results, but selectivity is somewhat less than that of a friend's receiver in which the same circuit arrangement is used. I notice that the tuning of the aerial-grid circuit is much sharper than that of the H.F. coupling; this seems to be in opposition to what one would expect, and I am wondering if the transformer is likely to be faulty.
L. F. L.

Except when using an H.F. valve of comparatively low impedance, it is to be expected, as you say, that the coupling circuit will be more sharply tuned than the other. As you suggest, the effect observed may be due to a fault in the transformer, and you should assure yourself that there are no faulty connections or leakages across its terminals; also you should check the connections of the detector bias battery and assure yourself that you are not applying a positive potential to the grid. Under these conditions the set would work, but not very efficiently, and tuning would be flat, due to the flow of grid current.

Crystal and Pentode.

Do you think it would be possible to obtain good loud-speaker signals by using a pentode valve as an L.F. amplifier after a crystal detector? I live only two miles from 55C and get excellent results with phones.
P. R.

Yes, a pentode valve coupled to the output of a crystal detector by means of an L.F. transformer (which may have a fairly high step-up ratio) should give signals of good quality and ample volume. You should not forget to "earth" the filament circuit of the valve.

Your judgment

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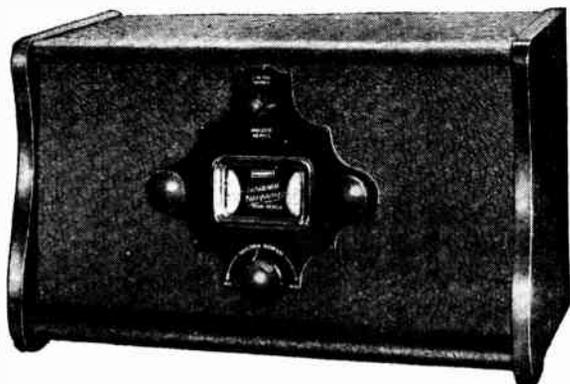
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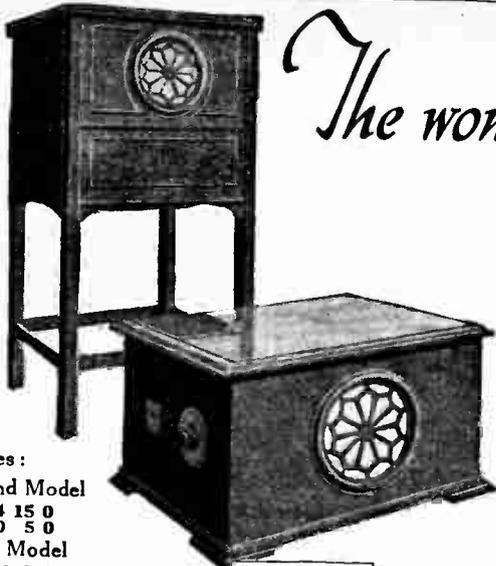
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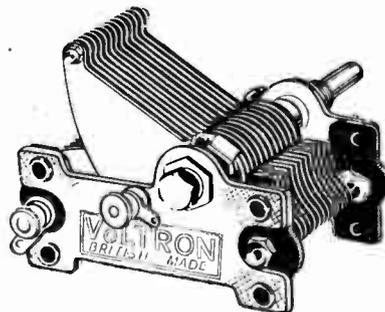


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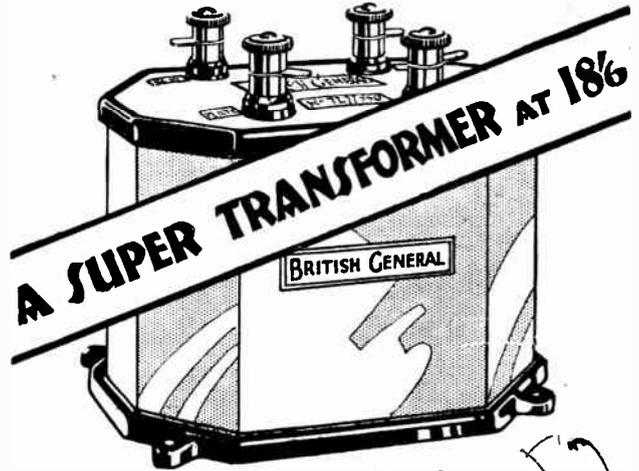
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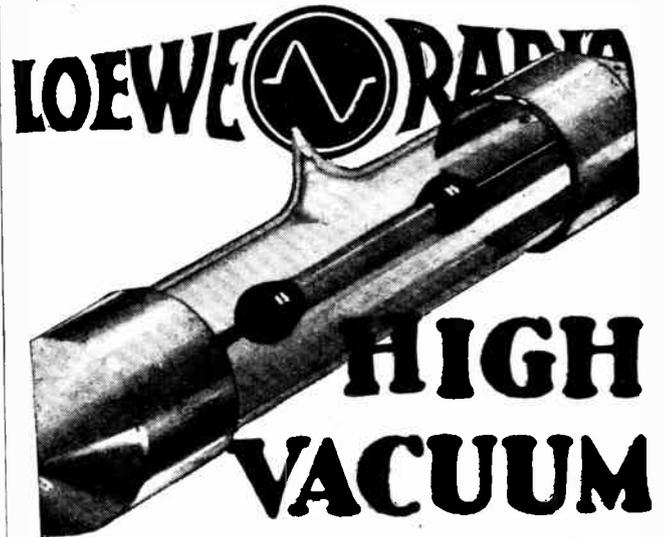
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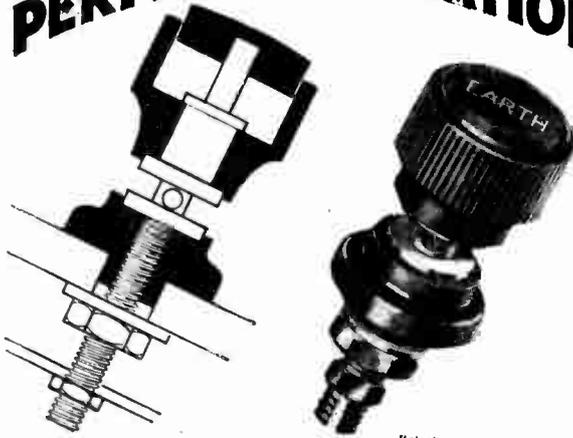
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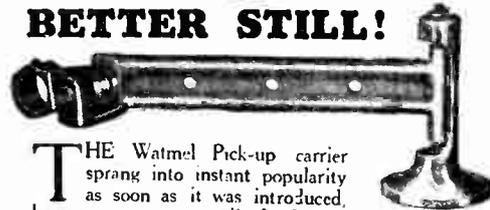
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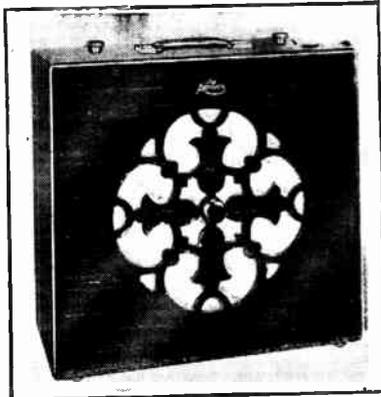
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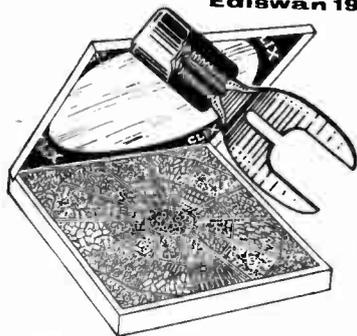
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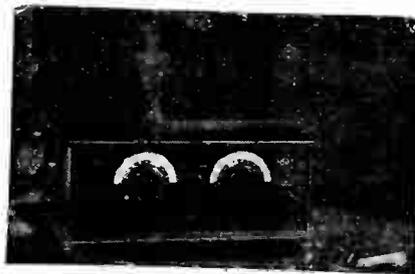
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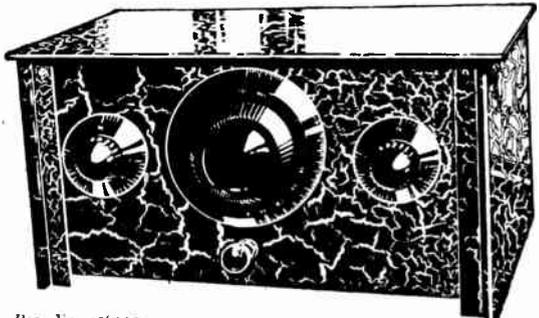
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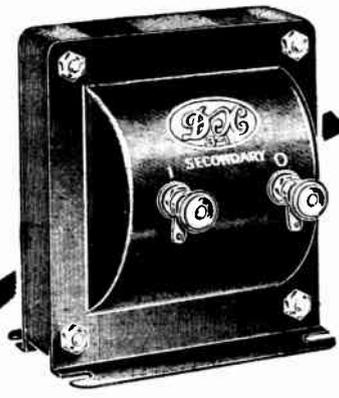
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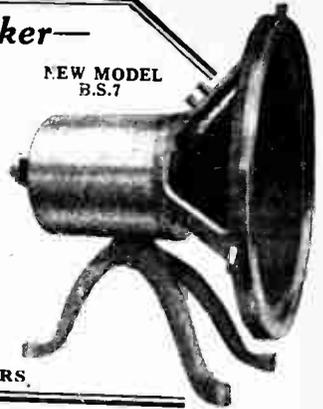
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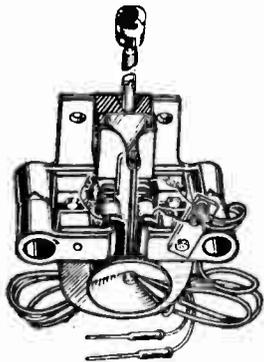
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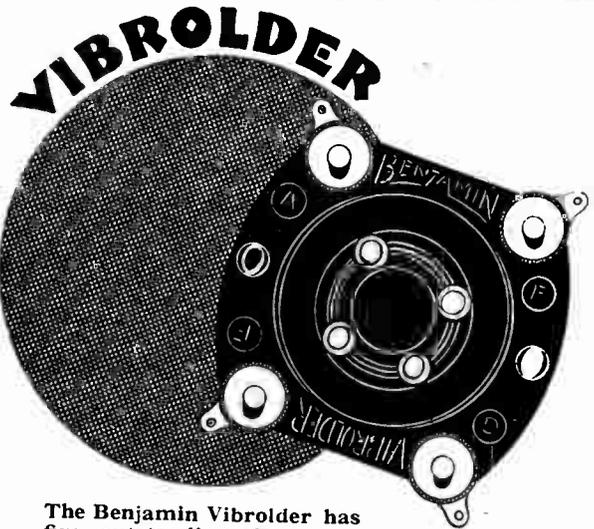
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All letters relating to advertisements should quote the number which is printed at the end of each advertisement, and the date of the issue in which it appeared.

The proprietors are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

NUMBERED ADDRESSES.

For the convenience of private advertisers, letters may be addressed to numbers at "The Wireless World" Office. When this is desired, the sum of 6d. to defray the cost of registration and to cover postage on replies must be added to the advertisement charge, which must include the words Box 000, c/o "The Wireless World." Only the number will appear in the advertisement. All replies should be addressed No. 000, c/o "The Wireless World," Dorset House, Tudor Street, London, E.C.4. *Readers who reply to Box No. advertisements are warned against sending remittance through the post except in registered envelopes; in all such cases the use of the Deposit System is recommended, and the envelope should be clearly marked "Deposit Department."*

DEPOSIT SYSTEM.

Readers who hesitate to send money to unknown persons may deal in perfect safety by availing themselves of our Deposit System. If the money be deposited with "The Wireless World," both parties are advised of its receipt.

The time allowed for decision is three days, during which time, if the buyer decides not to retain the goods, they must be returned to the sender. If a sale is effected we remit the amount to the seller, but, if not, we return the amount to the depositor. Carriage is paid by the buyer, but in the event of no sale, and subject to there being no different arrangement between buyer and seller, each pays carriage one way. The seller takes the risk of loss or damage in transit, for which we take no responsibility. For all transactions up to £10, a deposit fee of 1/- is charged; on transactions over £10 and under £50, the fee is 2/6; over £50, 5/-. All deposit matters are dealt with at Dorset House, Tudor Street, London, E.C.4, and cheques and money orders should be made payable to Iliffe & Sons Limited.

THE SALE OF HOME-CONSTRUCTED UNLICENSED APPARATUS.

A Service to our Readers.

We have made an arrangement with the Patentees whereby readers who wish to dispose of a home-constructed receiver not licensed under the patents made use of, can license the set by means of the Deposit System referred to above.

The person desiring to sell, in sending us particulars for his advertisement, will in every case make use of a Box No., and should add to the price which he requires the amount of royalty customarily paid by manufacturers.

If the purchaser is satisfied with his purchase, the sum realised will be forwarded to the seller, less the amount due in respect of royalties, which amount will be paid by "The Wireless World" to the owners of the patents concerned, and a certificate will be handed on to the purchaser of the set.

SPECIAL NOTE.

Readers who reply to advertisements and receive no answer to their enquiries are requested to regard the silence as an indication that the goods advertised have already been disposed of. Advertisers often receive so many enquiries that it is quite impossible to reply to each one by post.

ALL "WIRELESS WORLD" COILS.

PENTODE TWO
B.B.C. 3/6, 5XX 3/6, Litz. B.B.C. 6/-

MEGAVOX THREE
B.B.C. - 16/- Base - 1/6
5XX - 10/6 Copper Screen 5/-
Formers complete 16/6 pair.

STILL ON THE SPECIFIED FORMERS,

NEW COSSOR COILS
B.B.C. 10/6 pair. 5XX. 12/6 pair.

B & J. Wireless Co.
2 & 3 Atheistane Mews, Phone: Mountriv 1695
Stroud Green Road, N.4.

There's never a slip with

The ATALANTA SCREW-DRIVER
Patent No. 194419 (1921).

Special Wireless Model
with three box spanners (as illustrated) for 2, 4 and 6 B.A. nuts. These fit on the flat of the blade and are excellent for nuts in awkward places.

3/-	3/-
No. 1 (5 1/2") 1/6	with insulated handle of Bakelite.
No. 2 (7 1/2") 2/-	No. 1 (8") .. 4/-
No. 3 (8 1/2") 2/6	No. 2 (9") .. 4/6

Post free at list prices.

The Blade Never Slips
out of the screw slot, the handle remains stationary in the palm of the hand, turning is effected by fingers on the knurled ring below. **Nothing to go wrong.**

Ask your dealer or send P.O. to **ATALANTA** (Dept. C), 1-3, Brixton Road London, S.W.9.
Phone: Brixton 2110.

MAKE OR BUY A GRAMOPHONE.
Or Cabinets only for Wireless. At a quarter shop prices, size 32 x 30 x 16, with double spring motor, 3 rec. one wind; 12 in. Velvet table. Swan tonearm, soundbox, horn, cups, etc. Carr. Paid. All the above fittings less Cabinet £1 18s. 6d. Cash. Motors 9s. Accessories. List Free. 64 pp. Drawing and How to Make Gramophone. 3d. Regent Fittings Co. W.O. 120, Old Street, London, E.C.1.



No. 18A.
25

RECEIVERS FOR SALE.

YOUR New Set or Your Repairs.—Consult F. D. Armitage, 12, St. Domingo Grove, Everton, Liverpool. 19922

ALEXANDER BLACK. The Wireless Doctor, specialises in quality reproduction. Details under Miscellaneous. 19748

NEW Cossor Melody Maker. complete kit parts, including valves and cabinet, in sealed carton; £7/15; post free; assembled and wired ready for use; royalty only extra; part exchange if required.—G. A. Ryall 182, Kennington Rd., London. 1261

SHEFFIELD.—The "New Cossor" can be heard at Hillsboro's Leading Radio Depot, 341, Middlewood Rd. 1393

READ and MORRIS, Ltd., for mains sets and components, the mains pioneers in 1924; 28 London hospitals are equipped with Read and Morris mains set, using no batteries; some of these sets have not even required their doors to be unlocked for over two years! Single sets supply over 800 pairs phones and loud-speakers. Abroad one of our mains sets functions in a government hospital 600 miles from the nearest broadcasting station.

READ and MORRIS, Ltd.—2-valve set for D.C. mains from £10; A.C. sets from £15.

READ and MORRIS, Ltd.—H.T. eliminators for D.C. mains £4; for A.C. mains, £6/10; eliminator transformers from 15/-; full wave rectifying valves, 10/-

READ and MORRIS, Ltd.—Why use accumulators if A.C. mains are available? The Longton L.T. unit is a complete substitute at negligible cost, always ready, valve rectifier, no batteries, gives 1.2 amps. at 2, 4, or 6 volts, and operates any set; new price, £6/15.

READ and MORRIS, Ltd. for electrolytic condensers; we use them, have used them for 3 years, liquid and dry; we test them all, but find Longton the best, capacity approximately 1,800 M.F., non-liquid; price 12/6, as used in the famous L.T. unit.

READ and MORRIS, Ltd. for moving coil loud-speakers; delivery from stock; also mains-operated receivers and amplifiers for same. Demonstrations continually, service always.

READ and MORRIS, Ltd. undertake the design and construction of any type of radio apparatus. We make for the individual and guarantee results. It will pay you well to consult us before buying elsewhere.

READ and MORRIS, Ltd. have second-hand sets, best makes only, at junk prices; Marconi V.2, 50/-; voice amplifier, 30/-; Burndept Ultra 1V, with Mark IV tuner, £10, original price £54.

READ and MORRIS, Ltd. 31, Eastcastle St. (facing back of Waring and Gillows), Oxford St., W. 1519

SECOND-HAND Receivers. 1-8 valves, perfect; cheap; state requirements.—Coutts, Engineers, Holey. 11424

5-VALVE Set, built specially for quality, 2 power valves in parallel, Weston milliammeter, Weston voltmeter, reads low tension and all high tensions, complete with coil drive speaker in cabinet, battery eliminator, 240 volts D.C., 6-volt accumulator and valves; £30, or near offer; can be seen working.—Phone after 6 p.m.: Kingston 4368, or BM/SNF6, London, W.

MARCONI 81 (Straight 8), as new; £17/10, with valves.

BURNDIPT 4-valve Set, with valves and coils, £10; another, last season's model, as new, £12; all in good order and carriage paid.—James Scott and Co., Radio Engineers, Dunfermline. 0207

THE RECEPTE CO. were the first firm to specialise in building receivers to suit customers' own particular requirements, and their policy of building for the individual has amply justified itself; write for quotation, low prices and quick delivery; satisfaction guaranteed.

THE RECEPTE CO. also make a range of Standard Receivers which can be delivered from stock; write for particulars.

THE RECEPTE CO. 1, The Mall, Southgate, N.14. 1681

SCOTT SESSIONS for Megavox 3 and latest Circuits; read advertisement under Miscellaneous column. 1726

MICHAEL. Super Screened 4-valve Portable Receiver, quite new and in perfect condition; cost 35 guineas—Best offers to BM/BB6B, London, W.C.1. 1771

MICHAEL. Supersonic Block Unit, complete with 5 Cossor valves and Climax frame aerial, all practically as new bargain, £5/10. E. Pemberton, Elm Rd., Altrincham. 1753

5-VALVE Solodyne, in oak cabinet, splendid condition, with H.T. accumulators if desired; £12, or offer; for sale through death.—Write 77, Lynton Rd., Acton, W.3. 1750

GREBE Short Wave Receiver, type C.R.18, 10-200 metres, as new; £15, or offer.—Parker, 72 Victoria St., S.W.1. 1747

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

A HIGH AERIAL MEANS EXTRA POWER

P.R. PATENT STEEL MAST

15/-
26 Feet high. In 3 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 1/6; Midlands, 2/6; elsewhere, 3/6. Weight 24 lbs. Two masts for 28/6.

21/6
34 Feet high. In 4 sections of 1 3/4 in. Steel tube tapering to 1 in. Carriage, London, 2/-; Midlands, 3/-; elsewhere, 4/-. Weight 34 lbs. Two masts for 40/-.

29/6
The "Super" MAST.
42 Feet high. In 5 sections of heavy 1 1/2 in. Steel tube tapering to 1 in. A real bargain. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 46 lbs.; Two masts for 55/-.

Sent C.O.D. if preferred.

Damp Proof!

Rot Proof!!!

Gale Proof!!!

No Holes to dig—One Man's Job.

Any intelligent man can assemble and erect a P.R. Mast in a couple of hours. Our patent mast being tapered, it is easy for anyone to raise it from the ground into position. Ordinary tubular Masts require several hands and difficult rigging to do this. To help you the wire rope is sent cut to size—a saving of endless worry.

Imagine sorting out 500 ft. of rope in your back garden!

P.R. MASTS are made of British Steel in 9 ft. lengths, from 1 1/2 in., tapering to 1 in., and are supplied with cast-iron bed plate, steel ground bars, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts and fullest erecting instructions. No further outlay necessary.

The easiest Mast to erect. **GUARANTEE.** Money refunded without question if not satisfied. **Minimum Radius 3ft. 6ins.**

PAINTING.

Any protective coating applied before despatch gets so damaged by the Carriers that it is essential to paint the Mast before erection. All P.R. Masts are sent out oxidised ready for painting. One coat of P.R. Colloid covering applied—a 10 minutes' job—to all parts of the Mast when ready to erect sets dead hard in an hour and protects it against all weathers.

PRICE OF ACCESSORIES.

P.R. Colloid Covering sufficient for a Mast—with Brush, 2/6. Halyard Log Line—Ryland's patent rot proof:—For 26 ft. Masts, 1/6. 34 ft. 2/-. 42 ft. 2/8. Per 100 ft. 3/-. Note.—Double length supplied to make lowering of Aerial easy.

Your order sent C.O.D. if preferred.

P.R. MASTS 17-17, PATERNOSTER SQUARE, LONDON, E.C.4.
Opposite G.P.O. Tube.

Receivers for Sale.—Contd.

ELSTREE Six, factory built, complete with valves, double range coils, etc., extreme range; best offer around £20.—Jameson, 26, Onslow Av., Richmond, Surrey. [1734]

MARCONIPHONE 6-valve Set (5 high frequency), Marconiphone 2-valve power amplifier, frame aerial, General Radio Co.; what offers?—54, Carlyle Rd., E.12. Phone: Ilford 1068. [1733]

DEFERRED Terms; Marconiphone wireless apparatus supplied, £1 down, balance over 12 months; any model receiver, battery or mains drive, moving coil loud-speakers, H.T. mains units, etc., installed free within 30 miles of London; state your requirements.—Marconiphone Service Dept., 9, Ullgh St., Ealing, London, W.5. [1803]

MEGAVOX For Sale, first class components; any evening after 7, or Saturday afternoon.—Roed, South Lodge, Champion Hill, S.E.5. [1732]

SUMMONDS BROS.—Receivers constructed to any published design or to your individual requirements, guaranteed, workmanship, repairs, reconstructions, overhauls, modernisations.—Shireland Rd., Smethwick. [9691]

WIRELESS is a Fascinating Subject, but makes heavy demands upon the purses of its devotees. For one who is determined to keep abreast of the times, there are always new components to be bought, and sets and loud-speakers to be superseded.

At the same time, the would-be buyer is often deterred from buying because he knows that there will be still one more piece of apparatus left on his hands, to add to those already in the junk box.

We have opportunities of disposing of semi-obsolete apparatus to those who are not fortunate enough to be able to afford the latest type, and will take such apparatus or components, providing they are in saleable condition, in part exchange for any new set, loud-speaker or component required.

All We Ask is that You should Send Along a List of Your Old Apparatus, together with your requirements, or, better still, send the apparatus to us to inspect, when we will make you a fair offer.

If You Approve of this You can Send Your apparatus required; if you have sent your old apparatus and you do not approve of our offer, we will return carriage paid.

The Principal of this Firm who has been a professional wireless engineer since 1910, and has been manager for the Sterling Telephone Co., radio expert to the General Electric Co., and Chairman of the Technical Committee of the National Association of Radio Manufacturers, will willingly give advice to those who are desirous of purchasing apparatus; we are entirely unbiased, and will recommend the best apparatus for your particular purpose; you save money by having genuine expert advice.

Don't Forget We Will Take Your Old Receiver or Components in Part Exchange. We Will Also Build Any Sets to Specification (Marconi Royalties payable), and instal anywhere in the British Isles; sets modernised; send for estimate.—Scientific Development Co., 51, Fishergate, Preston, Tel.: 1364. [0226]

7-VALVE Branton Superhet, shielded intermediate frequency transformers, separate oscillator, complete with valves, in perfect working order, new condition, American type cabinet; 15 guineas; deposit, terms.—Braidwood, 1, High St., Barnet. [1834]

USED Demonstration Only.—2-valve G.R.C. set, in polished walnut, including Mullard valves and G.R.C. cone, perfect condition; £6.—Dupere, Lea Rd., Harpenden. [1801]

OSRAM Music Magnet.—Modern 3-valve receiver, with screened grid H.F. stage, one dial tuning, long and short waves, 27 stations on loud-speaker; price, including valves, as specified, £8/8; including cabinet, £10.—Write BM/ZVCH, London, W.C.1. [1800]

5-VALVE R.S.V.P. Portable, in use 6 weeks, virtually new; cost £23, sacrifice at £16; would consider part exchange; demonstration any time.—Irwin-Hutley, 25, Woodville Gardens, W.5. Ealing 2568. [1799]

5-VALVE Portable, Empire Marie 5, 2 screened grid H.F., demonstration model, 13x12x8, weight 22 lb., perfect order; £17.—Phone: Museum 6461. [1798]

SUPER-F, Super-F, Super-F 1929 models represent the most extraordinary value ever offered in wireless sets.—Below.

SUPER-F Sets have an Ebonite Baseboard and under Baseboard Wiring, mahogany cabinet, with oval ebonite panel, contains all but the loud-speaker.—Below.

SUPER-F—The fretwork front 14in.x14in. cabinet cone speaker supplied is specially designed for bass note reinforcement.—Below.

SUPER-F Sets are Supplied, as specified above, with all accessories and spare accumulator, royalty and carriage free, on 7 days' free trial.—Below.

SUPER-F 3-valve, £9/2/6; 4-valve for economy, one H.T. battery a year, £10/15; 5-valve, 4 electro superhet type, £16/10; 8-valve ditto with frame aerial, £24/15; in upright cabinet, £31.—Below.

SUPER-F—Trade enquiries solicited for sets or components thereof.—Below.

SUPER-F RADIO, 305, Wetherstien Rd., Glasgow. [1829]

MOVING COIL LOUD SPEAKER OUTFITS

OF
AMAZING REPRODUCTION AND 100% TONE PERFECTION



THIS IS OUR "SUPER" MODEL

(Registered Design applied for. Prop. Patent No. 23671—28.) Magnet unit made of Dynamo Steel as recommended by the Wireless Press. The only All-Steel model on the market at anything like **PRICE £4 - 7 - 0** the price.

THE VERDICT OF THE NORTH

The shrewd ones of the North have given their considered judgment on our outfits—their verdict is faultless reproduction with supreme tone and volume. You cannot do better than follow their selection; every Baker product is 100% representative of its class.



THIS IS OUR PERMANENT MAGNET MODEL, A.1

(Registered Design applied for. Prop. Patent No. 23571—28.)

This wonderful model needs no accumulator or house mains, and gives positively marvellous results. It is several pounds cheaper than any other speaker of its type manufactured. **PRICE £6 - 5 - 0**

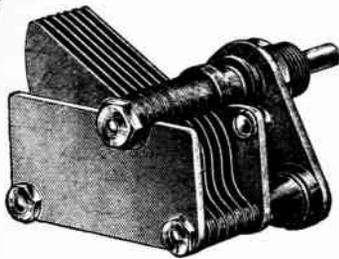
SEND FOR FREE 36 PAGE BOOKLET ("A New Hobby") TO-DAY.

BAKER'S 'Selhurst' RADIO

Offices:
89, SELHURST ROAD, 8, NORWOOD, S.E.25.
Works: (Always Open)
42, CHERRY ORCHARD RD., E. CROYDON.

ABERCORN

"UTILITY"
BABY CONDENSER



Space...
and to spare

In the construction of small and portable sets the same problem—how to obviate the crowding of components—confronts expert and amateur alike. It will help a lot if you use the small "Utility" Condenser illustrated—this, and also a small anti-capacity switch have been specially designed for the purpose. Neither has anything freakish in its design; the Condenser follows the lines of our popular standard models, has marked low-loss ball-bearing spindle and is perfectly made throughout.

BIG DEMAND
REDUCES PRICE!

We are enjoying splendid success with this new line. Bigger demand has effected reductions in our costs, and we are passing the difference to you via lowered prices, as follows:—

Capacity	With Dial	Less Dial	Vernier
'0005	7/6	6/6	10/-
'0003	7/-	6/-	9/6
'0002	6/6	5/6	9/-

Ask your local Dealer to show you "Utility" Components, and particularly the new Condensers and Dials with Thumb Control. Lists may be had on request.

Utility
GUARANTEED
COMPONENTS

Made and Guaranteed by
WILKINS & WRIGHT LTD.

"Utility" Works,
HOLYHEAD ROAD,
BIRMINGHAM

and Sold by Good Wireless
Dealers Everywhere.

Receivers for Sale.—Contd.

KILO-MAG 4.—Screening boxes, 23/6; sets of 6 coils, 37/6; isolating resistances, 3/-; full set of parts, including valves, £15.—Below.
PENTODE 2.—Full set of parts, with valves and cabinet, £5/15; coils, 6/- per set.—Below.
MEGAVOX.—Set of parts, with valves, coils, cabinet, £15; aerial coils, per set 22/6.—Below.
COMPLETE Set of Parts, valves, cone speaker, batteries, etc.; 2-valve £4/10, 3-valve £5/10; screened 3 £8/10.—Stott, 63, Syke Rd., Rochdale. [1796]
MICROPHONE Amplifier (Brown's), input 2,000, output 120 ohms, gives 2-valve amplification; cost £5/3, bargain, £1/10; as new.—37, Tivoli Rd., Crouch End. [1795]
MARCONIPHONE Wireless Receivers on Deferred terms, £1 down, balance over 12 months; installed free within 30 miles of London; state your requirements.—Marconiphone Service Depot, 9, High St., Ealing, London, W.5. [1802]

BATTERIES.

WET H.T. Batteries.—Parts per dozen; Jars, 2 1/4 x 1 1/4 square, 1/3; zincs, 1 1/2; sags, 1/2 dozen; cells, (16 volts), complete with bands and electrolyte, 3. post 9d.; high efficiency, long life, self-charging, upkeep small; send 6d. for sample unit; illustrated booklet free; carriage free orders 10/-; write for free list wireless bargains; trade supplied.—W. Taylor, 57, Studley Rd., Stockwell, London. [0039]
C.D.E.S. Accumulator Charging Service.—Collection and delivery in 5 mile radius of Croydon; send for particulars to Croydon and District Electric Service, Dept. W., 98, Cherry Orchard Rd., Croydon. [1009]
WET H.T. Replacements.—Sacs (capped or uncapped), highest grade, No. 1, 10d per doz.; No. 2, 1/9 per doz.—See below.
ZINCS.—Best quality (wired), No. 1, 8d. per doz.; No. 2, 9d per doz.; orders valued 5/- carriage paid, otherwise 6d. for postage.—British Battery Co., Clarendon Rd., Watford, Herts. [0258]
BATTERIES Direct, a saving of 40%—60-volt, 6/3; 108-volt, 10/11; postage 9d. and 1/- respectively; British throughout and fully guaranteed; super and treble capacity also stocked.—The Johnson Engineering Co., Dept. W.W., 86, Great Portland St., W.1. [1074]
FOR H.T. Battery Bargain, see under Components. [1769]
BATTERIES.—This week's special offer: Grid bias batteries, 36 volt, tapped every 1 1/2 volts, made up 1 inch wide 20 inches long, which is a convenient form for easy attachment to backboards of sets, price 4/6 each; also double capacity high tension, 66 volt, 7/6, and 115 volt, 12/- each; all batteries delivered carriage paid, for cash with order.—Guaranteed British throughout, and obtainable only from Ford Battery Works, New Rd., Ponders End, Enfield. [1824]
ACCUMULATOR, H.T., 150 volts, Ediswan, 5,000 m.a.; cost £6, sell £3.—15, North Gate, Harborne, Birmingham. [1822]

CHARGERS AND ELIMINATORS.

RECHARGEN H.T. and L.T. Chargers for A.C. and D.C., you may try 14 days.—Ardwick, Manchester and 39, Victoria St., London, S.W.1. [0222]
TANTALUM and Liumium for A.C. Rectifiers; make up your own inexpensive chargers; blue prints for H.T. and L.T. Liumium electrodes fitted with terminals 2-3 amps. and 5-8 amps.—Blackwell's Metallurgical Works, Ltd., Liverpool. [9503]
ELIMINATOR Kit, comprising mains transformer, full wave output, 200 volts 30 milliamperes, 32 henry choke, 2 4 mfd. condensers, 500 volts, test, variable potential divider, valve holder, 0/50 milliammeter and base board; price £3; other outputs at slight extra cost; state mains voltage when ordering.—H. Goodwin, Woodcock Hill, Elstree. [0257]
ELEMNIALI Eliminators for A.C. and D.C. Mains, to pass 100 milliamperes, 5 models, the eliminator you require for moving coil speakers; write for lists and full particulars; trade orders given special attention.—Stott, Clare Hill Huddersfield. [1438]
ELECTROLYTIC Condensers.—For these go to the specialists, Read and Morris, Ltd., 31, Eastcastle St., London W.1. [1520]
FOR Eliminator Bargain, see advertisement under Components.—Tetley, 1, Palace Gate, London. [1767]
A.C. H.T. Accumulator Charge, new, cost, 21/-, 12/6; A.C. Trickle L.T. charger, new, cost 54/-, 45/-; new A.C. eliminator, 3 tappings, 1 variable, cost £7/2/6, bargain, £5/10; voltage all 200-250.—Box 8808, c/o The Wireless World. [1779]
TRANSFORMERS, chokes, etc., guaranteed, wound to any specification; phone for quotation.—Kirby (Wimbledon), Ltd., 72, Merton Rd., Wimbledon, S.W. Tel.: Wimbledon 2814. [8987]
TRANSFORMERS and Chokes for H.T. and L.T. Eliminators, half wave transformer, input any voltage from 100 to 250 v., secondary 200 volts at 25 m.a., filament 6 v. 1 amp., 25/-; half wave choke, 18/6; transformers and chokes for extra heavy duty eliminators.—Messrs. Chester Bros., 244, Dalston Lane, London, E.8. [1702]

Electradix Radios.
THE
DIX-ONEMETER

HIGHEST GRADE RADIO TESTER.
Low price. Top Value. Worth £10.
INSTRUMENT, 55/- MULTIPLIERS, 6/6 each—
Radio Test Booklet. All Radio Users need one.



A Precision instrument of universal use, with a flexible system of multipliers which enable full-scale readings of any value to be made over a wide range. One millivolt to 2,000 v., or 50 ohms to 50 megohms. Mirror double scale, jewelled knife edge needle. A £10 De Luxe model for 55/-.

THE ACONEMETER, Model VAC.3. In case, is a new Meter for measurement of volts on Alternating Current, a 3-range instrument reading 15 volts, 30 volts and 60 volts or 0-150 v., 0-300 v., and 0-600 v. Price, inclusive of Case, 75/-, 1,500 volt Multiplier, 44/-.

VARLEY DOUBLE-WOUND CHOKE COILS. Carry 60 m.a. fitted ebonite panel with terminals, for use in H.T. Eliminator Filter. Bargain, 4/6. L.F. Ironclad Chokes, 1/- each.

THE FINEST LOUD SPEAKER is the New Mahogany Cabinet Violina, 25/-, Listed £5.

ELECTRADIX RECEIVERS. Royalty paid. First-class makes. 2-Valve, No. 33 Marconi enclosed, all waves, 50/-, 2-Valve Mark 32, 250 to 1,800 metres, £4. Western Electric 3-Valve, £5 5s. 3-Valve Aircraft, £3 10s. Polar 4, Pol. Cab., £6 10s. 5-Valve R.A.F. with Valves, £5. 5-Valve Marconi De Luxe, £8. Sterling Surplus Anodine, £5 10s. Marconi R.B.10 Crystal and 1-Valve Cabinet. With Valve, 22/6

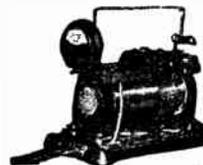
GRAMO. PICK-UPS. Magnetic Earpiece Units for making your own 40/- reproducer. Adapted with a little work. Only 1/2 each. Adapted Brown A ready for Pick-ups, 17/-, Moving Coil L.S. £3 10s.

TABLE ELECTRIC PROJECTORS. For Photo Slide or Home Television. 4 Magnif. and focus lenses, swivel stand. Socket cord and plug, Sale 25/-, Gun Telescopes, beautifully made, cost £10, 17/6.

OSRAM POWER AMPLIF. VALVES. Unused in cartons, 50 to 500 volts. Fully guaranteed, 4/6. Charging Valve. B.T.H., Cossor, etc., A.C. to D.C. 50 m.a. at 200 volts to 1,200 volts, cost 35/-; Sale, 4/6.

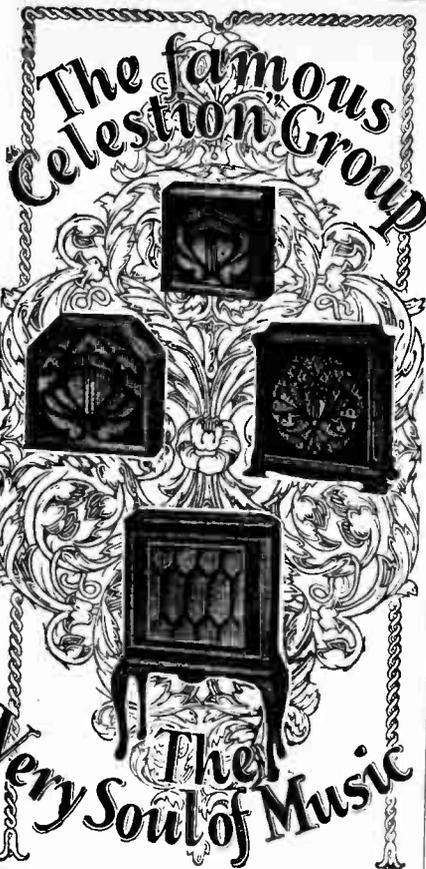
6-volt B.E. suit Eliminators.
ANODE CONVERTERS. All sizes from 120 volts 20 m.a., £5, 500 volts 200 m.a. £7 10s., 400 volts 100 m.a., £6 10s. Large Dynamo Stock to 4,000 volts.

A.C. to D.C. BATTERY CHARGERS.



Work off a lampholder and charge a 2, 4, or 6-volt battery up to 6 amps. max. Sale at Half Price, £2 10s. Larger type for 12-volt Car Cells, £4. Both fitted plug, cord and C.Z. Ammeter. There are only a few of these left.

Get our New 72-Page Catalogue.
ELECTRADIX RADIOS,
218, Upper Thames St., E.C.4.
St. Paul's and Blackfriars Stations. 'Phone: City 0191



THE famous Celestion group of speakers consists of four models in oak or mahogany, as shown, with prices varying from £5 : 10 : 0 to £25.

There is also the Celestion-Woodroffe Gramophone Pick-Up at £4 : 4 : 0.

Insist on your dealer demonstrating, or visit our new and luxurious showrooms, one minute from Victoria Station.

Made under licence.

CELESTION

The Very Soul of Music

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THE CELESTION RADIO Co.,
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Phone: Victoria 9530.

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MULLARD Eliminator, for A.C. mains, 210 volts, 40 to 100 cycles, complete with D.U.2 valve (full wave rectification), cost £7/10, accept £5, including extra D.U.2 valve; Philips new cone loud-speaker, 2 impedances, cost 50/-; take £2.—Oswald Chippindale, Wedderburn, Harrogate. [1763]

SIMPLEX Wireless Paradox A.C. Rectifier and Paradox Double Choke.—Attwood, 6, Sylvan Av., Levenshulme, Manchester. [1821]

TATALUM Remains the Cheapest Reliable Rectifier, why not try it first?

TANTALUM Eliminators for 37/- Upwards, or chargers for 21/-; full constructional details and blue prints, 1/- each.

CONSULT Us Also About Power Chokes and Mains Transformers, we guarantee your satisfaction.—Savage, 146, Bishopsgate, London, E.C.2. [1816]

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ARTCRAFT Radio Cabinets are Britain's Best Value; satisfaction guaranteed

ARTCRAFT Cabinets, made in oak and mahogany; from 8/- to £6.

ARTCRAFT Cabinets can be made to customers' special designs and sizes; estimates free.

ARTCRAFT Illustrated Catalogue, post free; write now.

ARTCRAFT Co., 156 Cherry Orchard Rd., Croydon. Phone: 1981 Croydon. [0040]

CABINETS.—First class goods at competitive prices; send for lists.—Gilbert, Cabinet Maker, Swindon. [9833]

DIGBY'S Cabinets.—Table models in solid oak and mahogany; from 11/6 to 71/-.

DIGBY'S Cabinets, fitted with Radion or Resiston ebonite if required.

DIGBY'S Cabinets.—Pedestal model, with separate battery compartment; from 56/- to £12

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DIGBY'S Cabinets.—Write for new 16-page art catalogue.—F. Digby, 9, The Oval, Hackney Rd., E.2. Phone: Bishopsgate 6453. [0128]

RAMSEY for Distinctive Cabinets.— Portable cabinets, cone speaker cabinets, moving coil cabinets, radio-gramophone cabinets; call and inspect.—Illustrated folder free from F. W. Ramsey, 63, Shaftesbury St., London, N.1. Tel.: Clerkenwell 7139. [1315]

OAK Cabinets, highly polished, with hinged lids, baseboards included: Cosmor 21x7x8, 14/6; Mullard 18x7x9, 14/6; Mystery Receiver 21x7x10, 16/6; also cabinets made to order; carriage paid; cash with order.—Ballard, 56, Northampton St., Clerkenwell, London. [1748]

FREEMAN and JOHNSON for Cabinets; quick and prompt delivery; send us your requirements, whether 10/- or £10; packing and postage free.—179a, Deritend, Birmingham. [1773]

SIMMONDS BROS.—Cabinets for sets and loud-speakers in oak and mahogany; your own ideas carried out; best materials and workmanship.—Shireland Rd., Smethwick. [9692]

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SUPER-F for Latest Style in Artistic Cabinets, hinged top, front with 13in.x6in. oval for panel, solid mahogany, 17in.x8in.x10in. and 20in.x9in.x11in., 19/6 and 22/6, post free; with 3-ply wood baseboard, oval ebonite panel 13in.x6in. to fit above, 3/3; complete with fasteners.—Below.

SUPER F Mahogany Loud-speaker Cabinets, the home for your cone, 14in.x14in.x5in., with fretwork front, 13/6, post free; fretwork panels, beautiful designs, all sizes to order, 11in. to 14in., 2/9.—Below.

SUPER-F RADIO, 305, Rutherglen Rd., Glasgow. [1830]

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B. & J.—Megavox Three coils; see displayed advert.

B. & J. Guarantee Every Coil under Money Back Conditions.

B. & J. All-British Super Four Portables, employing the Mullard pentode valve; £18/10, plus the new scale of royalties.

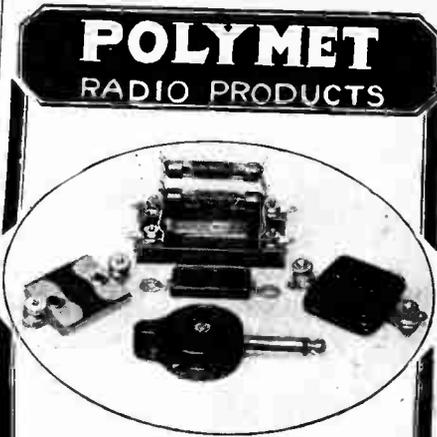
B. & J. WIRELESS Co., 2, Athelstane Mews, N.4. [0043]

EVERYMAN Coils, exact to specification, 15/- each; 2 H.F., complete set and bases, 63/-; Selection 4, complete set and bases, 42/-.—Jennens.

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LITZ Wire (genuine), 27/42, 70 turns, 4/8; tubes and Mikapac, 3in.x3in. 1/4, 3in.x4in. 1/6, 7in.x4in. 2/-.—Jennens.

EVERYMAN Coil ebonite bases, 1/6 each, screens, 3/-; spacers, grooved, with screws, metal or anode, 1/-; all wave short, 1/-; long, 2/6.—Jennens Radio, 31 Chapel St., Birmingham. [0075]



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THIS is the name given to a range of radio components which has already achieved a considerable popularity amongst constructors.

LOW COST.

We are particularly fortunate in having special facilities whereby we can offer you these components at prices which represent a very substantial saving.

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The quality of Hunt's Polymet is vouched for by the fact that they are made by the largest firm in the world to specialise exclusively in the manufacture of radio components. For example, this firm turned out during the 1927-8 season

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'0001 to '0005 mfd. each	1/-
'001 to '003 mfd. each	1/3
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Fitted Grid Leak Clips, 3d extra.	

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(right above)

'0001 to '0005 mfd.	1/6
'001 to '004 mfd.	2/-
'0005/6, 2, 6, '01.	3/-
Fitted Grid Leak Clips, 3d extra.	

MIDGET MOULDED BAKELITE

(centre above)

'0001 to '0005 mfd. each	10d
'001, each.	1/- '002, each. 1/2

R.C.C. UNIT (INTERCHANGEABLE CONDENSER & LEAKS)

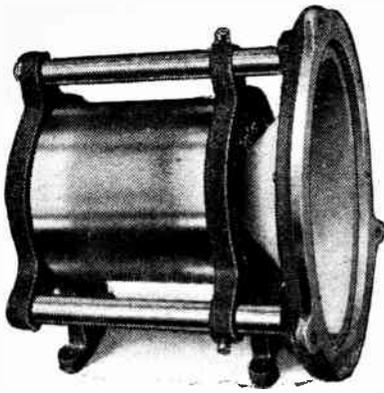
(top above)
1 meg. 100,000 ohms and '006 mica, or 2 meg. 250,000 ohms and '006 mica, 6 6 each.

PHONE PLUG (COMPLETE WITH WIRE TAGS)

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1, 4 each.



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Ask anybody who has heard them in the Manchester Exhibition!

Model 66 (shown above). The finest moving-coil speaker the world has yet seen. In a class by itself. £4-7-6 complete.

Junior Model. Also in a class by itself. Beats instruments costing four times the price. £2-10-0 complete.

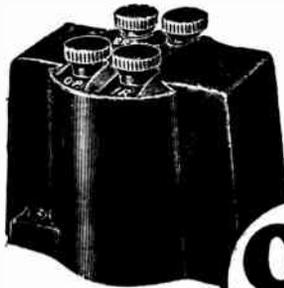
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The BROWNIE "POPULAR" Transformer



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THE BROWNIE 'Popular' has been designed to meet the public demand for a general purpose transformer giving really good reproduction suitable for inclusion in home-constructed sets. The remarkable results obtained on these "Popular" transformers are made possible by very careful attention to the windings and preparation of the core. The magnetic field is composed of special laminations of the softest iron procurable, and the accuracy of the windings on their moulded bobbins gives a resonance and reproduction unequalled by transformers costing twice the price.

The BROWNIE WIRELESS COMPANY (G.B.), LTD.,
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Coils, Transformers, Etc.—Contd.

COILS.—New All-wave Four, Regional Three, A.C. Three, short wave with bases, 35/-; long wave coils only, 40/-; above are Litz wound, long wave coils wound with 28 D.C.C., 27/- per pair; all tested and guaranteed.—Redgwell New Rd., Rayne, near Braintree, Essex. [1558]

FOR Transformer Bargain, see advertisement under Components.—Tetley, 1, Palace Gate, London. [1768]

ALL-WAVE Four, pair Bercliff H.F. transformers and base, suitable either design, cost 42/6, never used; 15/-.—Phillips, Crossbush, Arundel. [1755]

LARGE Power Transformer, 200v., output 180x180 and 6v., cost 35/-, 18/-; 2 Iye transformers, 6.1 and 4.1, nearly new, 8/6 each.—Box 8809, c/o The Wireless World. [1772]

L.F. Transformers, ratios 1 to 5 and 1 to 3, honestly worth 12/6; sell for 6/6 each.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1662]

COSSOR Coils.—A few surplus ones, wound silk wire, with terminals; worth 7/6, 5/6 each.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1660]

PENTODE.—Star Engineering, Didsbury, Manchester are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Pacne: Didsbury 1785. [1335]

BERCLIFF Coils, the standard of excellence, the best at Olympia, leading all the time. **MEGAVOX Coils and Base,** 33/-; screen, 7/6; resistance, 2/-; **Two-Rate Four,** set of coils ready for mounting, 67/6; **Switch-Over Three,** set of coils, 65/6.

NEW All-Wave Four.—Bercliff standard coils; 77/9 the set.

SCREENED Grid Everyman Four.—Interchangeable long and medium waves, no wiring alterations, complete set £4; or L.W. coils and bases only, 44/-; conversion present coils, 10/6.

EVERYMAN FOUR Coils; 33/- pair.

EVERYMAN FOUR Conversion, I.W. coils and bases, with wiring diagram, 43/3; conversion present coils, 9/6.

BERCLIFF H.F. Choke, spaced air wound, graduated windings, covers 10 to 2,000 metres; 8/6.

BERCLIFF Coils for all "Wireless World" Receivers, all popular types in regular production, special coils to your special needs.

BERCLIFF London Depot:—Appleby's, 44, Chapel St., W.1. **SIMMONDS BROS.,** Shireland Rd., Smethwick. [1258]

PAIR Everyman Four Coils, designers' specification, also aluminium screen; 15/-; deposit system.—Elton, The Dells, Biggleswade, Beds. [1818]

DYNAMOS, ETC.

M.L. Anode Converter, 6 volt-120, just been overhauled by makers, perfect condition; £7/10, or offr.—Box 8796, c/o The Wireless World. [1762]

GRAMOPHONE PICK-UPS, ETC.

B.T.H. Pick-up, with tone arm, 30/-; Celestion Woodrolfe pick-up, 40/-.—Box 8819, c/o The Wireless World. [1790]

LOUD-SPEAKERS.

GOODMANS Can Give Prompt Delivery of Moving Coil Units; the lowest prices consistent with highest possible grade workmanship; list MC3 on request.—Goodmans, 27, Farringdon St., E.C.4. [0089]

IF You are in London Call and See Goodmans' Coil Drive and Recd Units before purchasing elsewhere.—Goodmans, 27, Farringdon St., E.C.4. [0090]

AIR-CHROME Type Speaker Parts to build the speaker that has taken America by storm can be obtained from Components Production Co., Honley, Huddersfield. Send for list. [0130]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0231]

COIL Drive Units from Stock, the usual high standard of workmanship associated with the name of Goodmans, 27, Farringdon St., E.C.4. [0091]

REED Movements.—Double acting reed movements specially designed to operate cone and other large diaphragms extremely sensitive on small input, yet capable of enormous volume with sufficient input; will work up to 3ft. cone with ease; no rattle or distortion; 27/6 each; fair allowance on Brown A earpieces, or Lissenolas and other units in part exchange; send stamp for illustrated lists of these and seamless cones.—Goodmans, 27, Farringdon St., E.C.4. [0066]

VIBRO-SKIN, special leather for fixing the diaphragm of the moving coil loud-speaker; price 2/6 per piece 1 1/4 in. square, 2/- per piece 9/16 in. square, post free, cash with order; special terms to the trade. The Alder Leather Co., 3, Southwark St., S.E.1. Tel.: Hop 4448. [0224]

AIR-CHROME Type Loud-speakers Parts, as described in the June 6th issue of this paper, can be obtained from Components Production Co., Honley, Huddersfield. Send for list. [0129]

PERFECT CONTROL OF H.F. & L.F.



THE NEUTROVERNIA

In these days of Screened Grid Valves the sensitivity of the modern circuits cannot always be used to the full owing to the local station or the nearest high power station causing interference.

By connecting the Neutrovernias in series with your aerial the selectivity of your receiver can be adjusted exactly to suit the prevailing conditions.

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Price 5/6

THE VOLUVERNIA

Here is a true volume control, one which does not create distortion. It gives you just the volume you desire and keeps your reproduction pure at all times. The "Voluvernias" gives perfectly smooth control from maximum to minimum. For Gramophone Amplifier or Radio Receiver.



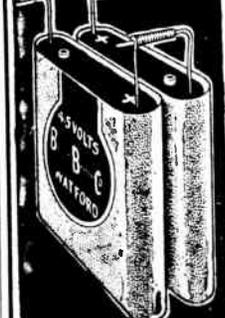
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From all Dealers. Write for "Components Folder W."

GAMBRELL RADIO Ltd.
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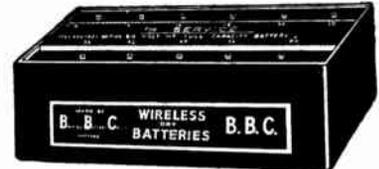


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No. 1W 4 1/2 volt Batteries—Standard Pocket Lamp Size. Patent Spiral Wire Terminals and Wander Plug Sockets. Permanent connections without soldering. Illustration shows how to connect in series. Build up the voltage you need.

No. 8W Super Capacity Type 41 volta. Capacity four times that of No. 1W 14/6 doz.

6/- doz. Carriage Paid 1 doz. = 54 VOLTS.



THE B.B.C. SERVICE BATTERY
S1 60 volts 7/6 S2 90 volts 12/9
Tapped every six volts.
Obtainable from all Dealers or direct from—
British Battery Co. Ltd. WATFORD, HERTS.

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REDUCTION IN PRICES of our Radio Products because of increased output.

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Anode and Filament Supply for

Transmission, Reception and L.F. Amplification:—

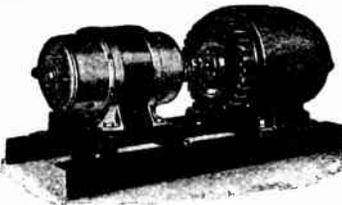
Public Address Systems, Gramophone Amplifiers & Band Repeater Equipment.

M-L Anode Converters, Rotary Transformers and Motor Generator Sets. ROTARY TRANSFORMERS

Input..... 12 to 250 v. D.C.
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Input..... A.C. or D.C.
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Efficient. Silent. Ripple-free.



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Loud-speakers.—Contd.

MOVING Coil Loud-speaker Parts of Quality are made and fully guaranteed by Components Production Co., Monley, Huddersfield. Send for lists. [0149]

THE New Goodman Junior Reed Movement; 14/6; the finest unit at anywhere near the price, for driving cone and other large disc type speakers; this unit should not be confused with converted carpieces or gramophone attachments; second only in efficiency and performance to our double acting reed movement; full description in our illustrated lists, free on request.—Goodmans, 27, Farringdon St., E.C.4. [0092]

AIR-CHROME Type Loud-speakers Give Wonderful Results, and, with the assistance of a screw-driver and hammer, can be easily built from parts supplied by Components Production Co., Monley, Huddersfield. Send for list. [0151]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0232]

AVOID Diaphragm Resonance.—Lomass paper is ideal for moving coil and reed driven cones; price 1/6 per sheet, post free, 3 for 3/6; special sizes to order; trade enquiries solicited.—Hector W. Westwood, Sound Reproduction Specialist, 176, Station Rd., Wyde Green, Birmingham. [1576]

MAKE Your Coil Driven or Cone Speaker a Success; use the cone paper that speaks for itself.—See below.

GILBERT Pampas Fibre Cone Paper, light, strong, non-resonant, pleasant copper brown shade, tonal qualities absolutely unequalled, ideal for use with the Blue Spot Goodman's, or Zampa units, and the Lissen or Bull-Phone units; marked and instructions for making ordinary or coil driven cones; price 1/9, post free.—Gilbert Industries, 519, London Rd., West-cliff-on-Sea. [1686]

TRADE Enquiries invited for this increasingly popular line. (Lib. dis.)—Apply Trade Dept. W/PFF address as above. [1770]

MOVING Coil Loud-speaker, by W. and G., 6-volt special transformer, practically new; £3/10.—Woodhams, 29, Duncan Terrace, N.1. [1770]

TRY Our High Grade Loud-speaker Unit, Komet, marvellous tonal quality; 10/- cash, or "Wireless World" deposit system.—Rafage, Berlin, Wullnertentstr. 79. Trade enquiries invited. [1754]

AMPLION A.C.9 Cone Speaker, £3; also Epoch moving coil speaker kit, pentode coil and 6-volt field; £2.—Taylor, The Lodge, Guilden Sutton, Chester. [1751]

MOVING Coil Loud-speaker, Goodman Minor model, fitted Pentode coil; cost £4/6, except 45/-,—22, Roundhay Mount, Leeds. [1743]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0233]

BLUE Spot Loud-speaker Units (2); cost 21/- and 25/-, guaranteed new, sacrifice 17/6 and 20/-.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1666]

SUPERIOR Loud-speaker Cone Unit, excellent tone, worth 21/-, sell 10/8; another, 9/6.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1661]

EPOCH—When better moving coil speakers are built they will be called Epoch.

EPOCH Model 66 Employs Super-compound Steel Magnet Pot, superior to dynamo steel.

EPOCH Moving Coil Now Obtainable with Copper Coil, as recommended by "Wireless World."

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EPOCH Moving Coil Parts are Instruments of Precision; every part interchangeable.

EPOCH Moving Coil Parts are the Most Beautifully Finished.

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EPOCH Moving Coil Parts.—Money refunded within 10 days if purchaser is not highly delighted.

EPOCH Moving Coil Parts.—Examine every make, but compare with an Epoch before parting with money.

EPOCH ELECTRICAL SOCIETY, Ltd., 53, Grace-chur St., E.C.3. Royal 8570. [1495]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0234]

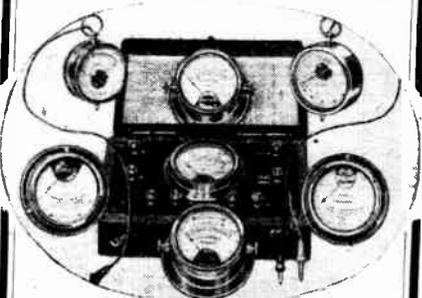
PENTODE—Star Engineering, Didsbury, Manchester, are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1336]

WRITE for Appointment to Hear My New Loud Speaker, which is the only one in existence that reproduces naturally; no resonance whatever; one type only, one price only.—Colato, 33, Edgware Rd., W. [1536]

VORTEXION Moving Coil Speaker Parts, any voltage, pots supplied, wound or unwound, guaranteed.—Kirby (Wimbledon), Ltd., 72, Merton Rd., Wimbledon, SW Tel.: Wimbledon 2814. [8986]

FINEST Suspension Leather, for fixing cones to principal makers; 2/- per sq. ft., post free, cash with order.—Dilley, 8, Ashby Rd., Essex Rd., London, N.1. [1810]

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Why Hand Calibrated?

It is general knowledge that any spring control must vary somewhat from its neighbour. Consequently the fitting of a control spring to an instrument whose dial has previously been calibrated by machine is at best a "hit and miss" method. Every instrument bearing Hunt's name has been *individually calibrated* by hand against a laboratory standard. Use Hunt's hand calibrated measuring instruments to check carefully the performance of your batteries and your valves. You will greatly increase the efficiency of your set.



HUNT'S DOUBLE SCALE VOLTMETER
Pocket Type
2" dial case
6/-

With this Double Scale Voltmeter reading from 0 to 3 and 0 to 120 volts you can measure accurately the voltage either of single L.T. cell, a single B.F. cell or an entire H.T. Battery. There are other models calibrated 0 to 8, 0 to 120, pocket, switchboard or flush types, and there are also special high resistance models. May we send you free our illustrated list No. 110?

A. H. HUNT, LTD., CROYDON, SURREY

HUNT'S

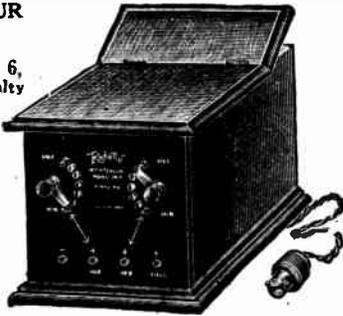
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**"NOTHING BUT GOOD TO REPORT
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WITH YOUR
G.R.60."**

Price: £11 17 6,
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and complete
with gaseous
rectifying tube.

200 volts on
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for A.C.
Mains.

The outputs of
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H.T. ELIMINATORS

**MAINS POWER
AT LOW COST
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Price: £3 17 6, in-
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"Philips 373" valve.
120 volts on 10 m.a.
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THE RADIELLE COMPANY LIMITED, 18a, HAVERSTOCK
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guarantees true radio
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The TRIX Portable Five is the only vertical type
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The TRIX Portable is the world's smallest portable. It
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17 GNS.
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Loud-speakers.—Contd.

YOUR Old Loud-speaker Taken in Part Payment
for the latest type, see our advert. under column
Receivers for Sale.—Scientific Development Co., 51,
Fishergate, Preston. [0227]

**EPOCH.
EPOCH.
EPOCH.**

EPOCH Moving Coil Parts, all models.—Trade en-
quiries must be addressed to the manufacturers,
Epoch Radio Manufacturing Co., Ltd., 53, Gracechurch
St. (1st floor). Phone: Royal 4135. [1496]

BAKER'S SELHURST RADIO Can Now Supply
Moving Coils of 2,500 turns of 48-gauge Wire,
to suit Pentode valves. [0235]

MOVING COIL Enthusiasts.—£1/5 secures the
following while they last. Impossible to repeat.
Complete assembly comprising 1 moving coil, special
soft grey iron pot and lid with small gap, aluminium
spider and front ring, Bakelite moving coil wound
to low resistance, mounted on cone, and special leather
for suspension.—Brew, Pytchley, Kettering. [1813]

DEFERRED Terms; Marconiphone moving coil
loud-speakers, any model; £1 down, balance
over 12 months.—Marconiphone Service Depot, 9,
High St., Ealing, London, W.5. [1804]

DONOTONE Loud-speaker, new; cost £8/8, accept
£5.—Hazelwood, Lower Hare Park, Newmarket. [1808]

ALTON Coil-drive Speaker Outfits, designed by
qualified engineers for finest quality, with maxi-
mum sensitivity, without an unpractical expenditure
of current, complete outfits for 6 volts, ½ or ¾ amp.,
85/- carriage paid; machined castings, 27/6; feather-
weight moving coil, 5/6; Pentode ditto, 8/6.—Rush-
ton's Radio, 50, Ilmber Rd., Wolverhampton. [1815]

MOVING COILS for Coil Driven Loud-speakers, wound
to customers requirements; trade enquiries in-
vited.—Amalgamated Manufacturers, 94, Aston Rd.,
Birmingham. [1814]

MARCONIPHONE Loud-speaker, model 105, new
condition; cost £5/5, sell £2/10.—Marshall, Rose
Hill, Illey, Oxford. [1807]

SELHURST M.C. Speaker, 230v. D.C. mains, com-
plete, working perfectly, 57/6.—D. R. White, 35,
Elm Rd., N. Birkenhead. [1811]

BAKER'S SELHURST RADIO Can Now Supply
Moving Coils of 2,500 turns of 48-gauge Wire,
to suit Pentode valves. [0236]

TWO PM252 Valves, 7/6 each; moving coil speaker,
6-volt ¾ amp., 50/-; B.T.H. headphones, 5/-
pair; Edison Bell pick-up, 15/-;—Box 8822, c/o The
Wireless World. [1806]

EXCEPTIONAL Offer.—'Wireless World' moving
coil loud-speaker parts (Haynes model); owing
to alterations in design all stocks of the above are
being cleared out at bargain prices; write for list.—
Pearson, 80a, Newland Av., Hull. [1776]

TRANSMITTERS.

1.774kc. Piezo Quartz Crystal, guaranteed to oscil-
late with air gap, 20/-; 3,550kc. ditto, 25/-.
Full particulars from G2NH, 65a, Kingston Rd., New
Malden. [1820]

VALVES.

MARCONI D.E.P. 610, D.F.L. 610, Anelco 625P, used
few hours only; accept 15/-.—22, Roundhay Mount,
Leeds. [1744]

VALVES, 2-volt, set of 3 low consumption, G.P.R.C.
and power, unused, a sacrifice for 15/6; and 3
Cleartron valves, same type, 14/-.—Wilson, 44, Douglas
Rd., Handsworth, Birmingham. [1665]

PENTODE—Star Engineering, Didsbury, Man-
chester, are now manufacturing moving coils
suitable for use with Pentode valves; send for par-
ticulars.—Phone: Didsbury 1785. [1537]

FOUR B12 Valves, unused, 15/- each; 3 B11 valves,
unused, 11/- each; 3 B11 valves, slightly used,
6/- each; all ideal for moving coil speakers; 3 B7
valves, slightly used, 4/- each; all above are perfect.—
R. Fry, 102, Markham Rd., Bournemouth. [1819]

COMPONENTS, ETC., FOR SALE.

COMPONENTS for Any Set Sent Anywhere.—Con-
sult F. D. Armitage, 12, St. Domingo Grove,
Everton, Liverpool. [9923]

BELLING-LEE Panel Fittings are designed to give
an expert finish to any home-constructed set;
catalogue post free.—Belling and Lee, Ltd., Queensway
Works, Ponders End, Middlesex. [0018]

WIRELESS Apparatus and Parts, large selection.—
Frith, 6, Cambridge Rd., Crosby, Liverpool. [1510]

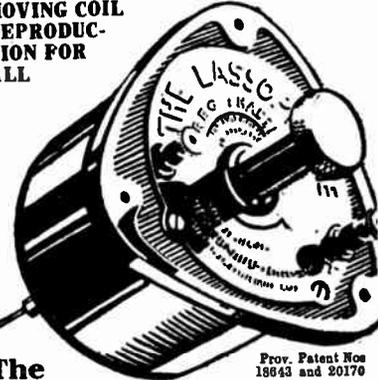
FRETTED Fronts for Loud-speakers, 14in. Lyre pat-
tern, 1/9, polished 2/3; speaker cabinets, 14in.,
7/-, polished 9/-; gold tinsel, first quality, 1/- square
foot; loud-speakers, 14in. cabinet, with Blue Spot cone
unit, £1/7/6; special bargain, wood cut to size for
14in. speaker cabinet, including fretted front, in
mahogany, 3/11; special paper for cone making, 9d.—
Warrick, 16, Berther Rd., Hornchurch, Essex. [1525]

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that works like a moving coil
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The County Chemical Co. Ltd., CHEMICO Works, BIRMINGHAM.

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CAMDEN Triple Gang Condenser, £1/5; Igranite twin gang condenser £1/5.
EBONITE Cuttings, all usable pieces, 7lb. parcel; 4/6, post paid.—James Scott and Co., Radio Engineers, Dunfermline. [0225]

VENEER Wood Paper converts a margarine box into an oak cabinet; how, by covering with real oak the thickness of paper; only glue and scissors required; don't scrap that ruined ebonite panel, cover it with wood veneer paper, indistinguishable from oak because it is real oak. 20in. x 30in., 8d. sheet; one dozen sheets, 7/6.—Burtenshaw, 13, Hillsboro Terrace, Ilfracombe. [1583]

HAIGH'S Mail Order Supply Service.—Immediate delivery; New Cosmor Melody Maker kits, postage and c.o.d. charges paid. £7/15; Megavox Three, Pentode Two, valve components, metal screens, coils and panels ready drilled, Pya differential, 2mf. T.C.C. metal cased condensers; no substitutes; if you fail elsewhere try us for satisfaction; we are expert radio engineers and British Valve Manufacturers' Association dealers.—Haigh's, 121, Gordon Rd., Ealing, W.13. [1550]

KILO-MAG Four Screen Boxes, made out of hard polished copper sheets exactly to specification; price 25/- net, cash with order.—Rigby and Woolfenden, Sheet Metal Workers, Rochdale. [1614]

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CYLANITE Enables 3-ply Panels to be used. (Provided the wooden panel is carefully prepared, there is no objection to using it in place of ebonite—vide "Wireless World," October 24th.)

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CYLANITE for Megavox, 2/6; Kilo-Mag, 3/10; post free.

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MULLARD Eliminator, for A.C. mains, 210 volts, 40 to 100 cycles, complete with D.U.2 valve (full wave rectification), cost £7/10, accept £5, including extra D.U.2 valve; Philips new cone loud-speaker, 2 impedances, cost 50/-, take £2.—Oswald Chippindale, Wedderburn, Harrogate. [1764]

ALL Under One Month Old:—Ecko D.C. H.T. eliminator, 60, 120 and power, 35/-; R.I. straight line super transformer, 12/6; 2 P.M.6 valves, 5/- each; 2 month-old 45-volt Columbia H.T. batteries, 10/- each; H.A.I. 0.250 high resistance voltmeter, 17/6; Igranite pick-up plug adaptor, 3/-.—Tetley, 1, Palace Gate, London, W.8. [1766]

CLIMAX Eliminator Transformer, for 200-volt mains, 20/-; 2 P.M. 256 valves, 15/-; perfect condition.—Childe, Chemist, 228, Roundhay Rd., Leeds. [1778]

AND Now:—Cosmor type metal cabinet, complete with baseboard and screen, 17/6; first class condensers for same, 4/- each; reaction condenser, 3/-; new Mullard panels, mottled finish, 3/-; Precision condensers, S.L.F. or M-log, 4/-; second quality, 3/-; neutralising, 2/6; balancing, 2/9; reaction, 3/-; indicating push-pull switch, 1/-; indicating terminals, No. 1 4d. each, 3/6 dozen, No. 2 3d. each, 2/6 dozen; new type spades in 6 colours, 5d. each, 1/3 dozen; orders value 4/- post paid; cash with order; send p.c. for list of other lines.—F. Widdowson, 114, Trinity St., Gainsborough. [1777]

ELESTROPHONE 5-valve, complete set of parts, except valve holders, as good as new; list price to-day £10, will sell for quick sale £6, or nearest offer.—Boulsover, London House, Bakewell. [1775]

R.I. Tuner, 7 plug-in coils, 2 Peto-Scott dials, 1 Lotus 3-way coil holder; the lot £2, or exchange for 250-volt D.C. unit or Amplion cone speaker.—Chambers, Quadrant, Bournemouth. [1756]

SPARE Components For Sale, stamped envelope for list.—Box 8798, c/o The Wireless World. [1760]

VOLTMETER, D.R., big class, 0-6 0-120, reliable reading; cost 7/6, sell 5/9.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1663]

COSSOR Panels, a few 21x7, high class mahogany, and cube panels in genuine ebonite, as advertised at 9/6; sell for 6/6 each.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [1664]

AMATEUR has following Surplus for Sale.—Two B4, 5/- each; P.M. 251, 10/-; P.M. 5B, 7/-; D.E. 5A, 10/-; 2 Mullard D.U.10, 7/6 each; Climax Autobat mains transformer, new, £1; Brown H.R. pickup, £1/15; 2 6 mfd. Sterling condensers, 5/- each; R.I. Varley H.F. choke, 7/6; Lissen L.F. choke, 1/-; S.625 and holder, Marconi, 15/-; 3 variable 0.0005 mfd., 1/6 each; + Mullard R.C. unit, 7/6; + R.I. Varley, type B, 7/6; 5 rheostats, 1/-; + R.I. Lissen binocular coils (6), 5/- lot; 2 Benjamin holders, 1/- each; + Igranite volume control, 5/-.—Whitehead, Tunwell Mount, Eccleshill, Bradford. [1736]

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19 metres-1000, 7/6 each; 1000-2000, 8/6; 1000-2000 special, 10/6 (compound primary, see list).

Bases as shown or cross pin. These coils are best for all Reinartz type circuits.

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TWO Colvern Mullard Master Three Coils, B.B.C. and Daventry; 8/- pair.—Sherratt, Station House, Stone, Staffs. [1741]

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COILS, neutrovernier, variable condensers, shield, panel resistors and holders, all suitable for Everymen Four—Apply R. Gardner, 29, Gladsmuir Rd., N.19. [1606]

RADIO HOUSE, HUDDERSFIELD, issues reliability wireless guide; copy sent post free.

RADIO HOUSE, HUDDERSFIELD.—Double scale voltmeter, 0/6, 0/120; 5/6.

RADIO HOUSE, HUDDERSFIELD.—For all advertised components of various makes; trade enquiries solicited.—J. H. Taylor and Co., 15, Radio House, Macaulay St., Huddersfield. [0028]

YOUR Old Components Taken in Part Payment for Latest Type; see our advert in column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0228]

CLAREMONT WIRELESS Co.—Polished oak cabinet speakers, giving wonderful tone and stupendous volume; 27/6; trade enquiries invited.

CLAREMONT WIRELESS Co.—Cone speakers, artistically fretted front, perfect tone and volume; 16/11.

CLAREMONT WIRELESS Co.—2-valve loud-speaker sets, complete, 5 guineas; 3-valve, 7 guineas; royalties extra.

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CLAREMONT WIRELESS Co. will Call and Inspect Your Set and Advise You Free in Bristol.

CLAREMONT WIRELESS Co. will Procure and Despatch Any Component same day as order is received.

CLAREMONT WIRELESS Co.—All above goods sent carriage paid.—Claremont Wireless Co., 68, Claremont Rd., Bristol. [1476]

TELEVISION Motors. 50v., 80v., 110v., 10/- each; 220v., 12/6; rheostats fitted for speed control, 2/6 extra; these motors are silent running and operate on low amperage; will revolve a full size disc at any speed up to 2,000 r.p.m.—Helow.

2 IN. Spark Coils, fitted high speed trembler, complete with contacts, 12/6; 1 in. spark coils, ditto, 5/9; Morse keys, 5/-; new Dewar switches, 1/-; hand driven H.T. generators, 80v.-10 m/a., 6/-—Below.

MILLIAMP. Meter, moving coil, 0-150, high class meter, by G.E.C., 20/-; voltmeter, 0-15, 4/-; G.P.O. galvanometer, 7/6; hand telephones, 4/6; large earphones, 1/6; microphones, 2/-; buttons, 1/-; microphone transformers, 2/6, large size 3/6; 1,000 ohm H.F. chokes, 1/-; buzzers, 1/-—Below.

1 h.p. Motors, 80v. and 110v., D.C., ball bearing, carbon brushes, continuous rating, condition as new, 25/-; 80v. to 110v. shunt regulators, 3 amp., 10/-—Below.

ALL Above Goods Guaranteed; 3 days' approval from date of delivery; cash with order, or c.o.d. charges extra; all letters answered.—Galpin, Binfield Heath, near Henley-on-Thames. [1780]

HALF Price.—Goltone eliminator (200v. A.C.), set Lewcos dual screened coils B.S.P.2, Peto-Scott twin gang 0.0005, R.I. Varley multiratio transformer, Mullard R.C.C. unit, B.P.11. C2 loudspeaker; also Mullard Cone loudspeaker, £3/5 model, all perfect condition, 45/-, offers.—Wilton, 95, Wallasey Village, Cheshire. [1740]

KILO-MAG 4.—Screening boxes, 23/6; sets of 6 coils, 37/6; isolating resistances, 3/-; full set of parts, including valves, £15.—Below.

PENTODE 2.—Full set of parts, with valves and cabinet, £5/15; coils, 6/- per set.—Below.

MEGAVOX.—Set of parts, with valve coils, cabinet, £15; aerial coils, per set 22/6.—Below.

COMPLETE set of Parts, valves, cone speaker, batteries, etc.; 2-valve £4/10, 3-valve £5/10; screened 3 £8/10.—Stott, 63, Syke Rd., Rochdale. [1797]

COSSOR Melody Maker, complete kit, with fret-work cabinet cone speaker, 14in. x 14in., batteries and accumulators; £10/7 6.—Super-F Radio, 305, Rutherglen Rd., Glasgow. [1831]

R.I. Reactive Anode Unit. 12/6; Formo twin gang condensers, with illuminated dial, 22/6; Lissen regenerative reactance, 25/-; Lissen H.F. reactance, 9/-; Lissen tuner, 10/6; Lewcos S.P. transformer binocular, 10/-; Lewcos screened multi coil unit DSP/2, 45/-; pick-ups, Igranic, 22/-; Loewe, 14/-; Lissen, 10/6; all as new.—Hazelwood, Lower Hare Park, Newmarket. [1809]

LAW Super Chokes are precision wound with latest duo wire, eliminating possibility of short circuited turns, 50 to 3,000 metres, suitable for any circuit, model A 5/-, B 3/6, post free; trade enquiries.—Lock-Atkinson Wireless, 107, Boisover St., W.1. Fitzroy 1223. [1832]

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THE WIRELESS LEAGUE

Notice is hereby given that the Annual General Meeting of Members of the Wireless League will be held in the Committee room of the Royal Automobile Club, Pall Mall, S.W. on Friday, 23rd November next, at 3 p.m., for the transaction of the following business:—

1. Annual Report and Accounts.
2. Election of Committee.
3. General Business.

Signed,
Arthur Stanley,
CHAIRMAN.

Dated 15th Nov., 1928.

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D. I. D. E. of the "Manchester Evening Chronicle," says—"Results have exceeded my expectations both for clarity and volume."

Cone is 6 in. in diameter. There is simple attachment for fixing unit side to cone and the frame is also ready for battle to be screwed on.



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The "Zampa" Moving Coil Loudspeaker

The "Zampa" is not just a kit of parts, it is a completely assembled unit, scientifically and soundly constructed, which gives absolutely natural, crisp and clean reproduction.

PRICES:
To work off 6-volt accumulator or Trickle Charger from A.C. Mains including step-down Transformer

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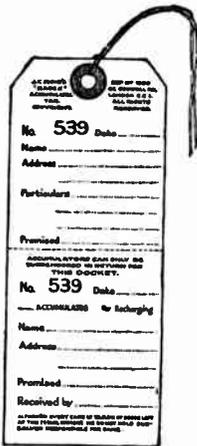
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This Model is guaranteed not to lose its magnetism, and can be worked direct off any standard set.

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Special Prices for Large Quantities.

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Components, Etc., for Sale.—Contd.

WAVEMETER, accurate, 20-500 m.; details on enquiry.—F. Brockbank, 51, Palatine Rd., Withington, Manchester. [1624]

LAW Screens are manufactured for all radio magazine circuits, highly polished, lacquered, and drilled to specification; Chummy 4, 16/6; Inceptor, 3/6; standard screening boxes, 12/6; post free; trade enquiries.—Lock-Atkinson Wireless, 107, Bolsover St., W.1. Fitzroy 1223. [1833]

H.F. Chokes; price 2/- each, post free; spaced windings, low self capacity, high inductance, suitable 50-2,000 metres; 7 days' trial.—Sole distributor, J. McMillan, 1, Hunter Sq., Edinburgh. [1812]

MEGAVOX Three.—Wearite Megavox coils; Toroid Megavox coils; Wearite 600-ohm resistances; R.I. Varley 5,000, 20,000 resistances; Igranic choke; Utility switch; J.B. log 0.0005; Ormond Midget; 6 Glazites; T.C.C. 3 2mf., 1 each 0.001, 0.0001, 0.0003; 2 2meg. Dumetohms; Resistor panel and strip; screen; brand new, unused; in one lot at list less 20%; urgent sale.—115, Southwood Rd., New Eltham, S.E.9. [1794]

COMPLETE Kit for Mullard Master Three, with valves, Mullard H.T. supply unit, Amplion Radiolux speaker, 3 accumulators (1 6-volt 60 and 2 smaller ones); also a number of spare valves and components; the whole, £12 cash; no offers.—Write J. D. Miller, 293, Main Rd., Sidcup. [1793]

ONE Marconi D.E.H.410, 1 Cossor H.F. 4-volt, 4/- each; 1 Cossor 6-volt full wave rectifying valve, 10/-; 2 4mf., 360v. Hydra condensers, 2/- each; 1 2mf., Hydra, 1/-; 1 1-megohm 1 2-megohm, 1 0.25-megohm Dubilier grid leak, 1/- each; 2 fixed resistors and holders, 5 and 20 ohms, 1/- each.—Box 8817, c/o The Wireless World. [1792]

FOUR I.F. Transformers: 1 Marconi Ideal, 2.7-1. 12/-; 1 Fellows, 5/-; 2 Lissen, 4/- each; 1 R.I. Varley R.C.C. unit (A), 10/-; 2 J.B. 0.0005 S.L.F. condensers, 5/- each; 1 Brown C.T.C. unit, 5/-; 1 McMichael neutralising condenser, 2/-.—Box 8818, c/o The Wireless World. [1791]

FERRANTI A.F.3 Transformer, 15/-; Mullard L.F. transformer, 15/-; both as new.—Box 8820, c/o The Wireless World. [1789]

WATNEL Autochoke, 10/-; H.F. choke, 6/-; Ferranti trickle charger, 36/-; Pye transformer, 2.5 to 1, 12/6; Mullard R.C. unit, 12/6; Bullphone cone unit, 10/6; Tefag cone unit, 16/-; Graham Farish 3-valve R.C. unit, 10/6; set of 6-pin coils, H.F. and aerial, the 4 12/-; separate, 4/- each; moving coil meters, 160 volts, 20/-; 3-0.3 amps., 19/-; Multi-meter, 6v, 120v, 3-12 and 30 ma. and 3 amps., 25/-; Brown A. earpiece for cone speaker, 7/6; all guaranteed perfect; other bargains; must be cleared; stamp for reply. Wanted, moving coil speaker.—BM/ZMNB, London, W.C.1. [1788]

NEW Cossor Kit, carton unopened, £7; Beam cone unit, 17/6; Bullphone speaker De Luxe, as new, £2.—25, Putney Rd., Enfield Wash, Middlesex. [1787]

SURPLUS.—New valves: P.M.5X, 7/-; Ediswan 210 H.F., 6/6; D.E.H.210, 7/-; Formo 0.00035, 4/-; transformers, unused: new Mullard, 21/-; Phillips, 21/-; Formo, 5/-; B.T.H. horn, 35/-; Terralco cone, 40/-; Phillips cone, new, 45/-; amperies, 2/- each; Igranic plug, 1/6; Colvern screens, 2/-.—F. Caddick, 15, Stanley Park Rd., Wallington. [1786]

R.I. Varley Mains Transformer, input 120 or 240, output 180, 25/-; D.U.2 valve, new, 12/6; A.C.9, new, 10/-; Stentor 6, 9/-; P.M.1 H.F., 5/-; R.I. 4-terminal straight line transformer, 12/6; R.I. 20-henry choke, 10/-; Clarostats, 5/-; Sterlites, 9/0; square law, 3/6.—Chapple, 4, Halliwich Parade, Muswell Hill. [1785]

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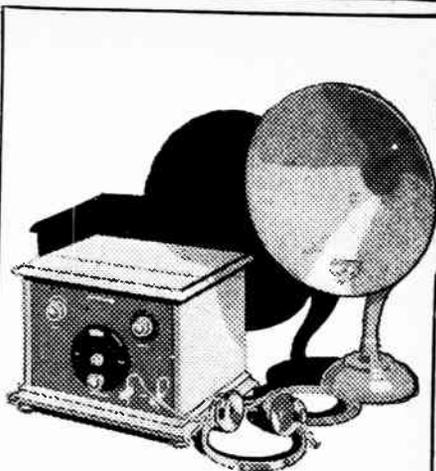
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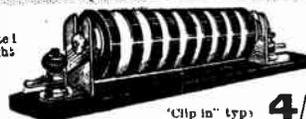
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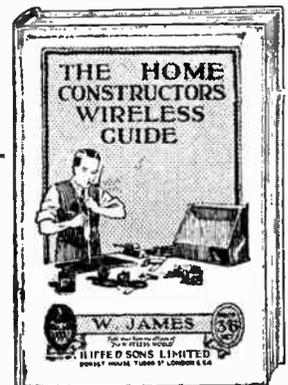
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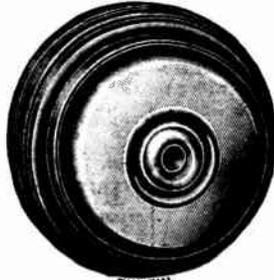
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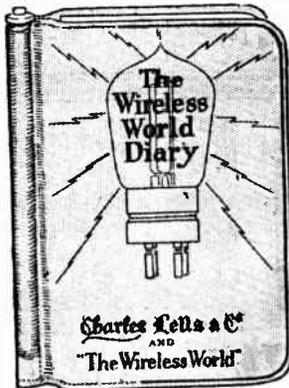
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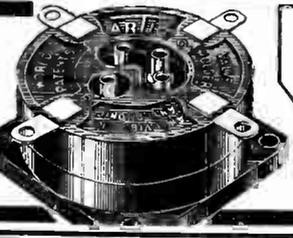
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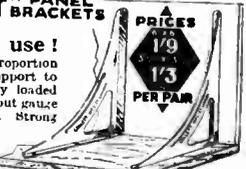
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The Wireless World
AND RADIO REVIEW

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CHEAPER & STRONGER than the best kinds of Ebonite.

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MOVING COIL LOUD SPEAKER.



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£4. With Stand.

Pot Magnet wound for D.C. Mains. 126 Extra.

The Steel Pot Magnet, wound for 2, 4 or 6 volts, requires only 3 to 4 watts. At 6 volts the current is between 5 and 75 amps.

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All over-tones are reproduced. Nothing is lost.

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(See page 2.)

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For A.C. or D.C. Mains.

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The Wireless World

AND RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, November 21st, 1928.

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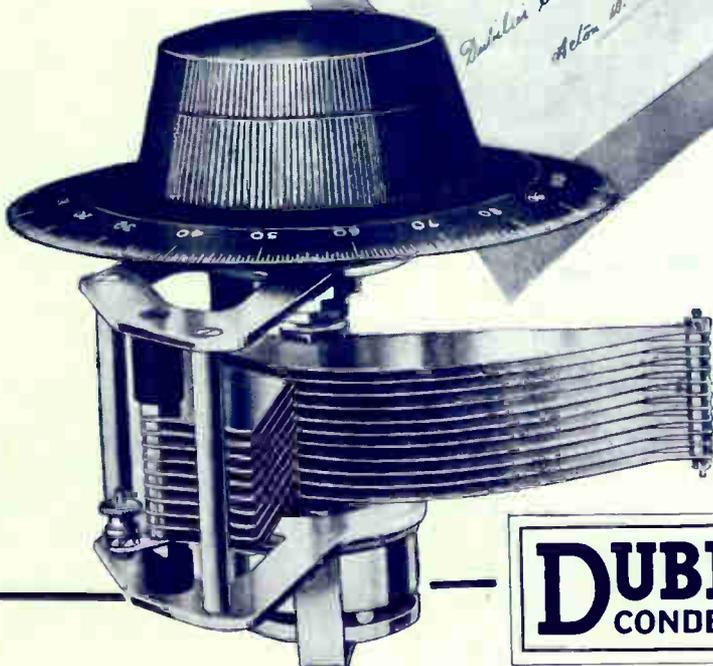
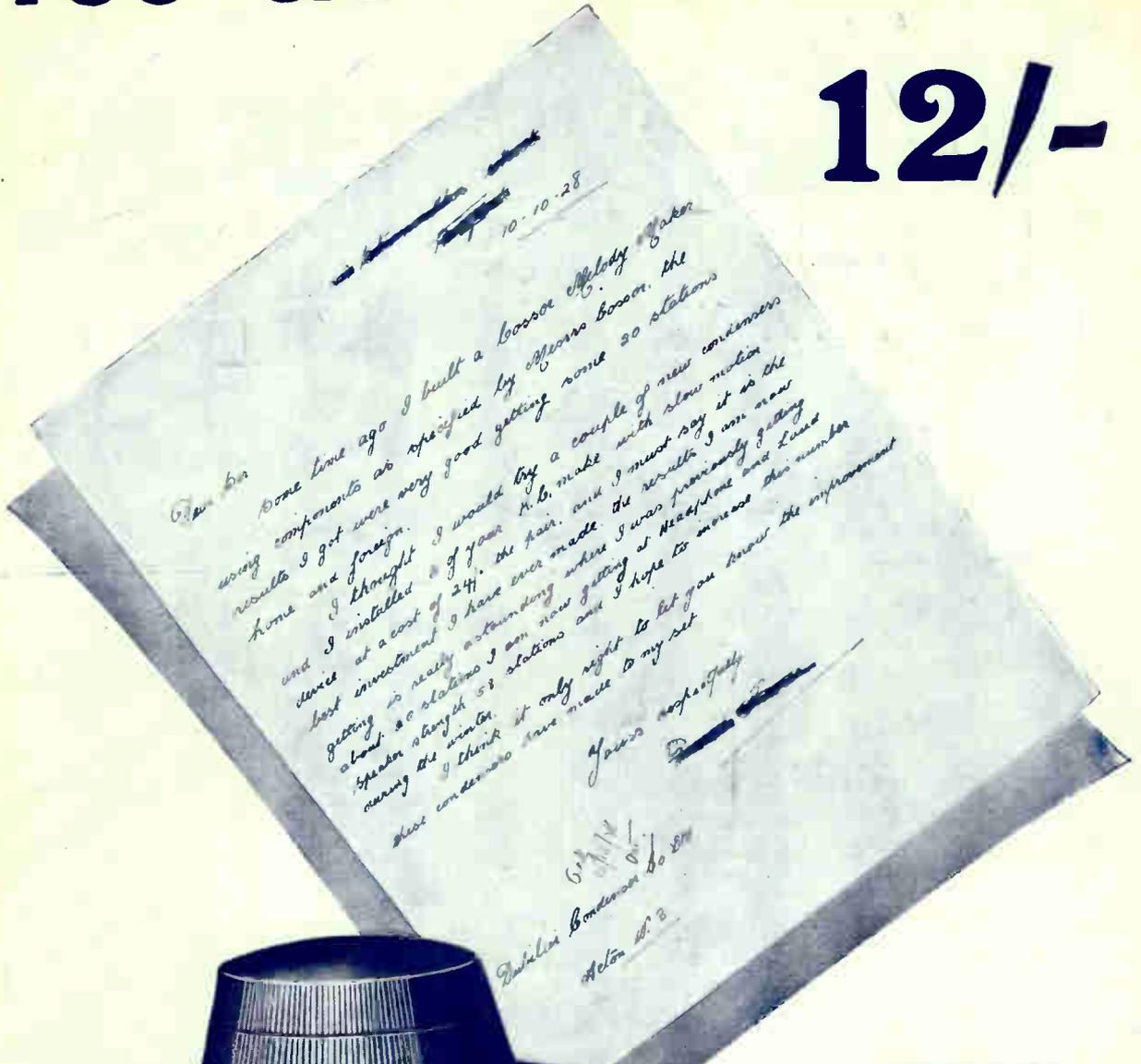
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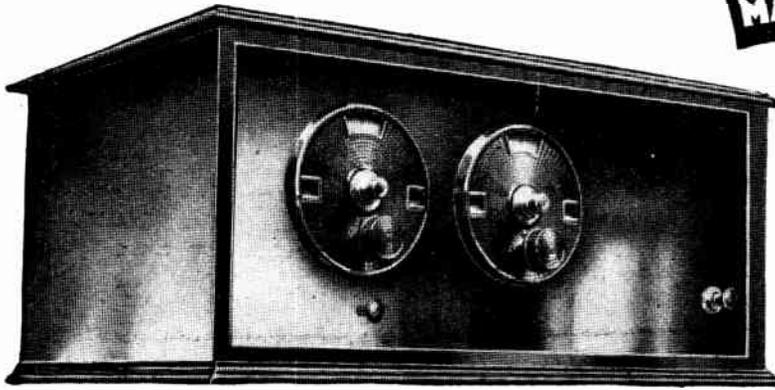
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NO COIL CHANGING

ONE DIAL TUNING



Judge it on quality of reproduction, on volume, on sensitivity to distant stations—judge it by any of the standards of radio receiver performance and you must admit that the Mullard Master 3* is supreme.

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Please send me, Simplified Plan of Assembly of
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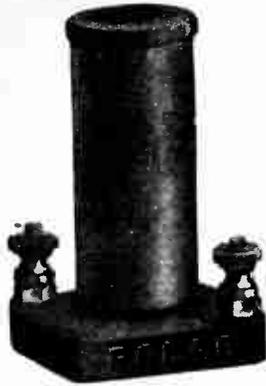
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STANDARD: 50-5000 metres effective choking.
Size only 1¼" × 1¼"
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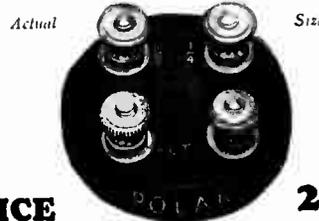


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FOR SMOOTH REACTION

For connection across L.T. and connection of detector leak, thus correctly biasing detector grid, and ensuring perfect tone and even reaction.



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PRICE **2'0**

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A kit of moving coil parts complete with cone and transformer. Electro-magnetic type. Supplied for 6 volt accumulator or any mains voltage between 110 and 240. Consumption 3 amp and 50 m/a respectively.

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Handsome, highly polished mahogany cabinet model incorporating the famous 4-pole balanced armature Type C Unit. Full round volume, magnificent reproduction.

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Hegra Loud Speakers for all

THE successful outcome of the Royalty question now enables you to enjoy the wonderful reproduction in your home which Hegra Loud Speakers and Units alone can afford.

Hegra Loud Speakers and Cone Units are famous not only in this country but throughout the civilised world. Ask your Dealer to-day to show you a Hegra Cone Unit or demonstrate a Hegra Loud Speaker; you will be astonished at the value they offer.

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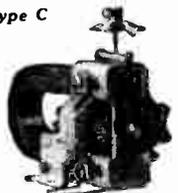


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12'6

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A 4-pole balanced armature cone unit. Superb workmanship. Even response to all audible frequencies, will handle great volume without distortion.

21'-

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The items chosen for first place were respectively, the 'Met-Vick' Model 'B' combined L.T., H.T. & G.B. Eliminator and the 'Met-Vick' Elastic Aerial Unit

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Prices for complete unit varies accord- } 12/6 to
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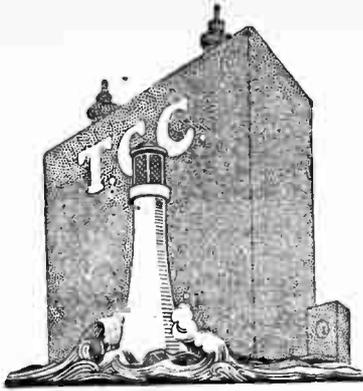
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- Three AC/G Valves and Holders.
- Two AC/R Valves and Holders.
- Two Tuning Condensers.
- Permacon Condensers.
- Moulded Resistances.
- Type "AB" Mains Transformer.
- Three Eliminator Chokes.
- One SP/42U Rectifying Valve and Holder.

FOR SIMILAR SATISFACTORY RESULTS USE—

MET-VICK COMPONENTS, VALVES and SETS

Metro-Vick Supplies Ltd., 155 Charing Cross Road, London, W.C.2.



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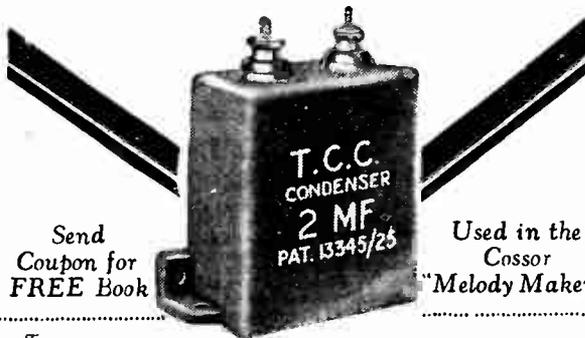
Just as a lighthouse safeguards ships at sea so do the letters T.C.C. safeguard you against faulty condensers.

THE letters "T.C.C." on a condenser are a hall-mark. For nearly a quarter of a century "T.C.C." has been synonymous with accuracy, durability and dependability.

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T.C.C.



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W.W. 21/11/28.

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The New Wonder "Nightingale"

CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker

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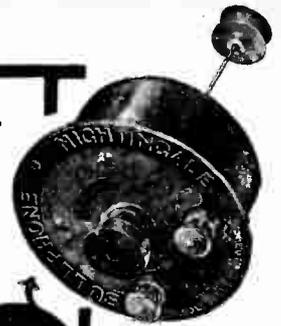
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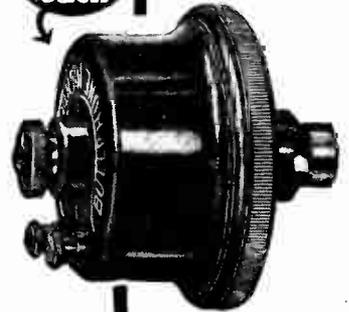
With 4-inch Diaphragm.

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15/- each

SATISFACTION GUARANTEED or money refunded



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5/- Secures this Speaker

5/- Secures this Speaker

50/- DE LUXE cash or 5/- deposit and 11 monthly payments of 5/-

21 ins. high, with 14-inch Bell, Mahogany finished, with plate arm and stand



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26" HIGH Bell, Mouth 14" finished in MAHOGANY

NIGHTINGALE CONCERT SUPREME SUPER

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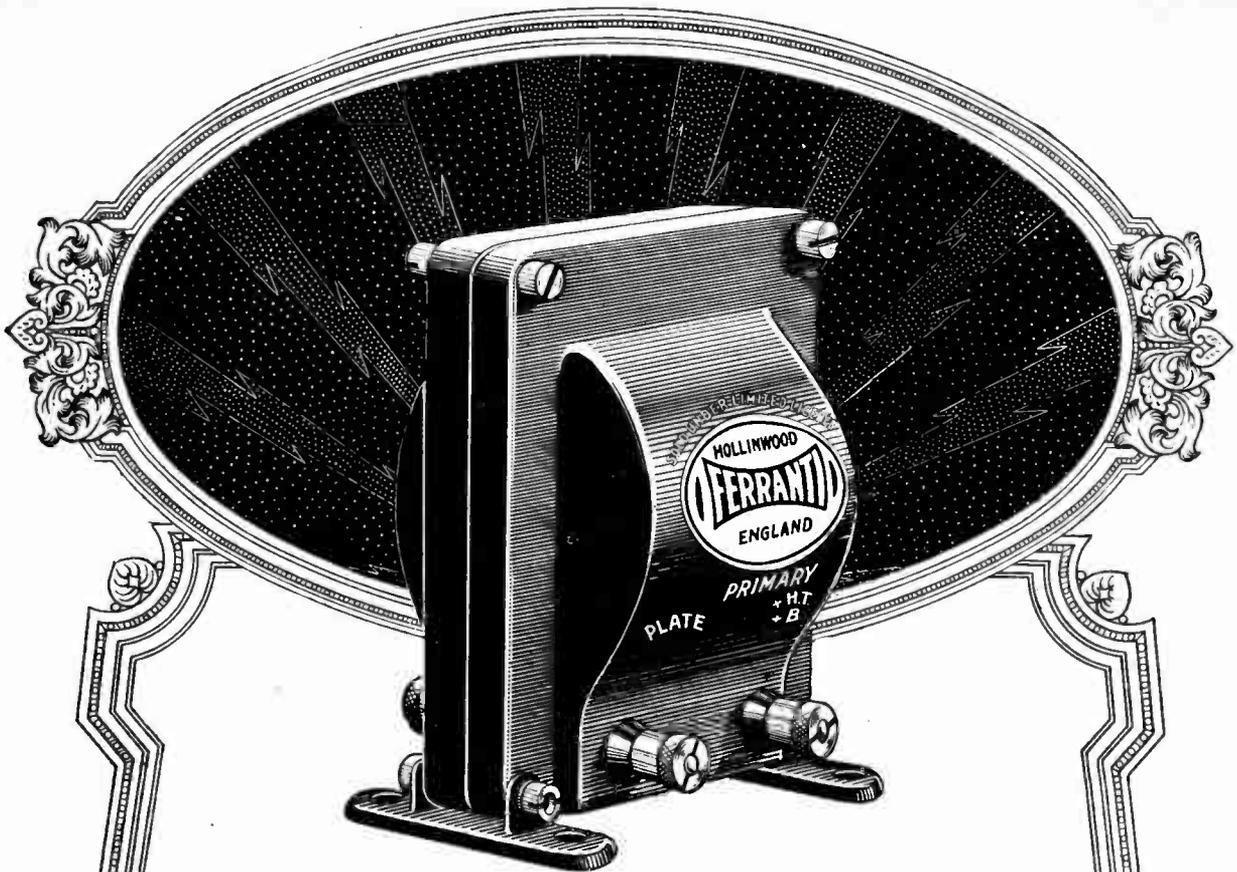


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*You must have a good Transformer
—and the best is*

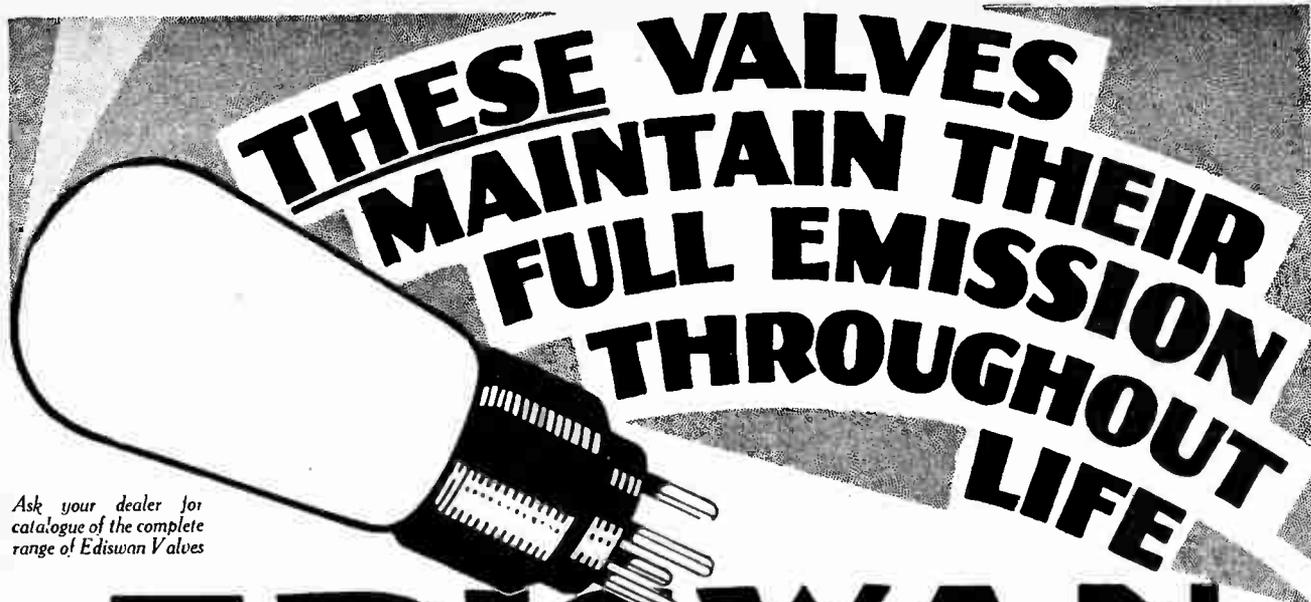
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**THESE VALVES
MAINTAIN THEIR
FULL EMISSION
THROUGHOUT
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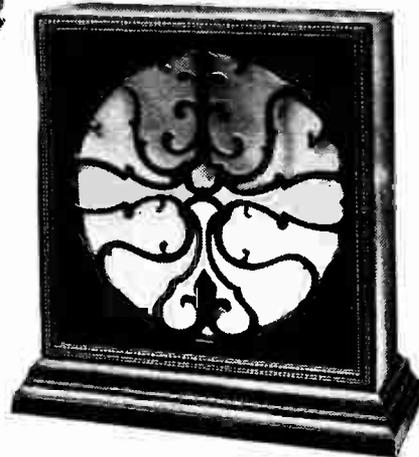
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MANUFACTURERS OF THE WORLD'S FIRST RADIO VALVES

**THE GREAT
NEW SPEAKER
WHICH COMPLETELY
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*Hearing that's
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THE M.P.A. DUAL INDUCTANCE is a Moving Coil Speaker built on an entirely new principle exclusive to M.P.A. Although self-energising, it requires neither accumulators, mains connections, special valves, nor transformers; and it undoubtedly represents the greatest value in popular-priced reproduction to date. Hear it at your dealer's! Note its amazing volume, its clarity, and exceedingly mellow beauty of tone! "IT GETS THE BEST FROM YOUR SET," any set—even a 2-valve receiver.

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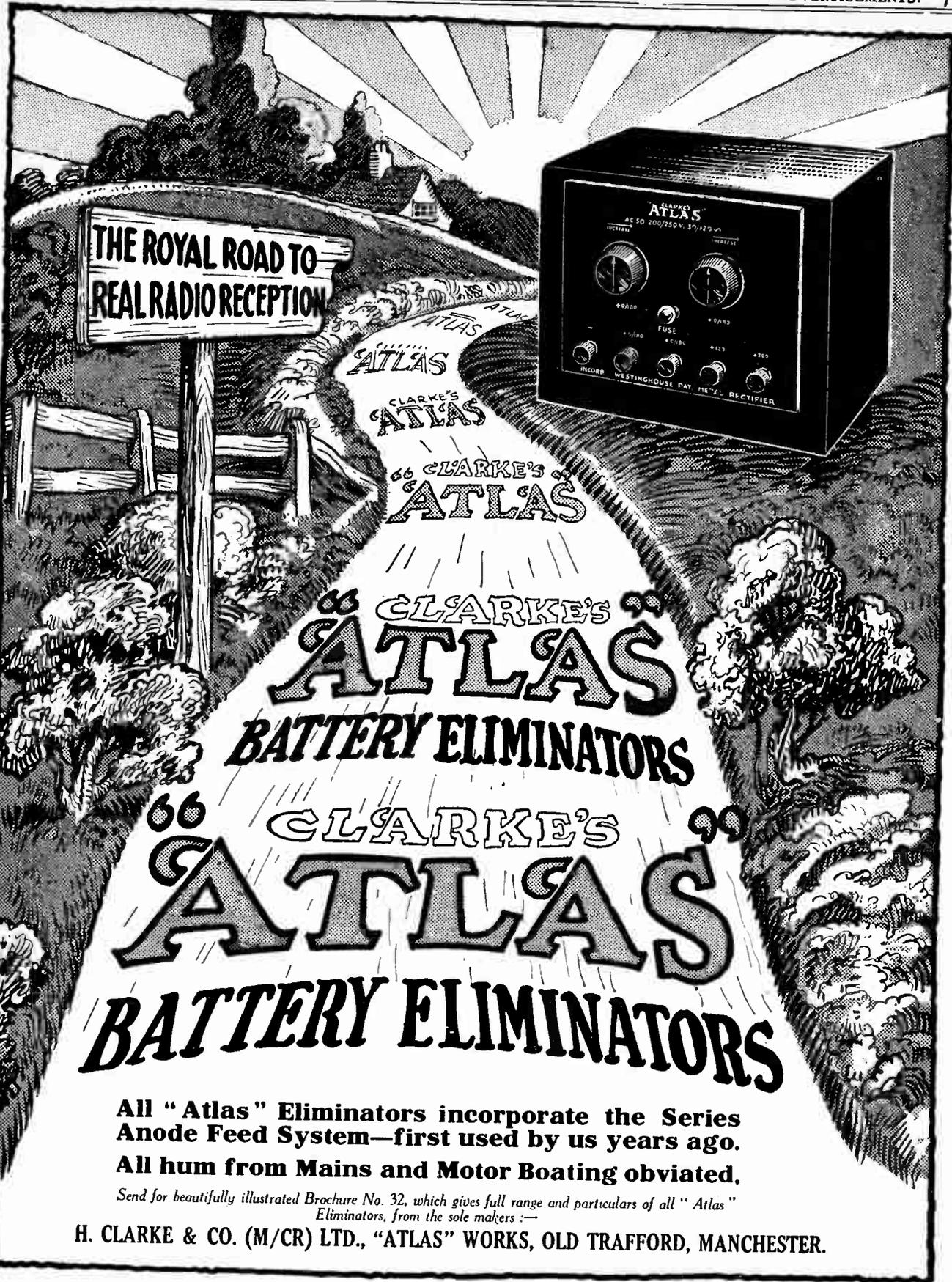
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The "EKCO"

Independent Series Anode Feed System

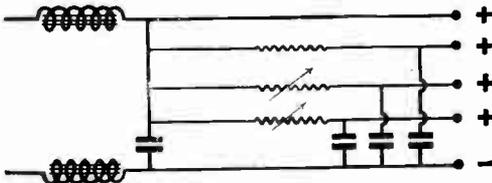
UNIQUE IN MAINS POWER RADIO

This now famous system is fully patented by "Ekco" and has played an important part in the wide success of all "Ekco" Mains Power Radio Devices, the most popular of to-day.

The "Ekco" Anode Feed System definitely eliminates all "hum" and "motorboating." It also assures correct voltage output and lower running costs.

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Circuit Diagram of Model 2V.60.D.C.

FULLY PROTECTED UNDER
PATENT NO 262567.

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ANODE FEED SYSTEM

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Models range from 17/6 D.C. and £2.12.6 A.C. complete in handsome dark brown crystalline metal cases. Every device carries a firm guarantee for one year.

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Watmel

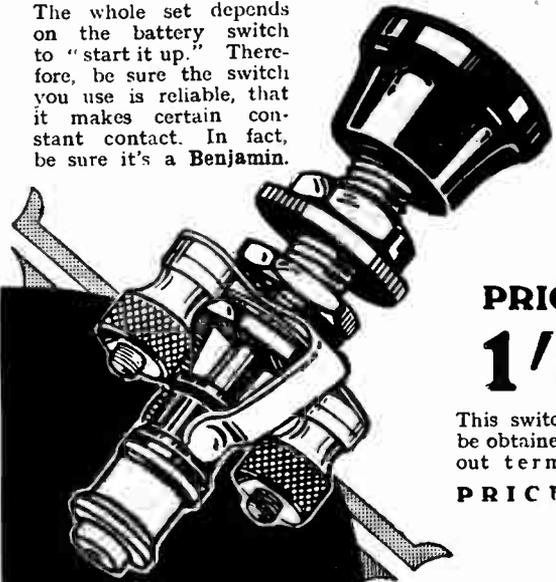
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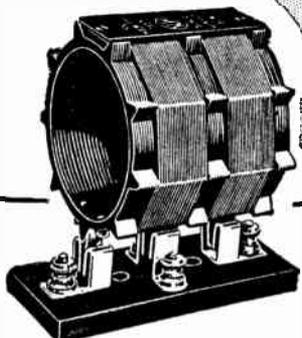
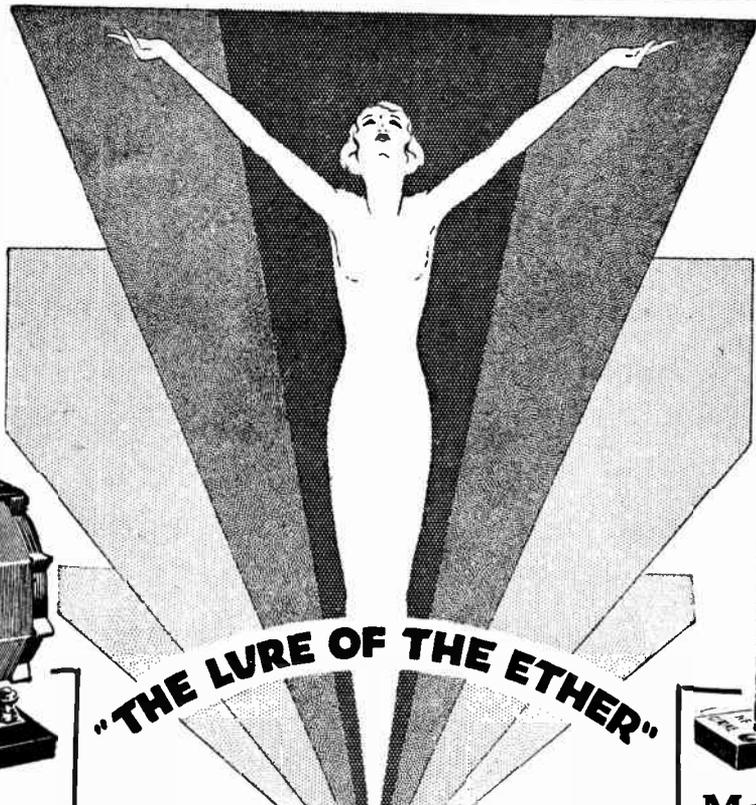
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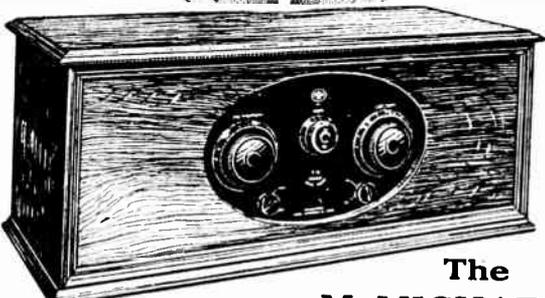
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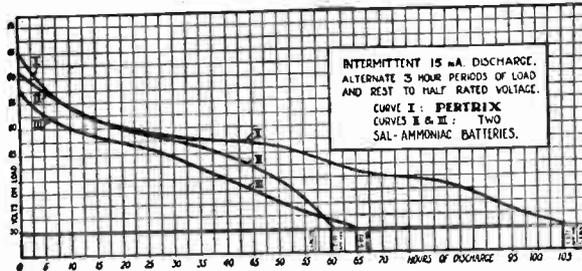
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407 G 4v.	'07 " "
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407 RH 4v.	'07 " " "

Frelat

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Valves

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 No Accumulator Required.

Can you buy five-valve results for £12-7-0?

Yes!—Burndept offers you in the amazingly popular Screened Ethophone a super three-valve set which gives results equalling the performance of the average five-valve instrument. This receiver represents the finest value in radio to-day at the very reasonable price of £12:7:0. Ask to hear the Screened Ethophone at your radio dealer's.

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Three valves — including screened grid and pentode.

Easy to operate—only two dials.

Wonderfully "selective."

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Range: 210-550 and 650-2,100 metres—and no coils to change.



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Burndept Receivers are supplied on Hire Purchase Terms.

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Build a COMPLETELY SCREENED Set.

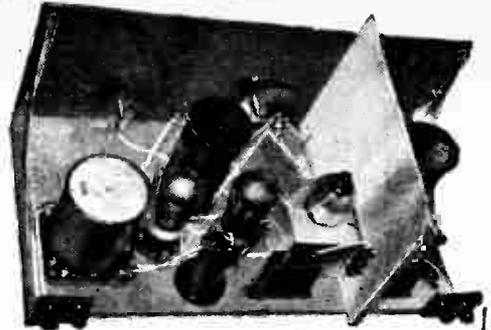
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From HIGH WAVE to LOW WAVE on a push-pull switch.

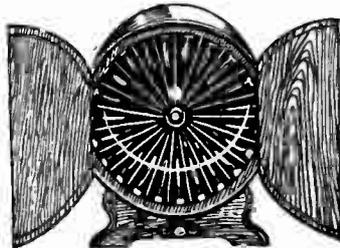


Send postcard for FREE FULL SIZE LAY-OUT PLAN and wiring instructions:—
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THE BEST LOUDSPEAKER

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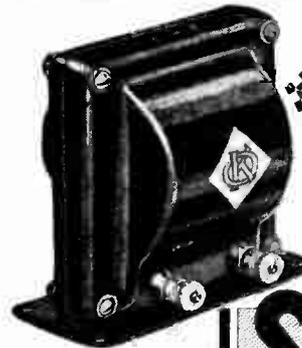


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30 ozs.

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PR 4	2	.095	120,000	32	R.C.
PR 8	3.5-4	.063	23,000	15	H.F.
PR 9	3.5-4	.063	18,000	14	Det.
PR10	3.5-4	.063	10,000	8.7	L.F.
PR11	3.5-4	.063	88,000	40	R.C.
PR16	5.6	.1	18,000	18	H.F.
PR17	5.6	.1	18,000	17	Det.
PR18	5.6	.1	8,500	9	L.F.
PR19	5.6	.1	80,000	40	R.C.
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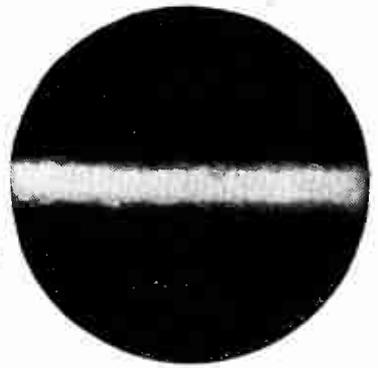
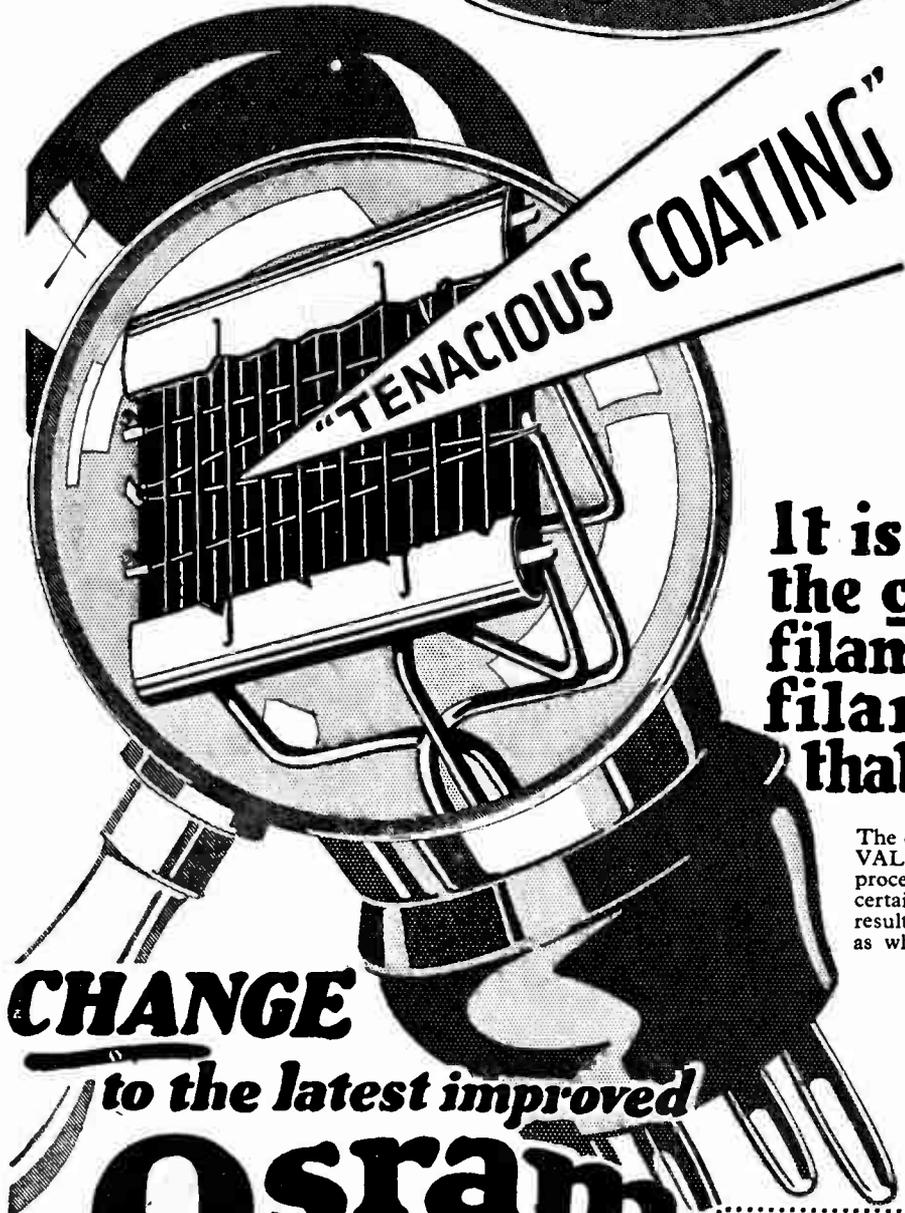
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ELECTRICAL



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Osram Valves
and

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AND ITS PRICE IS ONLY

ONLY

£7-15



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COSSOR Melody Maker

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The Wireless World

AND
RADIO REVIEW
(16th Year of Publication)

No. 482.

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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and status of the operator; but is it not time that something should be done to make so honourable a calling more attractive, and so ensure that in the future, as in the past, positions of such responsibility shall continue to be filled by men possessed of the same qualities as have been displayed by so many heroes in the past?

o o o o

EMPIRE BROADCASTING.

ON Sunday, November 11th, a permanent Empire short-wave broadcasting service was inaugurated by the transmission of a speech by H.R.H. the Prince of Wales through the Kenya short-wave station, 7LO, at Nairobi. It is reported that regular programmes will be transmitted from now on under the direction of the British East African Broadcasting Company, to whom we offer our congratulations on their enterprise.

We also learn that the League of Nations is about to recommence its experimental short-wave transmissions, and the choice of a short-wave station competent to perform the service has fallen upon the Dutch transmitter at Kootwijk, arrangements having been made to connect the station by landline with a studio in the League of Nations Secretariat in Geneva.

Thus development of the use of short waves for long-distance broadcasting proceeds abroad, but in England, in the absence of evidence to the contrary, we are left to assume that 5SW stagnates and has made no real progress since first the station was opened more than twelve months ago.

o o o o

MAINS SUPPLY UNITS.

WE are very pleased to be able to correct an impression given by a recent announcement in the daily Press, that the Middlesbrough Electricity Supply Corporation was encroaching upon what we regard as the legitimate activities of the wireless industry in arranging to design and manufacture its own battery eliminator for wireless purposes.

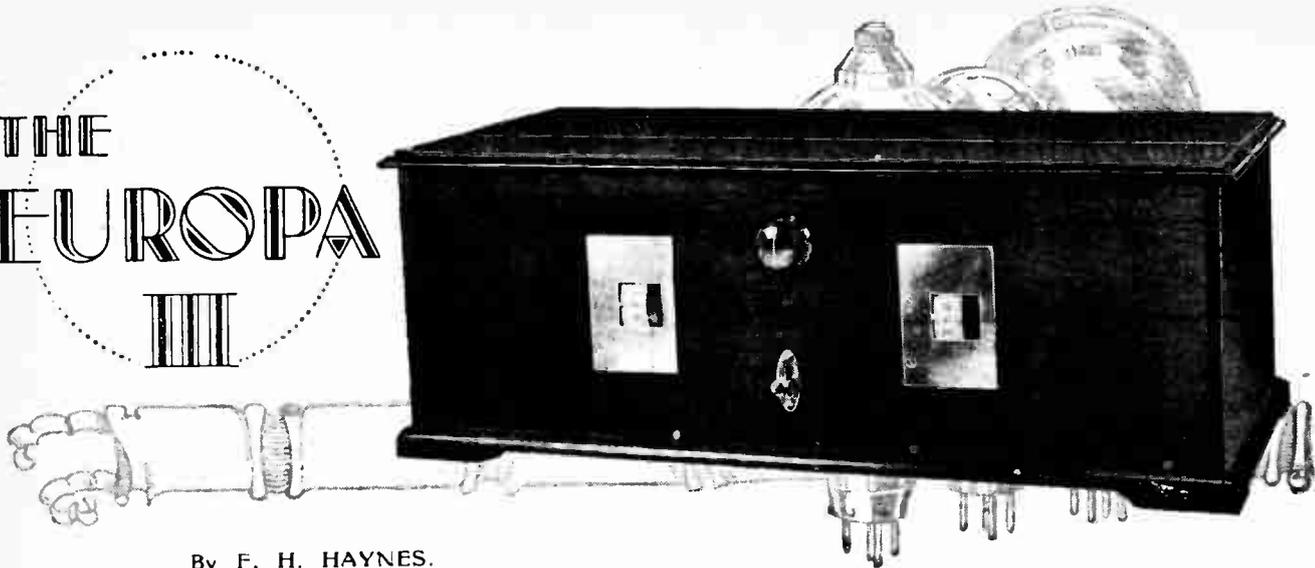
We have now been informed on good authority that this is not the course which the Corporation is adopting, but that the eliminators, although designed under the direction of the Corporation, are being supplied by a well-known manufacturer of wireless and electrical apparatus. The outfits are being purchased by the Corporation at standard trade prices and, under these circumstances, we take this opportunity of again expressing, as we did in our issue of November 7th, our appreciation of the enterprise of the Corporation in undertaking this service, which we consider sets a good example to other Electricity Supply authorities.

THE WIRELESS OPERATOR.

THE tragic disaster which has recently befallen the *Vestris*, and the heroic behaviour of the wireless operators, raises once more the question of the status and remuneration of the seagoing operator.

The position of wireless operator on board a modern liner is one which requires not only considerable technical knowledge, but, especially in time of disaster, may call for the most exacting service which it is possible for a human being to perform. In the history of modern navigation, both in time of peace and war, the wireless operator has set an example at least as fine as has been recorded in any other calling in life. The world is always ready to extol heroic deeds, but as soon as the first thrill experienced with the news of the heroism of a wireless operator whose ship has been involved in disaster is over, the hero is soon forgotten and the status of operators, both as regards pay and rank, still remains, with comparatively few exceptions, so unattractive that the choice of such a career is by no means popular. We know that serious difficulties stand in the way of effecting any radical improvement in the pay

THE EUROPA III



By F. H. HAYNES.

A Post-Exhibition Receiver.

A POPULAR receiver to meet home receiving conditions and incorporating attractive features by way of new apparatus from the recent exhibitions has been the objective in designing this set. In spite, perhaps, of a campaign in support of quality reception for moving-coil loud speaker reproduction, there would seem to be an insatiable desire for that class of set which will tune in stations at every few degrees' movement of its dials. New valves of super-

efficiency make possible the production of a simple receiver that will give loud speaker results from most European broadcasting stations, and it is around three selected valves that this set has been built. They are the P.M.14, a screened grid H.F. amplifier which has an impedance of 230,000 and a magnification factor of 200; the Marconi, or Osram, H.L.610 with an impedance of 30,000 and a magnification of 30, and the power valve P.625, which has an impedance of 2,400 and a

magnification of 6, possessing a mutual conductance of the extraordinary high value of 2.5 with a permissible grid swing of 42. It is such figures as these that account for the enormously improved performances of this season's receivers. Components have been selected for their merit in relation to price.

Although it has been the aim to assemble the receiver from entirely standard components, it has been necessary to make up the coils used in the H.F. circuits. The aerial inductance consists of a solenoid coil combined with a multi-layer honey-comb winding in a manner that when the latter is short-circuited the performance of the remaining coil is in no way impaired. Thus, a very simple switch action changes from

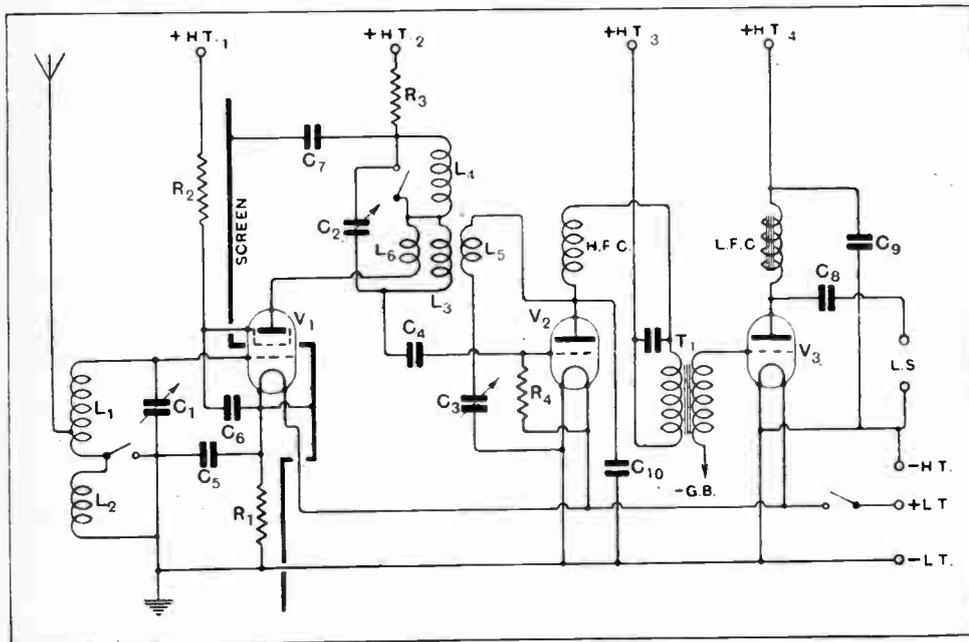
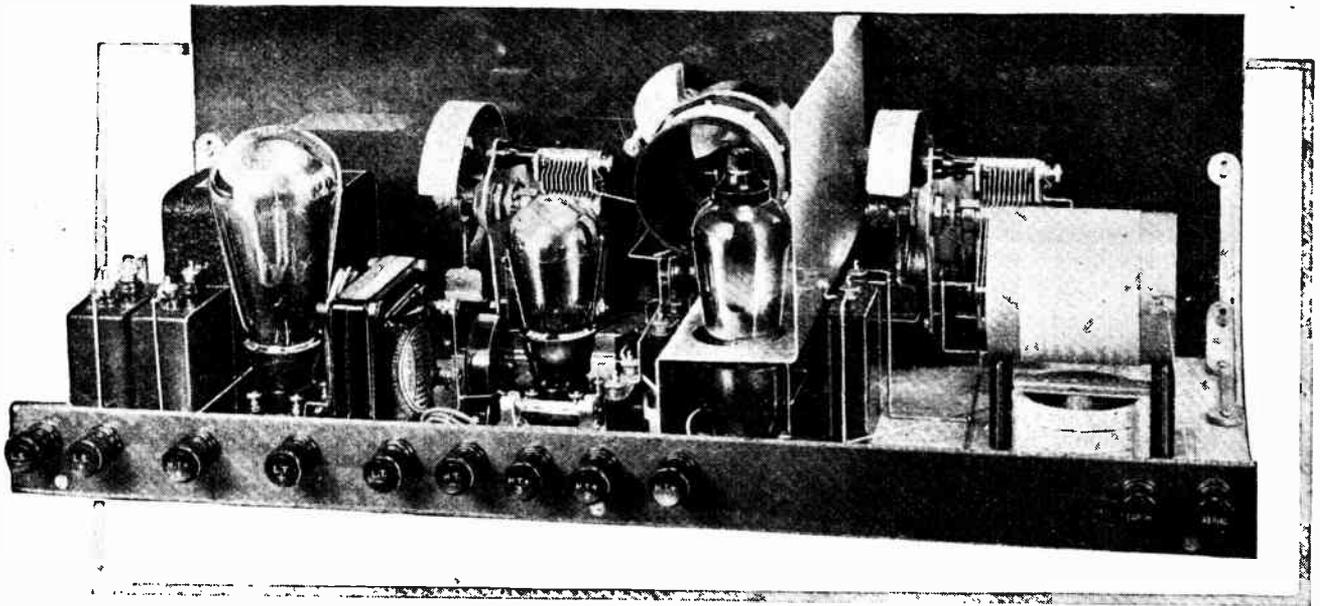


Fig. 1.—Reception on both broadcast and long-wave bands is provided by two single-pole switches arranged to short circuit loading coils. Reaction is associated with the H.F. intervalve transformer. L₁, L₂, aerial circuit transformer and loading coil; L₃, tuned transformer secondary; L₄, tuned anode coil for long-wave reception; L₅, reaction winding; C₁, C₂, 0.0005 mfd.; C₃, 0.0001 mfd.; C₄, 0.0003 mfd.; C₅, 1 mfd.; C₆, C₇, 0.05 mfd.; C₈, C₉, 2 mfd.; C₁₀, 0.0001 mfd. The transformer is supplied with the condenser shown across its terminals. R₁, 24 ohms; R₂, R₃, 600 ohms; R₄, 2 megohms.

The Europa III.—

broadcast band to long wave, the switch having two contacts and a short-circuiting piece. Better selectivity combined with a gain in signal strength is obtained on the broadcast band by including only a portion of the aerial coil, instead of the whole of it in the aerial circuit. Full constructional details of this aerial coil are given in an accompanying drawing. To avoid the making of tapped holes the countersunk-headed 6B.A. screws are driven into $\frac{3}{32}$ in. holes in the ends of the short ebonite rods which support the bakelised former. A clamp for the long-wave coil is made from a strip of ply wood serving as a bridge and secured to a small upright piece of wood. This aerial coil is mounted on its own separate ply wood base, and is well worth the trouble of making carefully. Three small strips of tin-plate secured to the former with 6B.A. screws and

screened grid valve, it may at first be thought to introduce only slight damping in the tuned circuit, it does in fact rule out any advantage one might hope to gain by the use of a really efficient coil. Another consideration in favour of a transformer coupling, apart from the gain in selectivity, is the lack of stability sometimes experienced with a tuned anode coupling. This ready tendency to oscillate arises from the same cause as that existing in an H.F. amplifier where no steps are taken to neutralise the capacity coupling present between the plate and grid of the H.F. valve. Plate-to-grid capacity is not entirely absent in the screened grid valve, and the high magnification gives rise to a sufficient out-of-phase potential difference occurring across the electrodes to bring about regeneration. By means of a transformer coupling, the H.F. potential fed back across the valve is sufficiently reduced to maintain stability,



Rear view showing the assembly of the apparatus. To avoid duplication of apparatus normally associated with the battery eliminator, separate H.T. terminals are brought out from all anode circuits.

nuts serve as double-ended tags for terminating the single layer coil.

Transformer for S.G. Valve.

The H.F. intervalve coupling is a transformer. The reason for this is that a simple tuned anode possesses poor selectivity, and particularly is the lack of selectivity in evidence when the tuned anode is followed by a leaky grid detector. The sensitiveness of a leaky grid detector to weak signals and its non-proportional output to stronger ones causes it to pass on even a comparatively weak interfering signal on an adjoining wavelength, the presence of which arises from the use of an unselective tuned circuit. With anode-bend detection the poor selectivity of the tuned anode is not so apparent, but anode-bend detection is too insensitive for our present purpose. The H.F. valve with regard to radio-frequency potential bridges the ends of the coil forming its anode circuit, and although with an impedance as high as 230,000 ohms, as possessed by the

as the potential existing across the ends of the primary may be less than that set up across a tuned anode coupling. Thus, in obtaining better selectivity, the H.F. amplifier is rendered more stable by the adoption of the transformer. From experiments with several forms of windings a good transformer results when primary and secondary are tightly coupled inductively, when there is a minimum of capacity coupling between the windings, the actual turns ratio which will vary with the arrangement of coils not being more than 2 to 1. This transformer with the P.M.14 gives a voltage amplification in excess of 30. A minimum of capacity coupling is desirable in order to avoid the existence of a path by which low-frequency currents can gain access to the detector grid from the H.T. supply. Low-frequency oscillation trouble so commonly met with in multi-valve receivers is now generally prevented by the use of feed resistances, so that the alternating signal currents are not permitted to circulate through the common resistance path of the H.T. supply. The

LIST OF PARTS.

- 1 Baseboard, $21 \times 9 \times \frac{3}{8}$ in. of 5-ply wood.
 1 Bakelised board panel, $21 \times 7 \times \frac{1}{8}$ in. (Pertinax or Paxolin).
 1 Terminal strip of bakelised board, $21 \times 1 \frac{1}{2} \times \frac{1}{8}$ in.
 1 Pair panel brackets. (Keystone, Peto Scott).
 1 Aluminium screen, No. 16 gauge (from makers of metal cabinets).
 1 Aerial coil former, $3 \times 2 \frac{1}{2}$ in. diameter (Pirtoid, H. Clarke & Co., M/c., Ltd.).
 1 H.F. transformer former, $3 \frac{1}{2} \times 2 \frac{1}{2}$ in. diameter (Pirtoid, H. Clarke & Co., M/c., Ltd.).
 1 Variable condenser, 0.0001 mfd., for reaction (Midgel, Dubilier).
 2 Variable condensers, 0.0005 mfd. (Utility, Thumb Control Type 191, Wilkins & Wright).
 1 L.F. choke (Type DY.11, 28.14 henrys, R. I. & Varley).
 1 L.F. transformer (AF4, Ferranti).
 1 Grid leak, 2 megohms (Loewe Radio Co., 4, Fountayne Road, London, N.15).
 1 Porcelain grid leak holder (Bulgin, 9/11, Cursitor Street, Chancery Lane, London, E.C.4).
 1 Condenser, 1 mfd. (T.C.C.).
 2 Condensers, 2 mfd. (T.C.C.).
- 2 Condensers, 0.05 mfd. (T.C.C., upright type).
 1 Condenser, 0.0003 mfd. (T.C.C., upright type).
 1 Condenser, 0.0001 mfd., (T.C.C., upright type).
 3 Valve holders, rigid type (Whiteley Boncham & Co.).
 1 H.F. choke (Burndept).
 1 Fixed value filament resistance, 24 ohms ("Pecrless" Varistor, Bedford Electrical Co.).
 2 Loading coils with pin bases removed (Type L.200, Igranite Electric Co.).
 1 S.P.D.T. switch (Utility, W190/1, Wilkins & Wright).
 1 D.P.D.T. switch (Utility, W190/2, Wilkins & Wright).
 1 Connecting rod for above, 7 in. between centres of holes (Wilkins & Wright).
 2 Resistances, 600 ohms (Wright & Wcaire).
 11 Ebonite shrouded terminals (Belling & Lee).
 Small quantities of wire for H.F. transformers, screws, etc., $\frac{3}{8}$ in. ebonite rod, soldering tags.
 1 Cabinet, $21 \times 7 \times 9$ in.
 Approximate cost of parts (excluding valves and cabinet), £7 5s.

In the "List of Parts" included in the descriptions of *THE WIRELESS WORLD* receivers are detailed the components actually used by the designer and illustrated in the photographs of the instrument. Where the designer considers it necessary that particular components should be used in preference to others, these components are mentioned in the article itself. In all other cases the constructor can use his discretion as to the choice of components, provided they are of equal quality to those listed, and that he takes into consideration in the dimensions and layout of the set any variations in the size of alternative components he may use.

coupling condenser of a tuned anode or an appreciable capacity between the primary and secondary windings of a H.F. transformer creates a condition whereby fluctuating potentials present in the H.T. supply may be

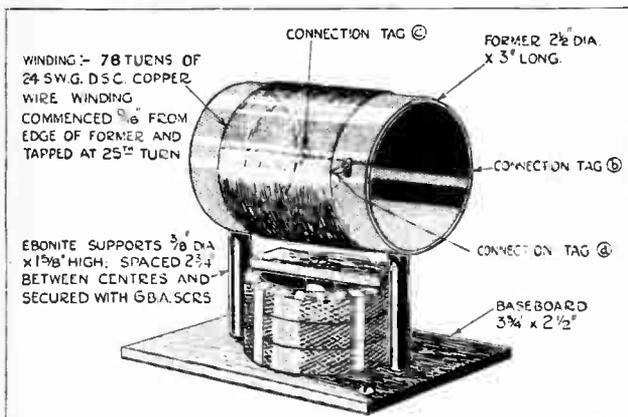


Fig. 2—Constructional details of the aerial transformer. The loading coil is an L.200 duolateral with its pin connector removed.

diverted to take a route through this capacity to the grid of the detector in sufficient value to introduce the dangers well known to exist by stray interstage coupling.

For simplicity of switching and wiring, the H.F. intervalve coupling becomes a tuned anode on the long wavelengths. Instability does not result, as the feed back across the valve capacity is reduced with the lower frequency.

The advantages of a critically controlled amount of regeneration cannot be omitted from a set that is to possess maximum sensitiveness; in fact, the voltage gain of the H.F. stage is, on weak signals, multiplied by three or more times by its aid. Quite a small amount of feed back associated with the detector valve

anode circuit gives rise to a greatly increased signal voltage across the H.F. transformer secondary. Incidentally, the evidence creeps in here that the screen of the valve is not completely effective, for the H.F. voltage rises also in the aerial transformer, a very beneficial condition provided it is not taken too far. With the H.F. stage gain now substantially controlled within the scope of 300 per cent., or more, by the use of reaction one need scarcely pay heed to the potentials set up in the aerial coil by the incoming signal. Measurement reveals that the local station may deliver an H.F. potential of more than a volt to the grid of the H.F. valve. 5GB may produce a potential of some tenth of this value at a distance of seventy miles, yet, apart from these two stations, the twenty, or more, distant transmissions which are to be received produce only a few millivolts. Thus with the H.F. gain and the benefit of reaction an input of 10 millivolts from

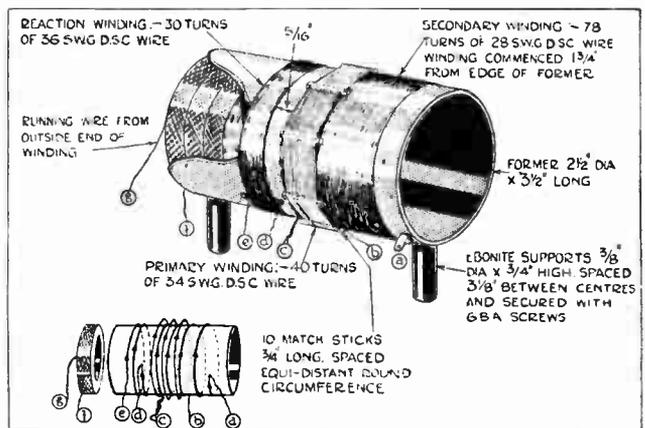


Fig. 3—Reacting H.F. intervalve transformer for use with the screened grid valve. The relative directions of the windings need to be carefully followed.

The Europa III.—

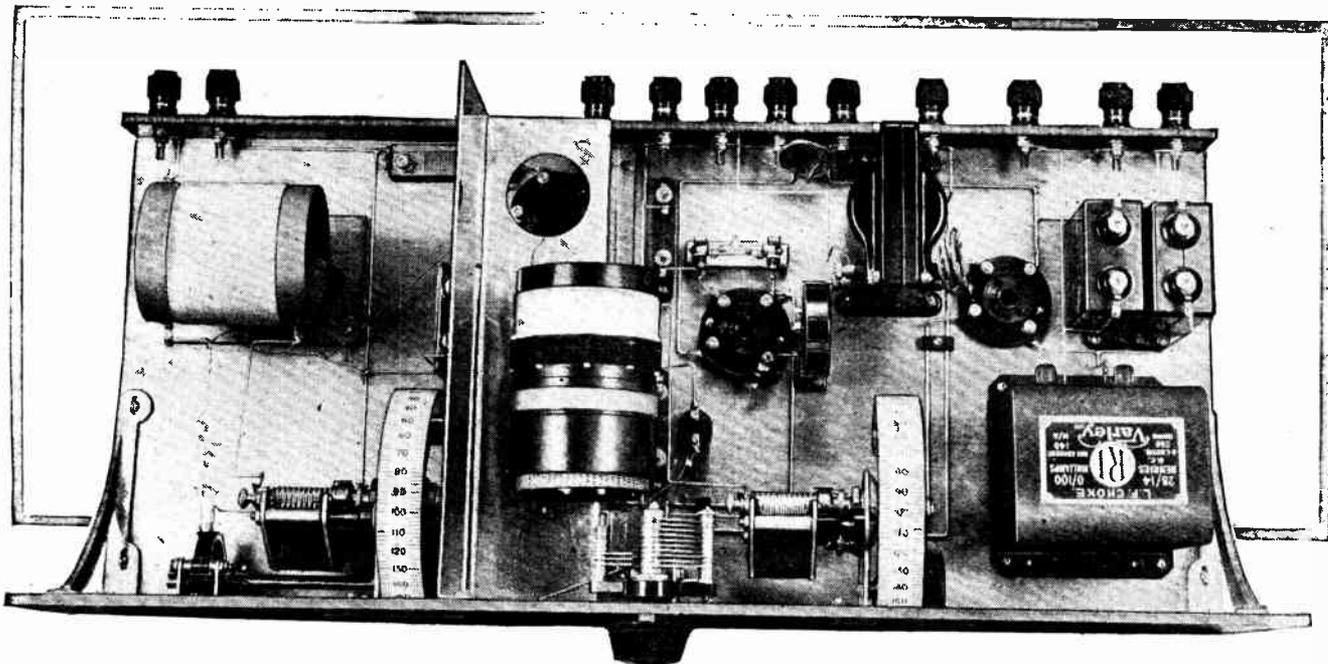
the aerial transformer will fully load the leaky grid detector by passing on to it a potential approaching a volt.

Volume Control and Reaction.

For local station and Daventry reception amplification is modified by the avoidance of reaction, and, in the case of a receiver of this class, by detuning. Increasing the potential applied to the screen grid will, of course, reduce the amplification. For these sufficient reasons a volume control, as such, is not provided. Moreover, if a battery eliminator is used means may be available for critically controlling the screen grid potential and so giving the necessary control of volume.

finishing end of the primary is wound into a cut previously made in one of the pieces of match stem. A good method of terminating the reaction winding is that of laying a thin paring of match under the winding and around which the ends may be looped.

Several plates have been removed from the reaction condenser so that the capacity change shall be as slow as possible while maintaining a sufficient maximum. Actually it is left with three fixed plates without reducing the number of moving plates, and the constructor will probably find that this amount of capacity reduction, too, meets his requirements. See that the plates do not short-circuit as the H.T. battery potential is across them. On the score of economy it was hoped when proportioning the reaction circuit to dispense with the H.F. choke coil, but for uniform reaction effects



Plan view showing the arrangement of the components. For the location of C_{10} see the practical wiring diagram

The capacity-controlled reaction is produced by a fine wire winding at the earth potential end of the transformer windings. It couples with the long-wave coil which exactly fits into the end of the bakelised former. It is most important that the direction of winding adopted shall be exactly as shown in each case and the ends connected up as indicated in the diagrams, avoiding, in particular, a reversal of the loading coil or reaction. The ten pieces of matchstick supporting the transformer primary are held in position with an elastic band before winding. The ends of primary and secondary are terminated by passing in and out through holes pierced in the former and are twisted and soldered together at one end ready for joining to a wire extending from a top contact of the switch. Primary and secondary are in the same direction, that is, from the soldered end the first turn of the primary overlaps the first turn of the secondary both spiraling away in the same direction. The finishing end of the secondary is terminated on a tag, while the

on both long and short waves a choke is required to ensure the circulation of H.F. currents through the reaction coil, while a small bridging condenser is still needed to afford an alternative path and permit of the detector valve functioning correctly when the reaction condenser is at zero.

The L.F. stage is quite orthodox, and makes use of a $3\frac{1}{2}$ to 1 ratio transformer and a choke filter output. Assuming that the leaky grid detector is dealing with a peak voltage of 1, as mentioned earlier, and has over a limited range a linear output, then the peak voltage which will be applied to the P.625 valve is 1 multiplied by the voltage magnification of the valve times the percentage modulation, times the transformer ratio. With 20 per cent. modulation—reaction may reduce this figure—the factors become $30 \times \frac{20}{100} \times 3.5$, which gives 21, or a total voltage swing of 42, thus adequately loading the output valve.

(To be concluded.)

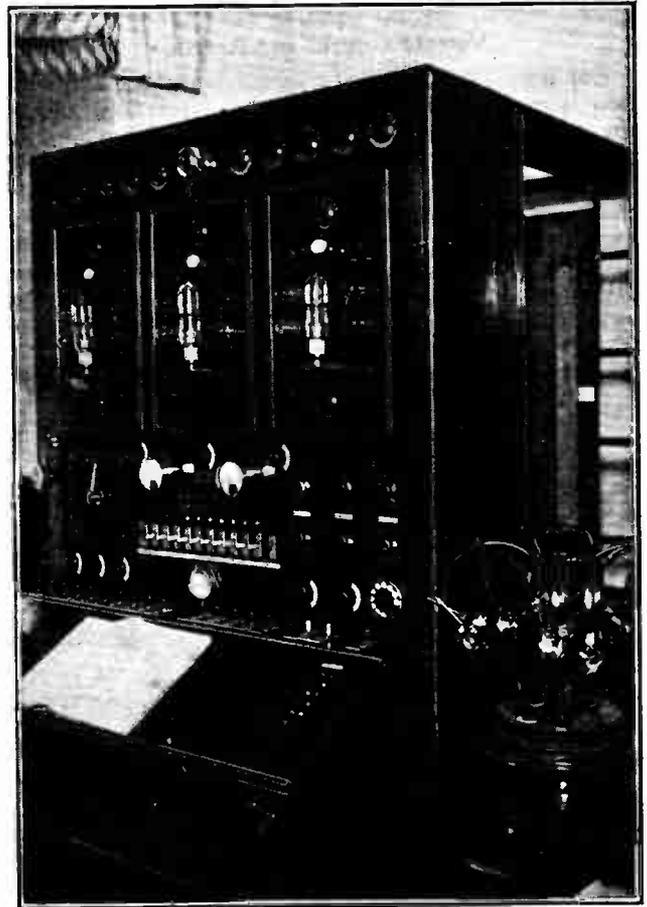
BROADCASTING BY WIRED WIRELESS.

Methods of Distributing Signals to Subscribers' Lines.

(Concluded from page 679 of last week's issue.)

IN the system of wired-wireless broadcasting suggested in the Western Electric Company's patent, programmes from, say, three points are brought into a central main distributing station. From the central distributing station the programmes are relayed to various telephone exchanges and introduced into the subscribers' lines for local distribution or are transmitted over the trunk lines to more distant exchanges. Before entering each distributing centre the currents are amplified in the usual manner, so that the currents on the trunk lines are at normal strength, and sufficient energy is available for supplying all the subscribers' circuits.

Various arrangements capable of being used in the collecting system at the main broadcasting station are illustrated in Fig. 6. Transmission of the programmes originating at the microphones T_1 , T_2 , and T_3 may



Speech amplifier used in connection with distribution over subscribers' telephone lines at a Continental opera house.

take place on ordinary telephonic frequencies or on carrier-wave frequencies. For example, the microphone T_3 is shown transmitting to the main distributing station over the line L_3 at ordinary telephonic frequencies.

Suppression of One Side Band.

At the distributing station M the band of frequencies received from T_3 is modulated by a carrier wave from the valve generator S_3 . The modulator is represented in the figure by M_3 . In the case of the microphone T_2 the modulator M_2 is supplied by carrier frequency wave from S_2 , and, if desired, one of the side-bands produced is suppressed by the band pass filter BF_2 , so that the same total width of band is transmitted by the line L_2 as L_3 . With microphone T_1 the carrier frequency is shown supplied to the line L_1 by a generator S_1 and filter F_1 , installed at the central station, one side-band being suppressed by the filter F_1 . Here the microphone varies the amplitude of the carrier frequency, and combines within itself the functions of an ordinary telephone transmitter and a modulator.

The signals due to the three programmes from T_1 , T_2 , T_3 , after being brought into the central station, are

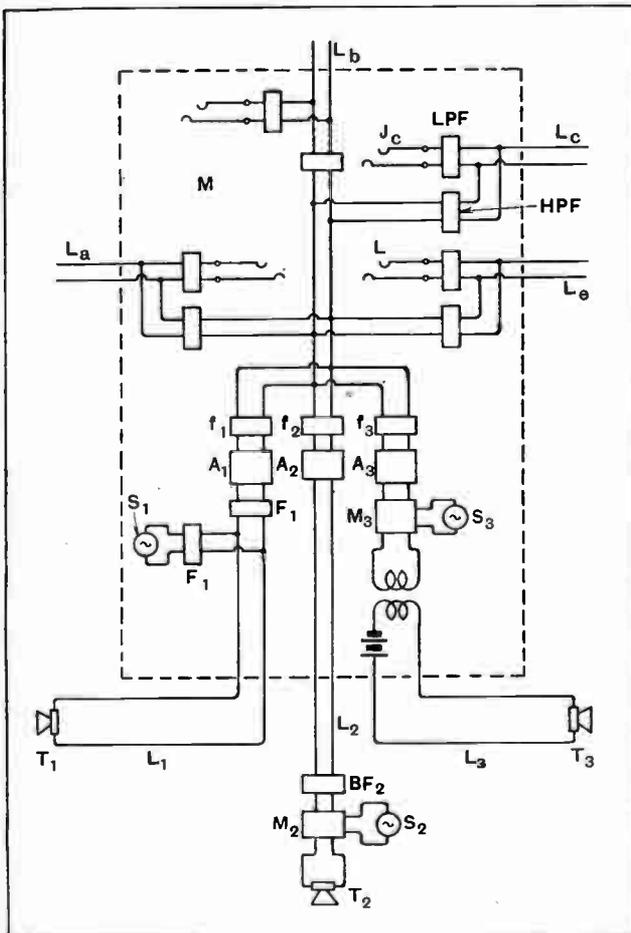


Fig. 6.—The circuit arrangements used in the collecting system at the main broadcasting station.

Broadcasting by Wired Wireless.—

amplified by amplifiers A_1, A_2, A_3 , and are selectively imposed on an outgoing line L by means of the band filters f_1, f_2 , and f_3 . The line L carries the programme to the various local telephone exchanges through lines such as L_a, L_b, L_c , etc. If the central broadcasting distributing station is made part of a telephone exchange, the various lines L_a, L_b, L_c , etc., would be terminated in jacks to allow of interconnection in the usual way. Thus, suppose the line L_c to an outside exchange terminates in a jack J_c , one branch from the line is connected to the broadcasting "bus" line L , through a high pass filter (HPF), and a low pass filter (LPF) is introduced between the jack and this connection. As we have seen already, the high pass filter will allow the carrier frequencies from L to reach the exchange line L_c , but prevents telephonic frequencies from reaching L . Similarly, the low pass filter permits ordinary telephonic frequencies to be transmitted to the jack, but at the same time prevents the carrier frequencies being transmitted to it.

Various means of coupling the lines carrying the programmes to individual subscribers are shown in Fig. 7. In one case the lines included in a cable are connected to the secondaries of a multi-wound transformer, of which the primary is included in the line from the central broadcasting station. Between the transformers and the jacks on the exchange switchboard condensers are inserted across the subscribers' lines. These condensers, if they are of the right value, will short-circuit the high-frequency carrier currents with respect to the jacks, so that if a given circuit is connected to another for ordinary telephony purposes the high-frequency currents carrying the broadcast matter will not be transmitted to the other circuit. Another method of coupling suggested is shown at the top right-hand corner of Fig. 7, and consists in gathering the subscribers' lines into a composite cable made in the form of a coil, which is coupled to a coil carrying the broadcast matter. A modification of this method is shown on the left where leads from a composite coil are bridged across each line. Suitable condensers are introduced in each connection to the coil to prevent short-circuiting the ordi-

nary telephone lines, and chokes are provided instead of condensers to prevent the carrier frequencies reaching the jacks. A further modification is also shown, where conductive instead of inductive connections are provided to the several lines, chokes and condensers being introduced to separate the higher frequency from the lower frequency currents. The simple schemes for using chokes and condensers for separating the currents of various frequencies assume that the carrier frequencies are sufficiently high compared with ordinary telephone frequencies to permit separation by the simple methods described. As we have already seen, this at the present stage of development of wired-wireless is not likely to be the case, and therefore the more complicated and expensive filters of the types already described would have to be used.

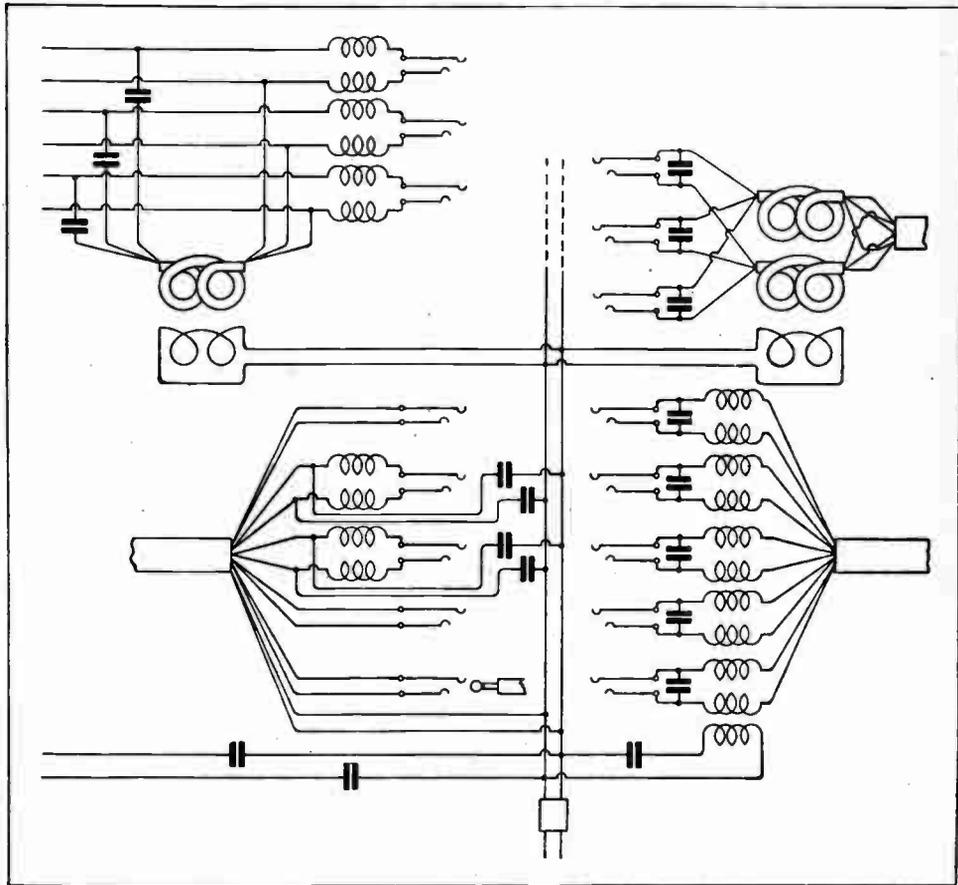


Fig. 7.—Various methods of coupling the lines carrying the programmes to individual subscribers are here shown.

Probably in the case of short-distance subscribers an ordinary separate circuit for the broadcast matter could be provided more economically. As privacy is not required, many subscribers could be included on such a special circuit.

As regards arrangements for the reception of carrier frequencies it is possible to select the frequencies by simple tuning methods provided the range employed is sufficiently wide for discrimination to be obtained in this way. If, on the other hand, the frequency bands

Broadcasting by Wired Wireless.—

used are nearer together, it would be necessary again to employ filters for each class of broadcast matter. In Fig. 8 three band filters, BF_1 , BF_2 , BF_3 , are shown intended for dealing with three broadcast channels.

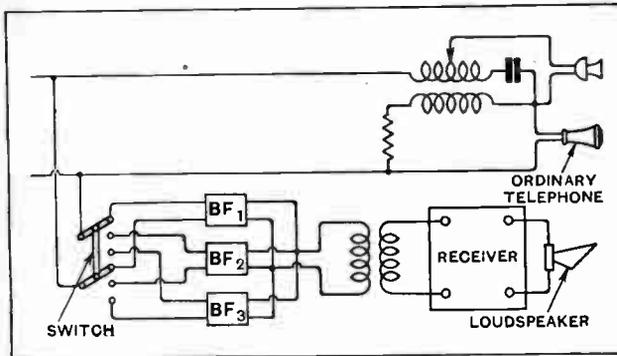


Fig. 8.—A receiver with three band filters intended for dealing with three broadcast channels.

These are coupled by a transformer to an ordinary wireless receiving set with the usual detector and low-frequency amplifier connected to a loud speaker. If only one side-band is transmitted, a valve oscillator would also be necessary to reintroduce the carrier wave eliminated at the transmitting station. In order to prevent the carrier frequencies reaching the subscribers' ordinary telephone transmitter, receiver, and ringing arrangements, a low pass filter is introduced.

Using the Power Mains.

Many of the complicated and expensive filters necessary for the introduction of carrier-wave broadcasting on to a telephone system are unnecessary if a power or lighting system is used for the wire network. The same transmission arrangements from the central broadcasting station to the power system can be used—suitable condensers being introduced to prevent the lighting currents interfering with the carrier currents. The apparatus associated at the receiving end with an ordinary alternating current lighting system is shown in Fig. 9. In this figure T is the usual step-down transformer, B is a cut-out box, and C the house-meter. An ordinary power load of lamps is shown on the right of the figure. The broadcast receiver is connected between C and B, and, as before, three band pass filters (BF_1 , BF_2 , BF_3) are employed. The necessary filament and high-tension

current for the receiver can, of course, be obtained from the mains, if desired, in the ordinary way. As the sub-station transformer T is designed for low-frequency currents it may be necessary to bridge the windings by condensers C_1 , C_2 , but probably the self-capacity of the windings would provide a path for the high frequency. The inductance of the coils of the meter C would also probably be sufficient to prevent high-frequency currents reaching the lighting load circuits.

As already stated, very few experiments have been made with wired-wireless broadcasting, and little has yet been done with multi-plex carrier-wave telephony over cables as distinct from overhead lines. Cables introduce a considerable transmission loss, especially with higher frequencies. They also introduce large irregularities in the impedance characteristics of the line which affect the amount of amplification necessary for efficient working.

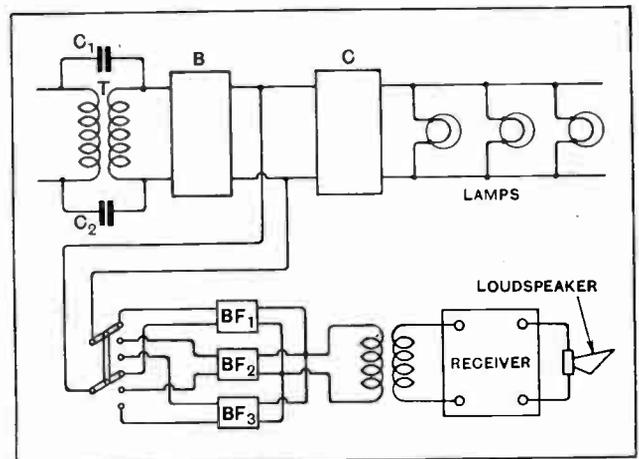


Fig. 9.—When an ordinary alternating current lighting system is employed the associated apparatus that has to be installed for reception is shown in this diagram.

The limitation of the frequencies which can be employed at present for wired-wireless without interference with ordinary wireless communications also presents a difficulty to be overcome. With the little practical experience available it is impossible to say that wired-wireless is likely to become at present a feasible adjunct to ordinary broadcasting, but the overcrowded state of the ether and the increasing demands upon it may, in the future, cause energy to be directed to any means by which the amount of broadcast matter can be increased. O. F. B.

Anoly Products, Eton Works, East Dulwich, London, S.E.22. Illustrated leaflet giving characteristic curves of the new L.S.680 output valve with a mutual conductance of 3mA./volt and maximum dissipation of 10 watts.

Elmesan (London), Ltd., 66, Victoria Street, London, S.W.1. Illustrated leaflets describing "Meta" solid fuel for heating soldering irons.

A. F. Bulgin & Co., 9-10-11, Cursitor Street, Chancery Lane, London, E.C.4. Illustrated 54-page catalogue of "Deck-orem" components, including a manual for home constructors.

**CATALOGUES
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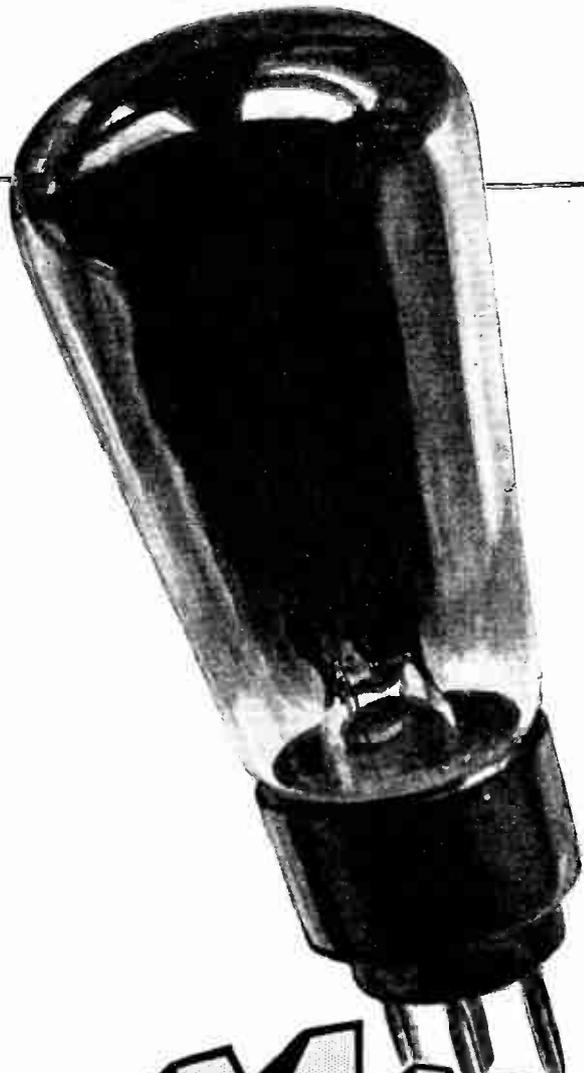
Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2. Illustrated leaflet describing the Philips Type 2007 loud speaker.

Baker's Sellhurst Radio, 89, Sellhurst Road, South Norwood, London, S.E.25. "A New Hobby for Wireless Enthusiasts and Experimenters," an illustrated catalogue of moving-coil loud speaker parts.

Lisenin Wireless Co., Connaught House, 1a, Edgware Road, London, W.2. Illustrated 16-page catalogue of terminals and other components.

Ormond Engineering Co., Ltd., 199-205, Pentonville Road, King's Cross, London, N.1. Complete illustrated catalogue for 1929 containing full particulars of Ormond condensers, receivers, and wireless components.

The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17. Leaflet No. 1032, describing Benjamin radio products for 1928-29.



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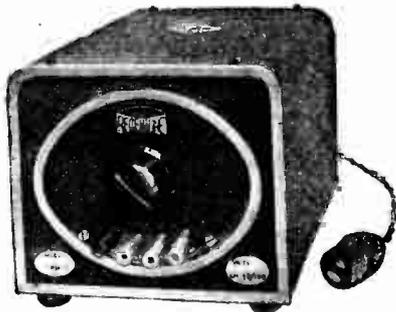


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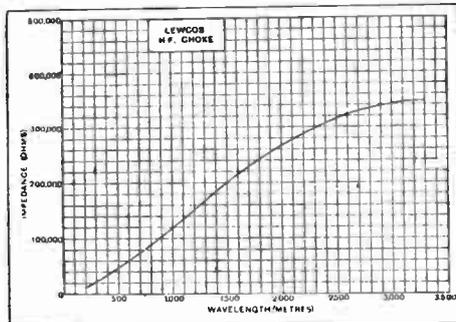
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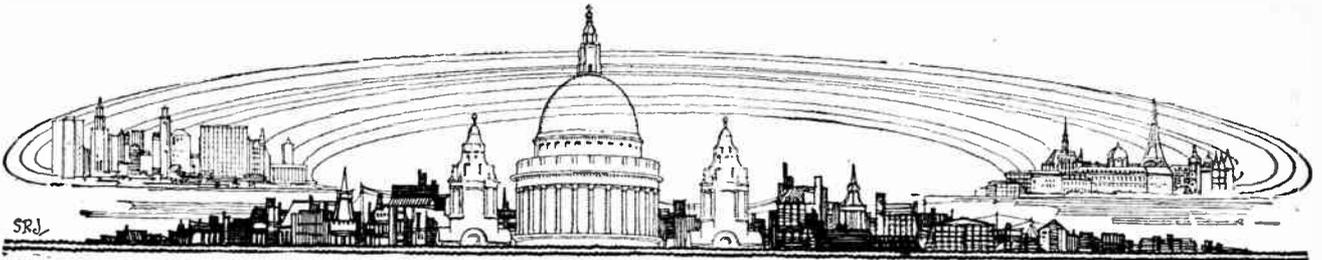


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CURRENT TOPICS

Events of the Week in Brief Review.

MAGNETIC WIRELESS.

The Tavistock Board of Guardians has opposed the introduction of wireless into the casual ward of the local institution because it might attract too many "casuals."

o o o o

AMERICA'S WIRELESS FAMILY.

According to the National Broadcasting Company of America, there are now 9,640,348 families in the United States using wireless receivers. The total audience is estimated to be 41,453,496.

o o o o

MAN-MADE STATIC.

Listeners who are troubled by electrical interference in their neighbourhood will be interested in an important decision given in a Dresden court last week, when it was held that sufferers from disturbance of this kind are entitled to take legal action to restrain the nuisance.

Legislation against electrical interference with wireless reception is long overdue in this country. Candidates for the next Parliament would do well to note this fact when preparing their election addresses.

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ANTARCTIC SEARCH FOR BLIND SPOTS.

A special type of oscillograph known as the "osiso," is about to be used by the Byrd Antarctic expedition in an endeavour to secure data regarding radio blind spots in Polar regions, says a New York message. The "osiso," which is stated to be capable of registering time variations almost to a millionth of a second, will be employed in tests to determine the time taken by a wireless signal to return to earth after reflection from the Heaviside Layer. Attempts will be made to confirm the theory that the Layer touches or approaches the earth at the North and South Poles.

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A GOOD LOAD.

Nearly 500 pairs of headphones and six loud speakers are operated from a new wireless set installed in Deptford Hospital.

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ONLY A TECHNICAL OFFENCE.

Major W. O. Prichard, of Brampton Brian, summoned for operating a crystal set without a licence, informed the Wigmore Bench that the omission was entirely due to an oversight on his part. The

aerial was connected to the front of his house, which adjoined the post office, and he contended that the post office staff should have sent him notice that a licence fee was due. Mr. Morris (for the post office) said that if defendant had taken out one licence he would have received an intimation when it expired.

The Justices held that a technical offence had been committed and imposed a fine of one shilling.

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WIRELESS ON TRAINS.

Passengers on certain trains on the Hungarian State Railways now find on each seat a hygienically sealed wrapper containing headphones. For a fee of 6d.



WIRELESS FEVER IN FRANCE. The recent Paris radio show has stimulated popular interest in broadcast reception. The photograph, taken in Paris a few days ago, shows an advertisement model of a well-known set.

an hour they can listen to programmes from the nearest broadcasting station.

During a recent test on the Budapest-Vienna express excellent reception was obtained throughout the run. The popularity of this innovation has been such that the railway authorities have decided to instal wireless receivers on as many trains as possible.

At one time it was believed that British railways might adopt a similar means of relieving the tedium of long journeys. The belief has now been successfully stamped out.

WIRELESS ON THE "VESTRIS."

The three wireless operators on board the *Vestris*, which foundered off the coast of America last week, worthily upheld the traditions of the wireless service. At the time of going to press it is greatly feared that the senior operator, Mr. Michael Joseph O'Loughlin, has lost his life; Messrs. Macdonald and Verchere, second and third operators respectively, have been saved.

Reports from New York state that the wireless gear was in operation for three hours on the main plant, and that the emergency plant was in use almost up to the time when the ship sank. The apparatus consisted of a Marconi 1½-k.W. set with emergency gear, a C.W. long-wave transmitter for special service, and a valve receiver.

The saving of 200 lives from the ill fated vessel can be directly attributed to the heroic operators and their installation.

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A POWERFUL BEAST.

"Two valve receivers incorporating the Loewe double-grid two-stage valve 2 h.p. will also be available. . ."—*The Sphere*.

A reader claims that he will improve on this when he builds his 40 h.p. o.h.v. super-het

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NEW CALL SIGNS IN "S.A."

As from January 1st next, writes a Bloemfontein correspondent, the call signs of the three broadcasting stations in the Union of South Africa will be as follows:—Capetown, ZTC; Johannesburg ZTJ; Durham, ZTD.

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MAINS TRANSFORMER DESIGN.

Owing to an unfortunate drafting error, the ordinates on the graph shown in Fig. 4 on page 630 of our issue of November 7th last show an unduly high loss for "Stalloy" transformer iron. The units for "Watts lost per lb" should be divided by 6.45 to give the correct iron loss.

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NEXT YEAR'S R.A.F. DISPLAY.

The Air Ministry announces that the tenth Royal Air Force Display will be held at Hendon aerodrome on Saturday, July 13th, 1929. The International Aerc Exhibition will open at Olympia on July 16th.

TRANSMITTERS' NOTES AND QUERIES.

New Signal-Strength Code.

There seems to be considerable divergence of opinion on the comparative merits of the "R" code to which we have become accustomed, and the new code which will supersede it when the new international regulations come into force. The "R" code deals mainly with the strength of signals after they have become clear and readable, whereas the new code will subdivide the weak or otherwise illegible signals into more classes. This seems the better plan, as, after all, when once a signal becomes "very good, perfectly readable," it is only a question of amplification whether its actual strength is R5 or R9. The present, not uncommon, practice of reporting strength as R5/R7 without specifying the type of receiver or the degree of amplification is of no value for comparison. Perhaps the most convenient method would be for amateurs to agree on some code indicating the receiver used, the number of valves employed, and the ultimate strength of the signals received. This, however, would be no easy matter if accurate and standardised comparison is to be achieved, as so many factors must be taken into account, such as the size and height of the aerial and the particular circuit used.

The new code is, in fact, more concerned with readability than strength, and signals which might be reported "R6" under the old code could easily be only "3"—"readable but with difficulty"—if atmospherics were bad.

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Nationality Prefixes.

We do not yet know what changes will be made in the nationality prefixes of some foreign countries in order to conform with Article 14 of the regulations, which specifies that private experimental stations shall use "the letter or letters indicating the nationality, and a single figure followed by a group of not more than three letters." England, France, Italy, and Norway will be unaffected, excepted for dropping the Continental "E," as they will have the unfettered use of "G," "F," "I," and "LA" respectively. Spain, we believe, will continue to use EAR, but may have to modify the distinguishing figures, though we feel sure she will certainly be loth to give up EAR 14, which, by a graceful act, has been reserved perpetually in memory of the late Senor Alfredo Liano.

The matter is, we understand, still under discussion in Sweden, and it is probable that the old call letters will be retained, but with the insertion of a figure after the "SM" to denote the geographical district. Germany will be no longer able to use "K," while Belgium, Denmark, Finland, and several other European countries will have to relinquish the prefixes to which they have become accustomed.

"Or Other Approved Type."

The question of wavemeters for use by transmitters under the new regulations is still somewhat undecided. The laboratory type of crystal-controlled wavemeter is expensive, and there appears some considerable doubt what "other approved type" will satisfy the Postmaster-General. Those answers which we have seen to direct enquiries addressed to the Post Office are either negative and intimate the wavemeter that may *not* be used, or they are discouraging; for example: "Where an experimenter has access to a wavemeter of the multi-vibrator type this will be considered satisfactory." It is not every amateur who is fortunate enough to have access to a costly standard wavemeter.

We understand that the R.S.G.B. is taking up the matter and is issuing a circular to its transmitting members showing how a comparatively inexpensive crystal oscillator can be made to check their wavemeters.

Club News.

Field Days in Pictures.

Films showing field days held in 1926 and 1928 were the chief items of interest at a recent meeting of the Newcastle-upon-Tyne Radio Society, at which Mr. W. R. Pope, the chairman, gave an expert demonstration of amateur cinematography.

Hon. Secretary: Mr. W. W. Pope, 7, Kimberley Gardens, Jesmond, Newcastle-on-Tyne.

FORTHCOMING EVENTS.

WEDNESDAY, NOVEMBER 21st.

North Middlesex Radio Society. At 8 p.m. At St. Paul's Institute, Winchmore Hill. Discussion on "Selectivity."
Tottenham Wireless Society. At 8 p.m. 10, Bruce Grove, N.19. Lecture: "Picture Broad-casting," by Mr. F. H. Haynes, Asst. Editor of "The Wireless World."
Muswell Hill and District Radio Society. At 8 p.m. At Tollington School, Tetherdown, N.10. Demonstration by Messrs. Celestion Radio Co.
Edinburgh and District Radio Society. At 8 p.m. At 117, George Street. "Loud Speakers."

THURSDAY, NOVEMBER 22nd.

Lepton and Leytonstone Radio Society. At 8 p.m. At Grove House, High Road, Lepton. Discussion: "H.F. versus Detector with Reaction."

MONDAY, NOVEMBER 26th.

Newcastle-upon-Tyne Radio Society. At 7.30 p.m. At 11, Saville Row. Lecture by Mr. A. E. Dees (of Messrs. S. G. Brown, Ltd.).
Hullonby Radio Society.—At 7.30 p.m. At Hullonby County Secondary School, Hilldrop Road, N.7. "Dubilier Condensers."
Hackney Radio and Physical Society.—At 8 p.m. At the Electricity Show-rooms, Lower Clapton Road E.5. "Junk Sale."

Amplion "Lion" Demonstrated.

The new Amplion "Lion" loud speaker was dealt with in a lecture and demonstration given to Mr. P. K. Turner, of Messrs. Graham Amplion, Ltd., at the meeting of the Muswell Hill and District Radio Society on November 7th. After indicating faults inherent in the ordinary reed-driven type of instrument, Mr. Turner explained in detail the ingenious manner in which these defects had been obviated in the "Lion."

Hon. Secretary: Mr. G. S. Sessions, 20, Gras-nere Road, N.10.

Wireless Progress and the War.

At the meeting of the Bristol and District Radio Society held on Friday, October 26th, Mr. H. de A. Donisthorpe, of the General Electric Co., Ltd., lectured on "Radio Progress and the Effect on Thermionic Valves." The lecturer pointed out that the War was responsible to a very large extent for the rapid progress made during the last fourteen years. Enumerating some of the present day applications of the thermionic valve, the lecturer mentioned automatic fog signalling apparatus, the Faltograph, Noctovision, Television, and Phonofilm.

"The Manufacture, Care and Maintenance of Accumulators" was the title of a comprehensive lecture given by Mr. H. C. Mayer, of Messrs. Joseph Lucas, Ltd., at a meeting of the Society on November 2nd. At the conclusion of the lecture, Mr. Mayer prescuted an H.M.G. high tension accumulator for ballot among the members.

Hon. Secretary: Mr. S. J. Hurley, Arno's Vale, Bristol.

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400 Per Cent. Membership Gain.

November 1st marked the commencement of the new session of Slade Radio (Birmingham). Meetings are held in the Parochial Hall, Broomfield Road, Erdington, and an attractive programme has been prepared for the coming winter. The membership of the Society now numbers ninety, showing an increase of about 400 per cent. this year. It is expected that there will be a considerable influx of new members in the near future. The Society has opened a new experimental station.

Hon. Secretary: Mr. H. Crows, 52, St. Thomas Road, Erdington, Birmingham.

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The Diode Rectifier.

Mr. F. E. T. Clark lectured on the "Diode Rectifier" at a meeting of the South Croydon and District Radio Society on November 6th. The lecturer stressed the advantages of this system of rectification, particularly in purity of reception obtained from it. The characteristics of the rectifier were illustrated clearly on the blackboard. In the following discussion some contention arose regarding the question whether the loss of volume entailed was outweighed by the rectification properties of the valve.

Hon. Secretary: Mr. E. L. Cumbers, 14, Cumpden Road, South Croydon.

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Transmission and Reception Demonstrated.

A demonstration of short-wave transmission and reception provided an interesting evening for members of the Kentish Town and District Radio Society at the last meeting. An attractive programme has been arranged for the winter season, and new members will be cordially welcomed. Meetings are held every Friday at 8 p.m. at the Carlton Road Schools, Kentish Town. Communications should be addressed to the Hon. Secretary, Mr. A. H. Sartain, at the above address.

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An Evening of "Lecturettettes."

"Lecturette Night" proved a popular feature at the last meeting of the North Middlesex Radio Society. The subject chosen was "My Own Set." The first speaker, Mr. Tagent, described a four-stage rectifier he had constructed on the "Unit" system, comprising (1) H.F. panel, (2) d-tector stage, (3) and (4) resistance and transformer L.F. stages respectively. Mr. H. A. Green followed with a description of his three-valve receiver, embodying the "Schnell" circuit. Mr. R. Kirlow then gave details of a Quartz-crystal oscillator he was constructing and gave a short account of the method of arriving at suitable circuit values and of the way in which the crystal controlled the frequency of the circuit. This was particularly interesting in view of the fact that the Postmaster-General now requires all transmitters to be equipped with a crystal-controlled wavemeter.

Hon. Secretary: Mr. E. H. Laister, "Endcliffe," Station Road, N.21.

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A Good Year.

At the annual general meeting of the South Woodford and District Radio Society it was reported that at the Society's meetings during the year more than thirty talks and demonstrations had been given. The retiring officers were re-elected *nem. con.*, with Mr. J. E. Nickless (2KT) as president.

Hon. Secretary: Mr. E. J. Turbfield, 48, Alexandra Road, South Woodford, E.18.



Ballot Result

Wireless World

OLYMPIA SHOW COMPETITION

A Review of the Apparatus which gained first place in its respective class in our Olympia Show Competition Ballot.

THE result of the Ballot in *The Wireless World* Olympia Show Competition has already been announced in our issue of November 7th. The purpose of the competition was to ascertain what were the best products in various classes exhibited at the Olympia Show, as decided by voting.

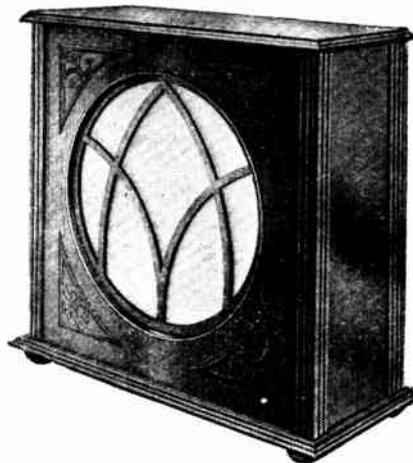
As a reminder to our readers, we repeat that in the Ballot we divided the apparatus into seven separate classes, and also invited entrants to vote for what they considered to be the outstanding single exhibit at the Show. The definitions given to the various classes were as follows:—

- (1) Complete receivers of five valves or more; that is to say, receivers exclusive of loud speaker and batteries, unless these should happen to be incorporated as a part of the receiver.
- (2) Complete receivers or amplifiers of four valves or less, similarly defined.
- (3) Batteries of all kinds, including accumulators for both high tension and low tension.
- (4) Mains supply units, both D.C. and A.C., and including those which provide filament heating circuits.
- (5) Loud speakers of all types.
- (6) Valves.
- (7) Other component parts, including transformers, fixed and variable condensers, tuning coils, valveholders, resistances, aerial equipment, etc., etc.

In the pages which follow we are illustrating and describing the apparatus which has won first place in its particular class, and we also give a brief reference to the works which have been responsible for the production of the prize-winning receivers and components.

AMPLION "LION" LOUD SPEAKER. (Outstanding Single Exhibit and Class 5.)

During the past year reed-driven cone loud speakers have been somewhat eclipsed by the amazing advance of the moving coil loud speaker. In spite of the admitted disadvantage of the latter type in that a generous current supply is required to energise the field magnet, it has succeeded because it satisfies the modern demand for superlative quality of reproduction. Previous to the opening of the Radio Exhibition in September that demand was not completely satisfied by the reed-driven cone, not, as we now know, because of any inherent disability in the principle of the reed drive,



The Amplion "Lion" loud speaker in type LC41M cabinet.

but because manufacturers had neglected to apply to the design of this type of speaker the scientific methods which

have brought the moving coil to its present state of development.

Messrs. Graham Amplion, Ltd., are to be congratulated on having staged a brilliant "come back" for the reed-driven cone. The achievement is especially noteworthy in that the recovery of lost ground has been made in one leap, whereas the advance of the moving coil speaker was made in small steps.

The thoroughness with which the minutest details have been investigated in designing the "Lion" loud speaker will be fully appreciated when it is pointed out that the following qualities have been separately investigated and achieved in the finished product:—

(1) Displacement of the diaphragm for a given frequency is proportional to the current in the coils instead of being proportional to the square of the current as in the ordinary type of reed movement.

(2) At low frequencies, where the amplitude for a given current is greater than at high frequencies the efficiency of the diaphragm is reduced by circulation of the air round the edges of the cone and the load on the reed is also increased. This is compensated for by a flexible reed which gives a greater amplitude for a given current when the load reaches a given value; normally the reed acts as a rigid unit and the flexibility plays a part only on the lowest frequencies.

(3) Loss of sound-radiating efficiency on the highest notes due to nodal points in the diaphragm is overcome by a careful choice of the angle and material of the cone and by stiffening the centre of the cone over a calculated area.

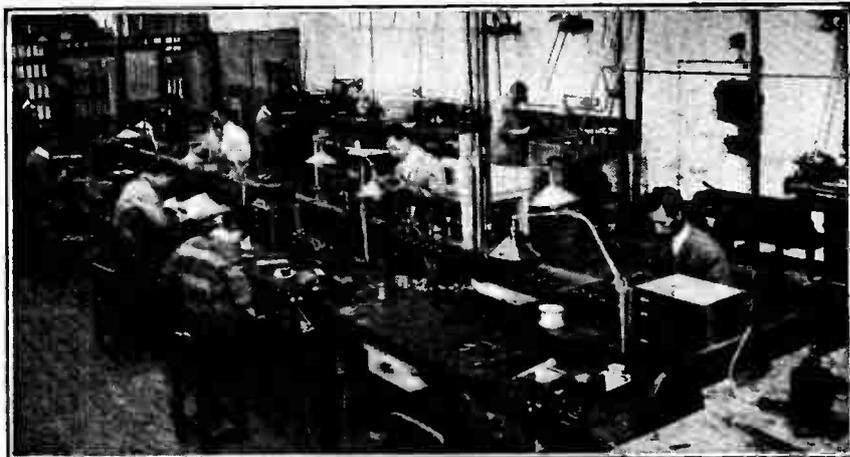
(4) For a given current the amplitude of the reed is inversely propor-

Ballot Result.—

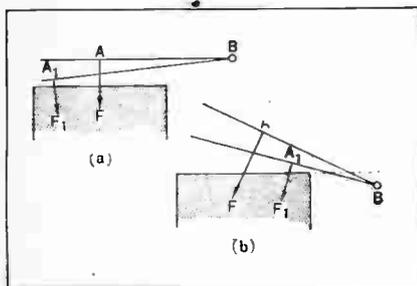
tional to the frequency, and there is a wide difference in amplitude between the lowest and highest notes. The peculiar form of construction adopted in the movement allows ample clearance for the development of the full amplitude in low notes without reducing the efficiency for the small amplitudes of the high notes.

(5) The quality of good "attack" is achieved by arranging for a slight "give" between the reed and the cone.

All the above factors are, of course, vital to perfect reproduction, but the arrangement of the reed and magnets by means of which the amplitude is kept proportional to the current at any given frequency is perhaps the most important and fundamental. In the old type of reed movement shown diagrammatically at (a) in the accompanying sketch not only is the force acting on the reed increased as the reed approaches



The experimental workshop attached to the Amplion laboratories.



Diagrammatic comparison between the relative positions of the reed and pole piece (a) in the conventional reed drive, and (b) in the Amplion "Lion" movement.

the magnets, but the point of application is moved to the left and the moment of the force about the point B is still further increased ($F_1 \times A_1 B > F \times AB$). In the "Lion" movement, (b) in the sketch, as the reed approaches the magnet the point of application of the

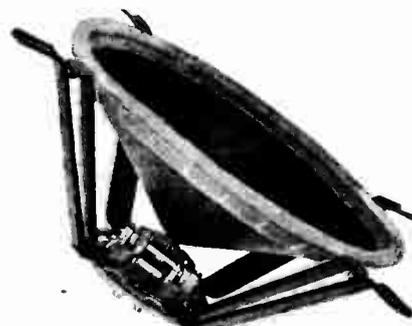
force is brought nearer to B and the moment of the force about B is kept constant ($F_1 \times A_1 B = F \times AB$). The incorporation of this principle in a practical design calls, of course, for elaborate calculation, and is by no means as simple as the foregoing explanation would lead one to suppose; in the actual instrument the relative positions of the various parts have to be machined and assembled to an outside limit of $\frac{1}{1000}$ in. For fuller information on these points the reader is referred to the Amplion booklet, WL 37, "Notes on the New Amplion Speaker."

Those who have had an opportunity of hearing the "Lion" during the Show week or subsequently will agree that its position at the head of the voting is well merited, for it gives "moving coil" quality without any of the drawbacks of the moving coil loud speaker, and, although extremely sensitive, will handle the output from a 20-watt amplifier without any trace of chattering.

The D.C. resistance of the winding is 650 ohms and the A.C. impedance at a few typical frequencies is as follows:—

Frequency.	Impedance (ohms).
250	1,500
800	3,500
1,000	4,000
2,000	6,500

A valve having an A.C. resistance of 4,000 ohms or less will give excellent results with the smaller cone. It is desirable to use a choke-capacity feed circuit (20 henrys and 2 to 4 mfd), but the loud speaker can be connected directly in the anode circuit provided the steady current through the windings does not exceed 30

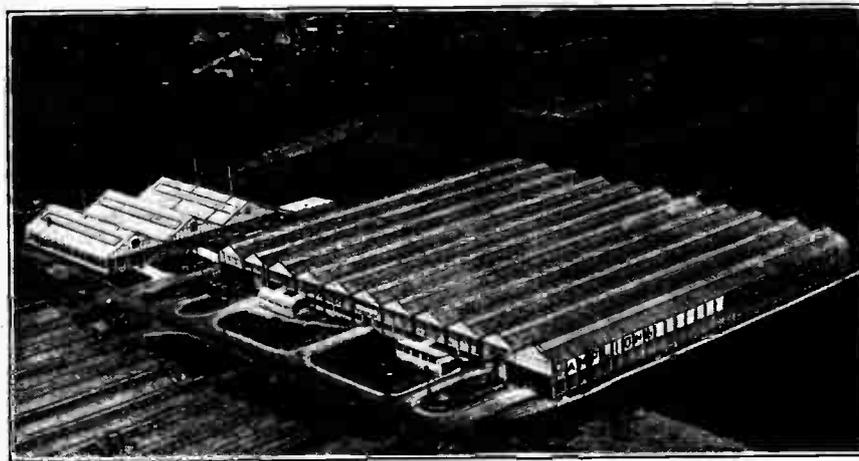


Amplion "Lion" chassis ready for assembling in a cabinet or mounting on a baffle. The cone is supported by the inner spiders on an aluminium ring lined with cotton wool.

or at the most 40 mA. With a pentode output valve a step-down output transformer having a ratio of 4 or 6 to 1 is desirable.

The Amplion "Lion" loud speaker is, we believe, the first new product to emanate from the new works acquired by Graham Amplion, Ltd., at Slough, a district which is rapidly growing in importance as an industrial centre and where the works of several wireless concerns are domiciled.

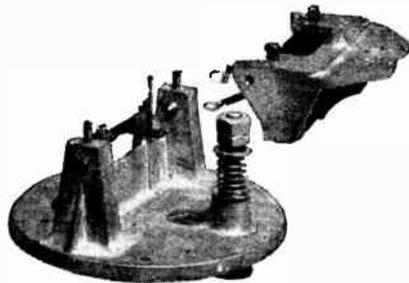
The Amplion works occupy some 140,000 square feet, all housed under one roof, and separated by the width of a road from another block of buildings of 25,000 square feet area, which comprises the offices. The establishment of the



A general view of the new Amplion works at Slough, taken from the air.

Ballot Result.—

works on this site has provided the opportunity for arranging that everything shall be right up to date, and the very most has been made of this opportunity. The works consist of a rectangular building of eleven bays, constructed of steel and reinforced concrete, and the aerial photograph which we reproduce gives a very good impression of the whole. Special attention has been given to the layout of the works, so that every process in manufacture can follow a logical sequence, with the minimum of loss of time in passing on from one stage of production to the next. A fully equipped research and experimental laboratory is a feature of the works, and, in addition to



Ampilon "Lion" movement with magnet cradle removed from the pivots.

general offices, the block of buildings separated from the works also houses a most up-to-date drawing office, experimental workshop, which is at the service of the laboratory staff, and an excellent demonstration room which has been so designed that various acoustic effects can be obtained.

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**MARCONIPHONE MODEL 53
PORTABLE.**

(Class 1.)

The choice of a portable set in the five-valve class is significant. With modern

valves sufficient sensitivity is obtained with three or at the most four valves when using an outside aerial, and five valves would appear to be justified only when using a short indoor aerial or a frame. If satisfactory signal strength can be obtained with a frame it is only logical to build the set in portable form, since its range of utility is thereby enormously increased.

The Marconiphone portable is typical of the general trend towards the use of two aperiodic H.F. stages, a practice which has firmly established itself on account of the inherent simplicity of operation. Portable sets with screened grid valves were much in evidence at the Show, but it will be some time before they oust the aperiodic 2-H.F. amplifier. In the Marconiphone set aperiodic transformers are used in place of the more usual H.F. choke couplings. Separate pairs of transformers are used for long and short waves, and the connections are changed over by means of a long barrel switch operated by a recessed control in the side of the case. This switch also brings into the frame circuit a loading coil on long waves.

The two low-frequency amplifiers following the detector are transformer coupled. A Marconiphone "Ideal" transformer (ratio 2.7 to 1) follows the detector, which is a high-magnification valve, but the transformer between the first L.F. and output valves is of smaller dimensions. H.L.210 valves are used for both H.F. stages and also for the first L.F.; the detector is a D.E.H.210, and the output valve a D.E.P.215.

The sensitivity of the receiver is good, and there is little difficulty in picking up foreign transmission in day-time on the long waves and at night-time on medium waves. The selectivity is particularly good, and with the additional advantage of the directive properties of the frame aerial, alternative programmes can be received when only 2 miles from a main station.

The loud speaker is a modified form of

the well-known Marconiphone reed-driven cone, and gives excellent quality up to the maximum output of the D.E.P.215 output valve. The movement is adjustable, and its sensitivity makes the most of the output from the set on long-distance transmissions.

The cabinet is well proportioned and is easy to carry. It weighs 30lb. complete with batteries, and the overall dimen-



The edgewise drum tuning dials set in the narrow white panel give a distinctive appearance to the Marconiphone Model 53 portable.

sions are 18in. x 16½in. x 7½in. Few portables have a more attractive appearance than the Model 53. The edgewise drum dials set in a narrow white panel give the receiver a distinctive appearance which has attracted very favourable notice.

The Marconiphone Model 53, therefore, fulfils all the requirements of a portable receiver—sensitivity and selectivity, sound workmanship and reliability, and a neat and attractive appearance.



The Sterling works at Dagenham where Marconiphone apparatus is produced.

Ballot Result.—

Marconiphone receiving apparatus is manufactured at the Sterling Works at Dagenham. The premises cover an area of rather more than 12 acres, and over 3,000 employees are engaged in the production of wireless and telephone apparatus. Everything is developed from the state of raw material, including the construction of all cabinet work required, both for the wireless and telephone equipments. As an example, every detail in the manufacture of a pair of

reaches the packing department, where it is prepared for transit with the necessary instruction book for the guidance of the eventual purchaser.

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GECOPHONE "VICTOR 3."
(Class 2.)

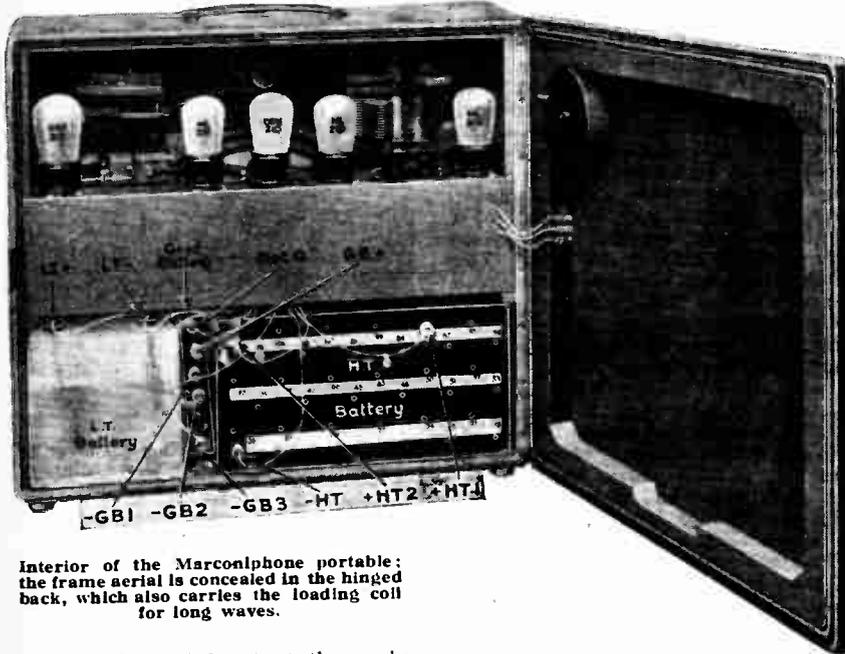
The typical British wireless receiver is an aggregate of highly finished units, any one of which could be boxed in an attractive carton and sold as a separate component. For instance, intervalve

with instructions for wiring engraved on the bakelite, are to be found *already wired up* and out of sight underneath panels. Apart from the extra cost, the space occupied by this redundant material frequently enforces a layout which is inimical to the attainment of maximum efficiency from the circuit employed, and the finished receiver is so large and conspicuous that it must be housed in an expensive piece of furniture before it can be installed in a drawing-room.

A breakaway from this policy of building sets with parts designed with an eye on the component market has already been made, notably in America, Holland, and Germany. A typical example was reviewed in this journal as far back as June 15th, 1927, when it was pointed out that British manufacturers would have to pay more attention to the design of sets for mass production and to give up the component assembling policy if they were to retain a prominent place in home as well as foreign markets.

In the "Victor 3" we have an excellent example of this new attitude towards set manufacture. With the possible exception of the condensers, there is no component which could be removed from the set and sold separately for incorporation in other receivers. Every part, down to the smallest connection, has been designed solely for the "Victor 3." The result is an instrument measuring only 9½ in. x 5 in. x 7½ in., with an interior looking more like an alarm clock than a wireless set, but with a performance quite equal to that of the best three-valve set in a 21 in. x 8 in. x 8 in. cabinet.

The circuit comprises a Reinartz type tuner with capacity-controlled reaction and three wave ranges operated by a sliding switch on the front of the case. Series aerial condensers with alternative sockets for the aerial give three degrees of selectivity. The leaky grid detector is followed by two resistance-coupled

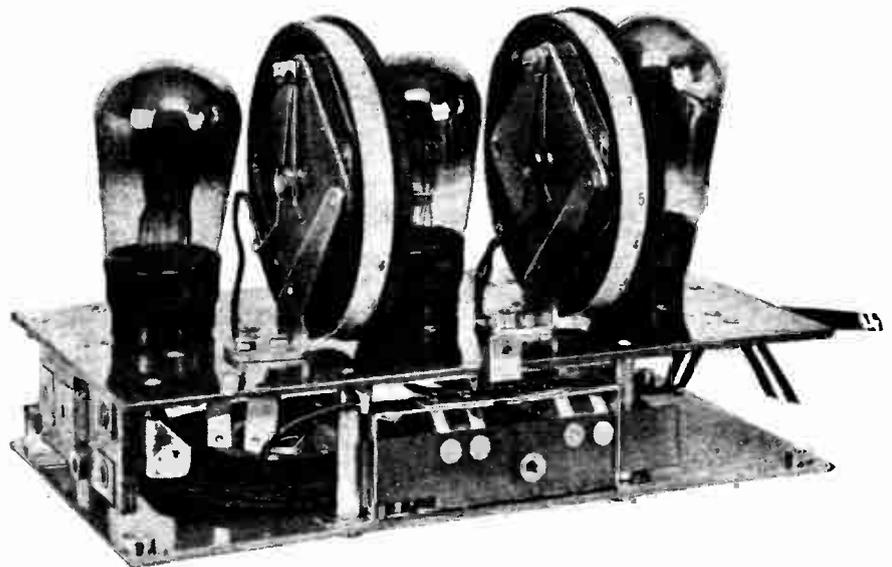


Interior of the Marconiphone portable; the frame aerial is concealed in the hinged back, which also carries the loading coil for long waves.

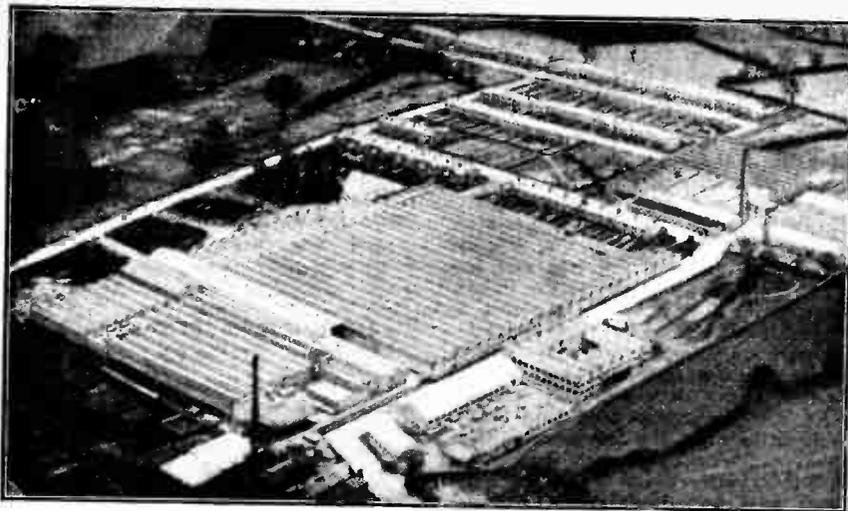
telephones is carried out at the works, even including the moulded telephone earpieces, which are produced in company with moulded knobs, dials, and panels.

In the production of wireless receivers the first stage takes shape in the design section, where many different models of the same circuit may be constructed before the final layout is decided upon. The approved model then makes its way to the drawing office, where it is taken apart and each individual item drawn in detail. At the same time, each item is priced and the cost of assembly estimated; the cost having been settled and the drawings completed, the latter are now distributed to the various shops concerned, where the component items are made. As soon as a sufficient number of sets of parts have been supplied to the stores, the work of assembly commences. In general, the assembly is carried out in two or more sections. Taking as an instance the portable receiver, the frame aerial and cabinet are completed in one shop and the actual circuit chassis in another; this chassis, provided it passes a preliminary test, is then fitted into the cabinet, after which it passes through the final works test, which consists of testing it out on broadcasting, and calibrating it for a number of stations. Next the receiver

transformers complete with nickelled terminals and polished cases, and resistance-capacity coupling units in moulded bases



The "Victor 3" removed from its cabinet; note the compact tuning condensers which are mounted inside their drum dials.



Aerial view of the G.E.C. Telephone Works, Stoke, near Coventry.

L.F. stages, the last valve feeding direct into the loud speaker. The tuning and reaction condensers are extremely neat and are entirely self-contained within the drum dials. The use of a solid dielectric between the vanes is responsible for the compact design; the condensers are delightfully smooth in operation and are quite noiseless. The condensers and the valves are the only visible components inside the case; the remainder of the circuit is situated between two parallel

loud speaker. On the long waves Radio Paris and at least two other stations can be received clear of 5XX.

The "Victor 3" may do for wireless reception what the Morris-Cowley did for motoring, and its progress will be watched with interest by the wireless industry as a whole.

The birthplace of the "Victor 3" is the General Electric Co.'s telephone works at Stoke, near Coventry, where the receiver comes into being alongside a number of other well-known Gecophone radio receivers, loud speakers, and other wireless equipment. The works were opened in 1921 mainly for the production of telephone equipment, and the factory (which is all on one floor) has an area of more than half-a-million square feet, and gives employment to approximately 5,000 people.



The Gecophone "Victor 3."

paxolin plates spaced only 1/4 in. apart. The principal materials used in the construction of the chassis are thin sheet paxolin and hard-rolled copper strip; hollow rivets are used instead of screws wherever possible. The container is neat and well finished, the lid and base being of ebonised wood, and the sides of crystalline enamelled metal.

The quality of reception is remarkably good up to the full output of the D.E.P.215 output valve, and under favourable conditions, as regards selectivity, Continental stations can be well received. During an interval in the transmission from 2LO, twelve foreign stations were clearly received on the

The various departments are so arranged that there is a continuous flow of components from stage to stage of manufacture up to the final assembly. Every consideration has been given to the requirements of quantity production, with scientific methods of testing as each process proceeds. In quantity production, especially where wireless apparatus and telephones are concerned, the quality of the materials employed is of cardinal importance, and it has long been the consistent policy of the G.E.C. to control their own production from raw materials as far as possible. The highest grades of ebonite are manufactured at the works, and the output of this material is on so large a scale that it is in excess of their own requirements, and can be supplied to other electrical firms. All cabinet work for Gecophone receivers is produced on the premises with the most up-to-date machinery and appliances. A research department is provided at the factory, which works in close touch with the main research laboratories of the General Electric Co. at Wembley, and although originally the works were constructed chiefly for the production of telephone equipment, the production of wireless apparatus now calls for a very substantial proportion of space at the factory and attention of the research laboratories.

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EXIDE WT10 H.T. ACCUMULATOR.
(Class 3.)

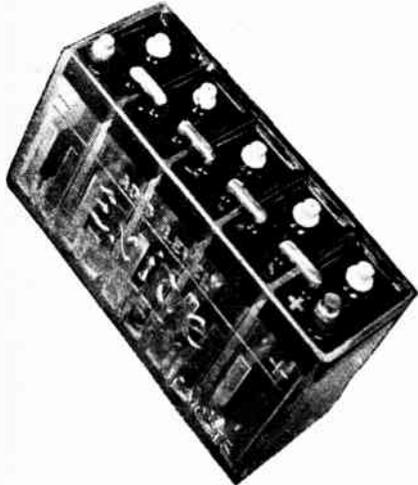
The increasing demands made by modern power valves in the matter of anode current have brought about a demand for increased ampere-hour capacity in H.T. accumulators. Even if there are local facilities for trickle charging, large cells are an advantage, but when such facilities do not exist they are an absolute necessity.



A section of the Exide works showing the assembling of cells.

Ballot Result.—

In producing the WT10 battery the Chloride Electrical Storage Co., Ltd., have completely satisfied this demand and at a price which compares favourably with batteries of smaller capacity. Each unit contains five cells of 10,000 milliampere-hour (10 ampere-hour) capacity. Thus, on a single charge, 400 working hours would be obtained at a discharge rate of 25 mA. This is somewhat better than the output from a



Exide type WT10 high-tension accumulator unit showing external inter-cell connections.

super-capacity dry battery, and of course the percentage fall of voltage in the case of the accumulator is considerably less during discharge; further, the charge can be renewed at negligible cost. The maximum discharge which can be taken from the WT10 battery is of the order of 250 mA, whereas the largest dry battery is limited to about 30 mA.

The plates in the WT10 are of the "mass" type, and will, therefore, hold their charge when standing for long periods. The glass container is of improved design, and the moulded glass partitions now extend up to the level of the top of the container. The lead bridge pieces are also brought up clear of the sealing compound, and intermediate voltages can be tapped off by means of suitable clips. This form of construction reduces the possibility of inter-cell leakage, yet in no way interferes with the cleaning of the tops of the cells. There is liberal acid space, and each 10-volt unit contains 1½ pints of electrolyte.

The WT10 battery represents excellent value for money, and will stand up to the demands of the most powerful receiving sets and public address systems.

The theoretical principles underlying the operation of storage batteries have undergone very little modification over a great many years, but, nevertheless, the storage battery of to-day, of which the products of the Chloride Electrical Storage Co. are typical of the finest examples, are very different from the products of the early days, for the manufacture of storage batteries has developed

stage by stage as a result of concentrated research work, until we have the modern product to compare with its very unreliable and short-lived ancestor.

The Chloride Electrical Storage Co. commenced in 1893 in a very unpretentious way with a works which consisted of a shed, the only outstanding feature of which was a tall chimney. To-day the area occupied by the works at Clifton Junction, near Manchester, has been so extended that the original part is lost amongst the rest and has to be pointed out specially to the visitor.

The Exide batteries were the first to be used for starting, lighting, and ignition purposes in motor cars—that was in 1911—and since then this part of the business has developed enormously. When wireless arrived, and long before broadcasting days, the first message from a ship was transmitted with the help of an Exide battery, and Exide batteries to-day need no introduction to wireless listeners the world over.

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MET-VICK COMBINED ELIMINATOR, MODEL "B." (Class 4.)

Primarily intended for use with a receiver employing Cosmos indirectly heated valves, the eliminator is a complete battery substitute in that it provides the high-tension voltages, together with grid potentials, as well as an A.C. supply of 4 amperes at 4 volts for heating the valves. A half-wave rectifying valve of low resistance and liberal emis-



Met-Vick type "B" mains eliminator.

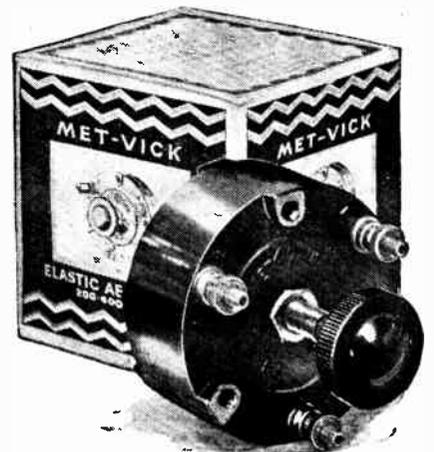
sion, the S.P.41/U, is stated to maintain a maximum potential of 180 volts when delivering a current of 120 mA. Three output voltages are provided, two fixed and one variable, the various values being obtained by stepping off along a high-resistance potential divider built up of a bank of series parallel connected resistances. These are carried in clips and are moulded as small bars composed of a high-resistance composition. A single grid biasing potential is obtained by taking the H.T. connection from a point some little way along a potential divider from the negative end. A wire-wound resistance bridges the 4-volt A.C. supply, so as to provide a point of zero A.C. potential. The apparatus is assembled on a plywood base with a metal surround and cover, and is given an attractive black crystalate finish. All terminals are shrouded as a protection against shock, and the mains supply is

taken to the transformer by flexible lead and lamp adaptor. Separate input terminals are marked off in steps of 10 volts to suit mains supplies of 200-250. Protection against overload is provided by a small pea lamp connected in the primary circuit of the transformer. Excessive current taken on any of the output circuits causes the lamp to glow, and it is burnt out by heavy overload. Smoothing is generous, consisting of a gapped core choke and bank of condensers.

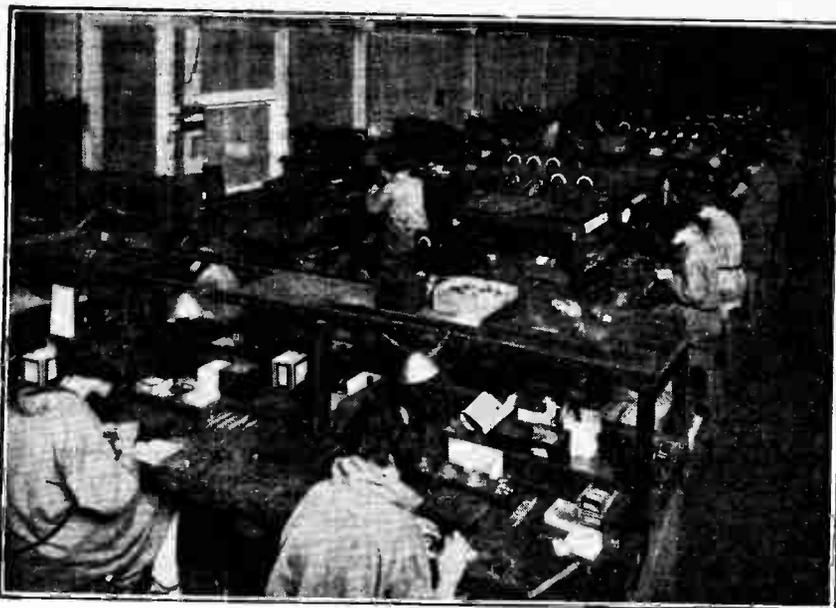
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MET-VICK ELASTIC AERIAL. (Class 7.)

The primary function of this component is to improve the selectivity of the receiver to which it is attached. It is not difficult to understand, therefore, why it has attracted favourable notice, for selectivity is probably the most sought after quality in broadcast reception at the present time. The factors which determine selectivity are for the most part built into the receiver itself and the maximum selectivity of which a set is capable is a constant quantity which cannot be improved without completely rebuilding the H.F. portions of the circuit. It may well happen that a receiver has been purchased, which, although giving perfect satisfaction at first, subsequently is found to be inadequate as regards selectivity when the user tires of the local station and tries to supplement his sources of entertainment by the reception of distant stations. In nine cases out of ten the scrapping of the old set and the purchase of a new one is financially impracticable, and the question arises as to whether the selectivity can be improved by the addition of some external accessory of moderate cost. Of course, if the *sensitivity* of the set is insufficient to pick up the distant stations there is no alternative but to buy a new set; it frequently happens, on the other hand, that the desired stations can be heard but are spoilt by the "spreading" of the local transmitter which superimposes a background of interference. In such circumstances the



Met-Vick elastic aerial unit.



A view taken in the Met-Vick works at Trafford Park.

Elastic Aerial Unit will effect a marked improvement.

It has been previously stated that selectivity is an intrinsic quality of the tuned circuits in the receiver, but there is another factor which is connected with the detector valve and can be controlled externally without structural alterations to the receiver itself. All detectors in common use exhibit this property, which may be summarised by saying that for weak signals the rectified output available for supplying the loud speaker is proportional to the square of the input from the aerial. For strong signals where the modulated fringe of the radio frequency input is carried over the bend on to the straight part of the detector curve the law breaks down and the output is proportional to the input.

The Square Law Detector.

Assuming that the input from the distant station is strong enough to carry well over on to the straight part of the curve and that the background from the local station, although sufficient to cause interference, is weaker and falls on the foot of the curve. If now we reduce the input from the aerial from *both* stations the fall in strength will be proportional in the case of the wanted signal, provided it stays on the straight part of the curve, but the reduction of the unwanted signal will be subject to a square law reduction. To take a concrete example, let us suppose that the wanted signal has an input strength of 32 and the unwanted a strength of 8 or a ratio of 4:1. If we halve the input the wanted signal will fall to 16, but the unwanted signal will fall not to 4 but to the square root of 4 (i.e., 2), giving a ratio of 8:1 and a consequent reduction of interference from the unwanted station. This explains the improvement in selectivity resulting from the use of

a short aerial; it is merely a question of reducing the input to the detector.

The Met-Vick Elastic Aerial Unit is a device for progressively reducing the input from the aerial in order to make full use of selective properties of the detector in differentiating between strong and weak signals. It is really a form of potential divider by means of which any desired fraction of the total energy collected by the aerial may be transferred to the aerial and earth terminals of the set. In this respect its action is analogous to shortening of the aerial both as regards reduction of input and also in diminishing the loading effect of the aerial on the tuning circuits, which also makes for better selectivity. A detailed account of the electrical circuits comprising the Elastic Aerial is outside the scope of this article, but in general the principle of the unit consists of a three-electrode condenser and an arrangement of aperiodic coils. The centre electrode of the condenser is adjustable and moves in the electrostatic field between the two fixed plates. When the moving vane is midway between the fixed plates the energy passed to the receiver is a minimum, an increasing transfer of energy taking place when the vane is moved from this mid-point in either direction.

An Aerial of Any Length.

The neatness and convenience of this method of controlling input needs no emphasis. Instead of laboriously experimenting with aerials of different length to find the best dimensions for perhaps only one set of conditions, it is possible to make all the necessary adjustments at the receiver and to find the equivalent of the best length of aerial for any point on the tuning scale.

The home of the radio products of Metro-Vick Supplies, Ltd., is Trafford

Park, Manchester, where the works occupy an area of some 75 acres, within easy access of the Manchester Docks. The main building alone occupies one million square feet, and no fewer than 750 electric motors supply the power required for the machinery of the works. Some idea of the size of the establishment may be gained from the fact that throughout the works and the enclosed land there are ten miles of standard gauge railway line. As soon as broadcasting began, a section of these works was immediately devoted to the manufacture of wireless apparatus, and the first Manchester transmitter, 2ZY, was originally housed in the research department of the works. The works have since then been kept fully engaged with the production of wireless apparatus and receivers, specialising in apparatus operating direct from the electric light mains. The normal number of employees is between 8,500 and 9,000.

Cosmos valves, which are products of the same company, are produced at the Cosmos Works at Enfield, these works being devoted almost entirely to the manufacture of lamps and wireless valves.

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MULLARD PENTODE VALVE. (Class 6.)

It is seldom that an entirely new component has been standardised in receivers so quickly after its introduction as the



The Mullard Pentode valve P.M.24.

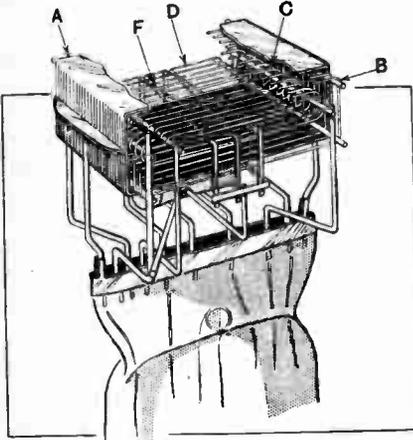
pentode. The thermionic valve undoubtedly exercises more influence on the design of the set than any other accessory; the pentode is no exception, for we find that almost overnight the low-frequency amplifier which we have become wont to regard as necessarily having two valves for adequate loud speaker signals can now give entirely satisfactory volume with one stage of amplification.

Somewhat wild statements as to performance are always rife when new inventions find their way on to the market for the first time; it is therefore important to take stock of the potentialities of the pentode and combine theoretical considerations with the practi

Ballot Result.

cal experience which we have been able to gain during the last few weeks with this valve in the *Megavox-Three* and the *Pentode-Two* receivers.

The screened grid valve when introduced some eighteen months ago, besides effectively reducing the oscillation bugbear in H.F. amplifiers, contains new



Drawing showing the construction of the Pentode valve.

principles in valve technique—a comparatively high mutual conductance could be maintained with an extremely high magnification factor. With the triode the mutual conductance falls off with increase in magnification factor and an anode voltage change is accompanied by a marked change in anode current, whereas in the tetrode the anode current after a certain point remains substantially the same for change in anode voltage

That Kink in the Curve.

These characteristics were of paramount importance in high-frequency work where very small signal inputs of one or two volts would be anticipated, but as soon as an effort was made to modify the valve to cope with signal voltages of greater magnitude—such as would be created in an L.F. amplifier—a peculiar phenomenon was encountered, as a result of which instability and oscillation occurred. With certain relative applied voltages the screening grid may have a higher potential than the lowest instantaneous potential of the anode so that electrons will reverse their normal direction and an increase in anode voltage will result in a decrease in anode current. The anode characteristic representing this state of affairs shows a "kink" which causes a limitation in linear anode voltage swing. Until this disability was removed there was little chance of combining reasonably large signal handling capacity and power output with the inherent advantages of the H.F. tetrode.

A remedy was found by interposing an earth-connected third grid to form a five-electrode valve or pentode: this extra electrode is placed between the screened grid and the anode and allows the electrons by reason of their velocity to pass in the normal direction to the

plate, but reversal of direction to the screening grid, which will periodically be at a higher potential than the plate, will be prevented. The velocity of the electrons trying to return is much less and is adequately reduced by the zero field around the earthed grid.

The earth connection is made internally in the valve to the centre of the filament, so that as compared with an ordinary three-electrode output valve there is only one extra terminal which is normally taken to maximum H.T. positive.

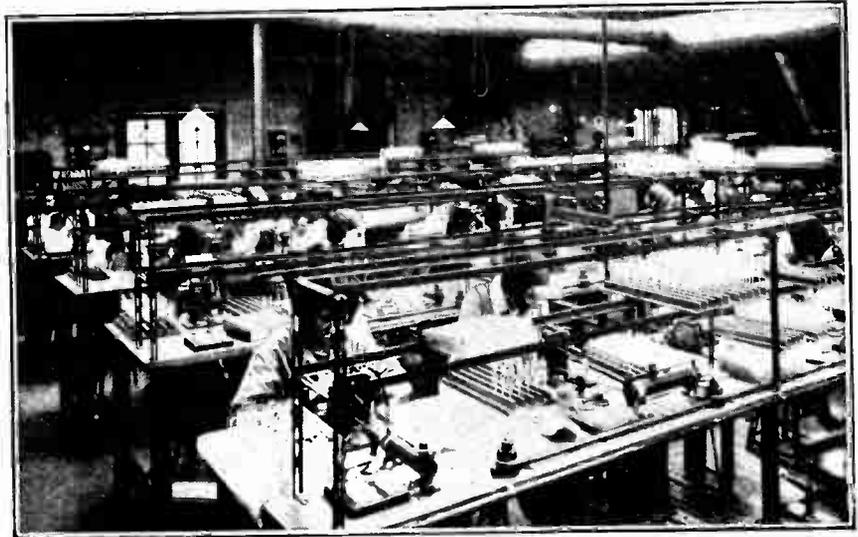
The pioneers in pentode manufacture in this country are Messrs. Mullard, who have to their credit the P.M.24 and the P.M.22. The former valve has a filament consumption of 0.15 amp. at 4 volts, while the maximum anode voltage, which must not be exceeded, is 150, at which a magnification factor of no less than 62 and a mutual conductance of 2.3 mA. per volt is obtained. The two-volt counterpart has very similar constants.

Although the impedance of the pentode is high (the P.M.24 is 28,000 ohms), the anode current is perforce heavy, since

From the foregoing it will be evident that the amplification before a pentode valve must not be too great—in fact, there should be no other low-frequency valve embodied in the receiver. It is due to much improved sensitivity that a small signal can produce adequately loud output, and we must regard the limitation of input, which has not appeared before, since output valves have been considerably less sensitive, as all in favour of the pentode.

A stroll around the set manufacturers' stands at Olympia must have revealed to the reader how immensely popular this new valve has become in so short a period of time. Of the three-valve receivers exhibited, a large percentage embodied a pentode in the last stage, because greater volume is obtainable with a considerably reduced number of components.

The Mullard Wireless Service Co., Ltd., was first established in 1920, by S. R. Mullard, M.B.E., M.I.E.E., with a factory in Southfields. Later a small factory was taken in Hammersmith, and in 1922 a larger building was occupied in Nightingale Lane, Balham, where the present premises are situated. Since



A corner of the Mullard valve works.

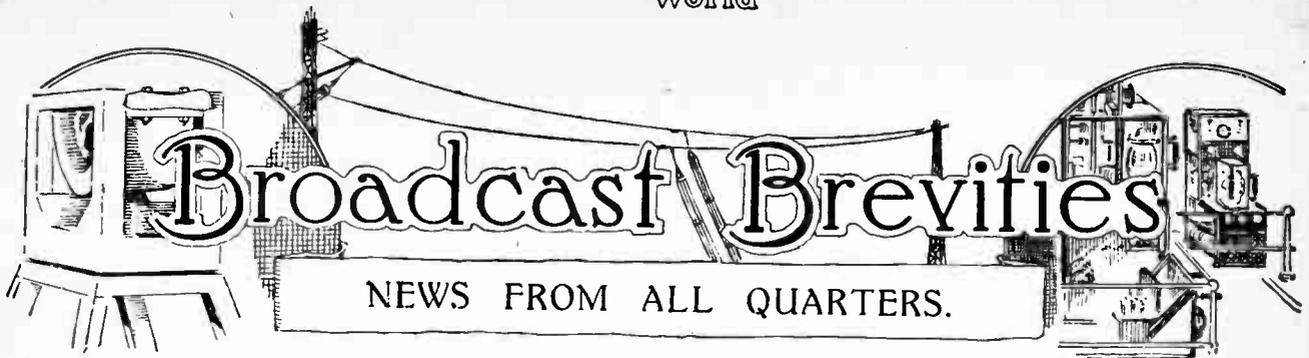
it is the change of anode milliamperes per given voltage on the grid that fundamentally provides power output for a loud speaker and the milliamperes cannot swing below zero.

The amplitude of grid swing that is permissible with a pentode has been recently dealt with at some length in an article by Dr. N. W. McLachlan, in which it will be seen that curvature distortion begins before the normal grid bias base is filled. Suffice it to say that for all normal domestic purposes the output from a pentode even when restricted to linear conditions is entirely satisfactory from a quality and volume point of view.

1922 the factory has been extended at regular intervals, until now well over 1,000 employees are engaged.

Mullard accessories are produced at a separate factory at Mitcham, and it is here that transformers, loud speakers, and H.T. supply units are produced, the Nightingale Lane factory being confined to the production of valves. From small beginnings the progress of the Mullard Company is one of the romances of the radio industry; having been established more particularly for the production of transmitting valves prior to the advent of broadcasting, the extraordinary development of the company may be taken as an example of the possibilities which the radio industry has offered to those who were prepared to make the most of opportunity.

¹ *The Wireless World*, October 31st, 1928.



By Our Special Correspondent.

**The Regional Stations.—How Lyons was Subdued.—Kenya's Example to Britain.—
Trouble in Edinburgh.—The Schubert Centenary.—Applause Cards.**

The London Regional Station.

Building at Brookman's Park has now reached the skeleton stage. The walls of the main building are now *in situ*, and the next job is to put the roof on. When that is done and the place is weathertight, a move will be made to instal the dynamos and some of the other heavy machinery.

It is expected that the bulk of the constructional work will be completed before the end of January next.

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An Insult to Barkisland!

Although the site of the Northern Regional Station is not yet chosen, there is a certain liveliness in the mountain air over the question of a water supply to the hypothetical station. The Soyland Urban Council has refused to supply Barkisland with the 10,000 gallons of water a day which the broadcasting station would require, but states that it is not influenced in its decision by the possibility that the station might be built in its own territory, as the point is immaterial. This refusal is regarded as "an insult to Barkisland."

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Meanwhile . . . P

While the world is waiting for Barkisland's reply to Soyland, it is quite possible that the B.B.C. may choose a site several miles away from either of these localities, in which case the world might languish in ignorance of Barkisland's final sentiments on the matter.

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Tact.

A piece of masterly diplomacy at Savoy Hill has removed a heterodyne note which was becoming a nuisance to 5GB listeners. The offender was Lyons (La Doua), which had dropped from its normal frequency of 628 k.c. to something very near 605 k.c., thus trespassing on 5GB's preserve.

On the night of October 29th, when Daventry Experimental was broadcasting "Pelléas and Mélisande," Lyons became more than ordinarily troublesome. A bright idea struck a member of the B.B.C. staff, with the result that a letter

was addressed to Lyons pointing out that disturbance had been caused during the transmission of a French opera, and that British listeners were likely to form a mistaken impression of the merits of this beautiful work owing to the said disturbance.

The consequence was: Lyons has now returned to its proper frequency!

FUTURE FEATURES.

London and Daventry (5XX).

NOVEMBER 20TH.—"Caravan," by C. A. Lewis.

NOVEMBER 28TH.—"Samson and Delilah," an opera by Ferdinand Lemaire, English version by Eugène Oudin, music by Saint-Saens.

NOVEMBER 30TH.—St. Andrew's Night Programme.

DECEMBER 1ST.—A Popular Scottish Concert.

Daventry Experimental (5GB).

NOVEMBER 25TH.—Selections from Mendelssohn's "Elijah."

NOVEMBER 27TH.—"The Invention of Dr. Metzler," a play by John Pollock.

NOVEMBER 28TH.—The Annual Meeting of the Hospital Savings Association.

NOVEMBER 30TH.—Bunyan Celebration Speeches.

DECEMBER 1ST.—A Concert of Medieval Music.

Cardiff.

NOVEMBER 27TH.—A Concert by Victors at the National Eisteddfod Treorchy—1928.

DECEMBER 1ST.—A Wagner Concert.

Manchester.

NOVEMBER 30TH.—"The Jackdaw of Rheims," from "Ingold's Legends," by Richard Barham, set to music by Robert Chignell.

Glasgow.

NOVEMBER 29TH.—"What Was That?" a "Memory" Competition by the Station Orchestra.

Belfast.

NOVEMBER 26TH.—"The Man who was Thursday," by Mrs. Cecil Chesterton and Ralph Neill, adapted from the novel by G. K. Chesterton.

Keston v. Chelmsford.

The English Test Team did not "come over" well in the B.B.C. relay from Sydney on November 10th. As one newspaper wittily put it, the cricketers were "out first bowl"! Readers may remember that this relay was to provide an efficiency contest between Chelmsford and Keston, the receiver which sent in the better signals to the Savoy Hill control room being chosen for the relay. As

a matter of fact, Keston was "returned unopposed." Chelmsford failed to put in an appearance!

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Permanent Empire Short-wave Service.

Unaware, possibly, of B.B.C. opinion on the subject of short-wave broadcasting, the British East African Broadcasting Company has had the temerity to inaugurate a "permanent Empire broadcast service"—I quote their own words—from the plucky little station at Nairobi.

The service was opened by H.R.H. The Prince of Wales on Armistice Day at 10.30 G.M.T., and the station now transmits regular daily programmes from 4 to 7 p.m. G.M.T. on a wavelength of 33.5 metres and a power of 2 kilowatts. A Sunday programme is given from 7 to 8 p.m.

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More Reports Wanted.

Nairobi has received excellent reports of its test transmission from listeners in England, India, Australia. Further reports are warmly welcomed; they should be addressed to the company at Nairobi, Kenya.

The programmes are also sent out on 400 metres with a power of 4 kilowatts.

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Trouble in Edinburgh.

"The B.B.C. are having a very hectic time of it just now with Edinburgh.

"Edinburgh people want London programmes, and the essence of their complaint is that they are getting rather too much from Glasgow."

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Polite Hints to Glasgow.

The above paragraph was written nearly four years ago, and appeared in these columns in the issue of February 11th, 1925. Soon afterwards the Edinburgh folk had the satisfaction of hearing more programmes originating at their own station, with the bulk of the remainder coming from 2LO.

The recent administrative changes in Scottish broadcasting have placed the reins of power in the hands of Glasgow, with the result that Auld Reekie is beginning to fear a return to the old con-

ditions. To prevent anything of the kind, Bailie Philip Smith has stepped into the limelight as the champion of Edinburgh's wireless independence. He declares that if Edinburgh is to be a sub-station of Glasgow, strong protest will be made. ○○○○

2LO or 5SC?

This rugged attitude is commendable, but is there any certainty that Edinburgh stands to lose by tapping Glasgow's output? Many Edinburgh people hate the notion of indebtedness to Glasgow for anything musical or artistic, but do they overlook the fact that the London programmes, which they so much desire, involve a long land line and inevitable distortion? Perhaps they have considered this point, and prefer muffled music from London to pure music from Glasgow. ○○○○

Landline Distortion

"That they are not all of this persuasion is proved by a letter I have received from an Edinburgh reader, who says: "I have not got a moving coil yet, as I don't think it worth while, so long as we in Edinburgh have to put up with a transmission coming over the landline from 2LO. Sometimes the line is corrected, so that we get occasionally a perfect result, but more often it is woolly in speech. This is very marked at the moment, and is quite a contrast to the speech which we had from our local studio earlier this evening. . . . Unfortunately, 2EH closes down as a studio from to-day (October 31st)." ○○○○

Framing the Protest.

The closing down of the Edinburgh studio is the whole cause of the trouble. It follows upon the reorganisation plans which are already taking effect in preparation for the regional scheme. All the relay stations are losing their separate identity in order to serve as distributing points for programmes from the main station in the regional group. In the case of Scotland, Glasgow is the fountain-head, and will shortly be the main source of supply for Edinburgh, Dundee, and Aberdeen. So it looks as if Bailie Philip Smith had better begin framing his protest. ○○○○

The Schubert Centenary

The B.B.C. is commemorating the centenary of Schubert's death, which occurred on November 19th, 1828, in a number of broadcasts of his music extending over the next six weeks.

The Foundations of Music series this week consists of piano duets by Schubert, played by Berkeley Mason and Victor Hely-Hutchinson.

At the Queen's Hall, on November 23rd, the second half of the B.B.C. Symphony Concert will consist of Schubert's Symphony No. 5 in B flat, and an arrangement by Liszt of the Reitermarsch in C. On November 24th the Wireless Military Band will broadcast from the studio some of Schubert's

works specially arranged by Gerrard Williams for military band performance. ○○○○

A Schubert Miscellany.

The memory of Schubert will also be honoured in The Foundations of Music series throughout December. Next week they will consist of his violin and piano works, played by Winifred Small and Maurice Cole; in subsequent weeks these recitals will include Schubert's miscellaneous piano items played by Harold Craxton, songs by George Parker, piano sonatas played by James Ching, and piano duets by Ethel Bartlett and Rao Robertson.



SIR HARRY LAUDER, who gave a farewell broadcast on November 8th, photographed on the s.s. Tamaroa on his departure last week for New Zealand. His luggage included the 5-valve McMichael portable set seen in the picture. ○○○○

Manners to Music

WEAF, New York, has got ahead of the B.B.C. with a talk on "Etiquette," with appropriate music. ○○○○

No More Radio Applause?

The radio applause card is nearly extinct, according to an American broadcasting authority, who states that it is being killed by radio advertising. I gather that the man who has to sit through a recital of the merits of somebody's dried prunes or pickled pork or artificial meat feels entitled to the scraps of entertainment that follow without any obligation to give thanks. ○○○○

Filling in the Card.

Probably the stereotyped nature of these applause cards was against them. One secured a stack of, say, fifty applause cards, each of which bore a glowing tribute on these lines: "To the Station:—Dr. Sirs, We sure enjoyed yr. program of and we guess special mention is due to

..... We'll say he/she was the cat's pyjamas. Sgd. (Mr., Mrs. or Miss)" After filling in about the twenty-fourth of these forms the listener suffered from a vague feeling of irritability, a sort of unconscious urge towards the self-expression denied him on the form. (There was no room for parenthetical remarks, as the margins of the forms were filled with exhortations to buy So-and-So's Dry Batteries.) ○○○○

Cards of Criticism Needed.

No one seems to have thought of printing cards of criticism. ("We sure shuddered last night, etc.") These would have had a wide appeal, and I am not sure that they would be a failure to-day, even over here. ○○○○

Sir Harry Lauder's Towel.

A correspondent applauds Sir Harry Lauder's idea of putting a wet towel over the microphone to give a cameo effect to the voice. "I think there should be a wet towel in every studio," he writes, "though I don't think that the microphone should always be the sufferer." ○○○○

"Alice Through the Looking-glass."

Cecil Lewis, who is producing his own translation and adaptation of Max Mohr's play, "Caravan," from 2LO and 5XX on November 26th, is to adapt "Alice Through the Looking-glass" for broadcasting on December 18th and 21st. The music is by Victor Hely-Hutchinson. ○○○○

"L.G." to Broadcast.

Mr. Lloyd George will broadcast from 5GB on November 30th, when he is to speak at the Bunyan Tercentenary celebrations at the City Temple. ○○○○

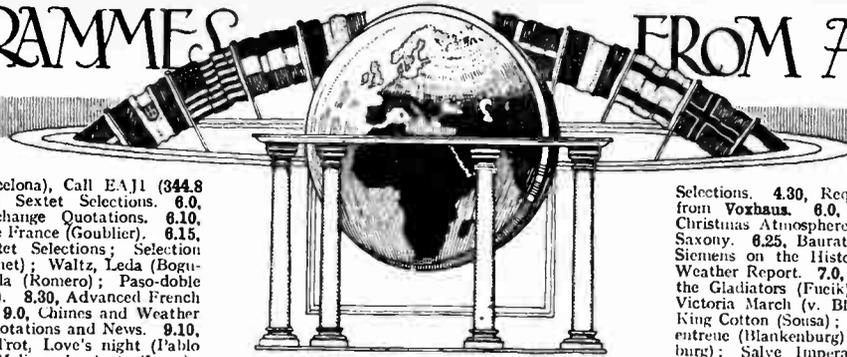
Broadcasting a Scottish Festival Service.

The twenty-fifth annual Scottish Festival Service at St. Columba's Church of Scotland, Pont Street, will be relayed to 2LO and 5XX on December 2nd. The service will start with the National Anthem, and an address will be given by the Rev. Archibald Fleming, the minister. ○○○○

Scots Programme for England.

On several occasions Aberdeen has supplied programmes of Scots Variety for broadcast from the English stations as well as those North of the Tweed. Another of these programmes, "Ayont the Grampians," will be relayed to the English stations on December 3. The Buckie Ladies' Choir is travelling to Aberdeen to take part, and the City of Aberdeen Police Pipe Band is to perform on this evening for a wider audience. The soloists, Minnie Mearns (contralto), W. M. Johnston (tenor) and Paul Askew (viola), are all Aberdeen artists, and so is Mrs. MacFarlane, of "Ragbag Lane," who will uphold the lighter side of the entertainment. The programme also includes selections by the Station Octet and a short play by Rae Elrick presented by the Aberdeen Vaudeville Players.

PROGRAMMES FROM ABROAD



SATURDAY, NOVEMBER 24th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

BARCELONA (Radio Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—5.30, Sextet Selections. 6.0, Market Report and Exchange Quotations. 6.10, Sextet Selection, Marche de France (Goublier). 6.15, Sacred Music. 6.25, Sextet Selections; Selection from La navarraise (Massenet); Waltz, Leda (Bogumil); A Night in Granada (Romero); Paso-doble from Don Quixote (Demón). 8.30, Advanced French Lesson, by Prof. Martin. 9.0, Chimes and Weather Report. 9.5, Exchange Quotations and News. 9.10, Orchestral Concert: Fox-Trot, Love's night (Hallo Navarro); Selection from Molinos de viento (Luna); Waltz-Boston, Ideal (José Baltart); A travers les longs jours (Ligar); Mazurca, La brujula (Coté); March, The Elite (Bidgood). 10.0, Programme relayed from Madrid, EAJ7.

BERGEN (370.4 metres); 1.5 kW.—5.30, Programme for Children. 6.0, Programme for Girls. 7.0, Orchestral Concert. 7.50, Topical Talk. 8.0, Editor Freddy Bernhoff, Talk: Christmas in the French Foreign Legion. 8.30, Recitations and Ballads by the Actor Victor Ivarson. 9.0, Weather Report, News and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—3.0, Educational Talk by Fritz Westermann. 3.30, Programme from Hamburg. 4.30, Talk by Herr Th. Kotzur. 5.0, "Coal and Light"—Dialogue by Siegfried Böhm. 5.30, Elementary Spanish Lesson. 5.55, Dr. Elias Hurwicz, Talk: Russia. 6.20, Genealogical Talk by Herr B. A. Hasse-Falcnorth. 7.0, Programme from Voxhaus.

BERLIN (Voxhaus), (484 metres); 4 kW.—2.30, Chess Talk by Herr E. Nebermann. 3.0, Dr. Paul Frank, Talk: Medical Hygiene. 3.30, Harry Gondl, Anecdotes of German Humour. 4.0, Orchestral Concert: Overture to Ombre et Clarté (Gabriel-Marie); Waltz Fantasia (Glinka); Träume (Wagner); Selection from Pique Dame (Tchaikovsky); Melody from Friederike (Lohr); Burlesque (Södermann); Aus Mozarts Reich (Urbach); Canonetta, Second Movement from the Concerto for Violin Op. 35 (Tchaikovsky); Tin Soldiers (Kockert); Followed by Advertisement Notes. 5.30, Talk: Germany's Architectural Masterpieces—Cologne Cathedral. 6.0, Armin T. Wegner, Talk: The Country and Cities of the Caucasus—Baku, the City of the Black Towers. 6.30, Dr. Wende, Talk: The Development of German Industrial Legislation and its Coming Phases. 7.0, Variety Programme. 8.0, Georg Kaiser Recital, followed by Weather Report, News, Time Signal, Sports Notes and Dance Music. 11.0 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—3.0, Orchestral Concert. 3.30, Programme for Children by Frau Kipfer. 4.0, Orchestral Concert. 6.29, Time Signal and Weather Report. 6.30, Popular Concert: Readings, Accordion Selections, Jodeling and Quartet Songs. 8.0, Orchestral Concert. 8.45, News and Weather Report. 9.0, Concert of Light Orchestral and Vocal Music. 9.40, Dance Music. 11.0 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—3.0, Review of Books. 3.30, Concert: Festival Overture (Leutner) Liebesnacht (Schmalstich); Walza, Wiener Kinder (Jos. Strauss); Weck-und in Schlaraffenland (J. Armandola); Aragonaise from Le Cid (Massenet); Ballet Scene (Luigini); Selection from The Tales of Hoffmann (Offenbach); Intermezzo, Indische Gaukler (Siede); Waltz, The Wedding of the Winds (Hall); March, Per aspera ad astra (Urbach); 5.0, Talk by Georg Hallama. 5.25, Talk in Esperanto by Alfred Hanschke. 5.35, Talk by Herr Dankelman. 6.20, Shorthand Lesson. 6.50, Talk: The French Revolution. 7.15, "Lilium"—Play (Franz Molnár). 9.0, News. 9.15, (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—3.30, Programme for Children. 4.30, Talk, The Principles of Music. 4.45, German Talk. 5.15, Weekly Wireless Review. 6.0, Orchestral Concert: Overture to Orpheus in the Underworld (Offenbach); Selection (Nedbal); Gavotte Louis XV (Galimberti). 6.30, Dramatic Programme relayed from Bratislava (300 metres). 9.0, Programme from Prague.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Orchestral Concert from the Palace Hotel Restaurant. 6.0, Elementary English Lesson. 6.25, Intermediate English Lesson. 6.45, Pianoforte Recital. 7.0,

Selections. 4.30, Request Programme. 5.30, Talk from Voxhaus. 6.0, Senator Hirsch, Talk: The Christmas Atmosphere in the Handicraft of Lower-Saxony. 6.25, Baurat Böttcher, Talk: Werner von Siemens on the History of Electro-technics. 6.55, Weather Report. 7.0, Concert of Marches: Entry of the Gladiators (Fucik); Florentine March (Fucik); Victoria March (v. Blon); Hail Europe (v. Blon); King Cotton (Souza); El Capitan (Souza); Germain-entreue (Blankenburg); Mit Siegespalmen (Blankenburg); Salve Imperator (Fucik); Husarenvedette (Fucik); Unter der Freundschaftsflagge (v. Blon); Unter dem Siegesbanner (v. Blon); Manhattan Beach (Souza); The Liberty Bell (Souza), Festjubel (Blankenburg); Elbtalgruss (Fucik); Durch Kampf zum Sieg (v. Blon); The Star-spangled Banner (Souza); The Gladiators' Farewell (Blankenburg). 9.30, Weather Report, News, Sports Notes and Programme Announcements. 9.45 (approx.), Selections by the Kuban Cossack Chorus. 10.50, North Sea and Baltic Weather Report.

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Selections. 1.40, Orchestral and Organ Concert from the Tuschinski Theatre, Amsterdam. 3.40, Italian Lesson. 4.40, German Lesson. 5.30, Orchestral Concert: Overture to Zampa (Hérold); Waltz, Mon Réve (Waldteufel); Potpourri, Notrejeun (Urbach); Si vous l'aviez compris (Denza); Selection from No, No Nautette (Youmans). 6.30, French Lesson. 7.25, Police Announcements. 7.40, Concert and Talk arranged by the Workers' Radio Society. 10.10, Concert relayed from the Royal Cinema, Amsterdam. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 3.40 p.m.—12.10, Concert of Trio Selections. 2.49, Programme for Children. 5.10, Concert of Gramophone Selections. 6.30, Catholic Bulletin. 6.40, English Lesson. 7.10, Lesson in Dress-making. 7.40, Talk by Mr. Haastert. 8.0, "Le Moulin de Sanssouci"—Historical Comedy in Three Acts (Harting).

KALUNDBORG (1,630 metres); 7 kW.—Programme also for Copenhagen (337 metres).—6.30 a.m., Morning Gymnastics. 10.0 a.m., Weather Report. 12.15, Educational Talk. 2.30, Programme for Children. 2.30, Orchestral Concert: In the Interval, Recitations by Gudrun Lohse. 5.50, Weather Report. 6.0, News and Exchange Quotations. 6.15, Time Signal. Carl Gad, Talk: Modern Foreign Authors—Jacob Wassermann. 7.0, Chimes from the Town Hall. 7.2, Carl Gad reads from the Novel "The Maurizius Case" (Wassermann). 7.30, Concert of Copenhagen Street Songs of the 19th Century: Talk by August Gyldenborg; Songs (Oehlenschläger), (a) Bag grønkaedte Bakker, (b) Den lykkelige Modebutik i Vimmelkæft, (c) En flukkende ny Theater-Vise, (d) Fra Ministeriet Hall's Dage; Mit eget Kompagni (Bögh); Hyvad er Men'skelt uden Mønt (Rantzau); Hertugen af Choiseul Praslin (Recke); Followed by News. 8.45, Concert of Light Music: Jesopolitan March (Gastaldon); Poupadour Waltz (Jespersen); Selection from Die Räuber (Offenbach); Indian Intermezzo, Malomba (Jessel); Palisader Polka (Bentzen); Serenata (Cajani); Selection from Un bon garçon (Yvain); Silver Wedding March (Ryning). 9.45, Dance Music by the Orchestra of the Industri Restaurant. 11.0, Chimes from the Town Hall. 11.15 (approx.), Close Down.

KATTOWITZ (422 metres); 10 kW.—2.45, Financial Report. 3.0, Concert of Gramophone Selections. 4.10, Music Lesson by Prof. F. Sachse. 4.35, Children's Letter Box. 5.0, Programme for Children. 6.0, Announcements. 6.30, Talk. 6.56, Time Signal and Agricultural Report. 7.5, Mr. K. Rutkowski, Talk: Impressions of a Journey to Greece. 7.30, Programme from Warsaw. 9.0, Weather Report and News. 9.30, Dance Music.

KAUNAS (2,000 metres); 7 kW.—3.0, Concert of Lithuanian Music. 3.45, Talk by Mr. Z. Kuzmickis. 4.15, Talk for the Agriculturist, by Mr. Strazdas. 4.45, Announcements. 5.30, News. 6.0, Weather Report. 6.30, "Cavalleria Rusticana"—Opera (Mascagni), relayed from the National Opera House.

LAHTI (1,522.8 metres); 35 kW.—4.0, Orchestral Selections: March (Blankenburg); Selection from Coppelia (Delibes). 4.30, Talk. 5.15, Orchestral Selections: Danza delle ore (Ponchielli); Tannhäuser (Wagner); Slavonic Dance No. 10 (Dvorak). 5.40,

Selection of Columbia Gramophone Records. 7.15, Radio-Chronique. 8.0, Concert by the Orchestra of the Conservatoire Royal, relayed from Liège: The Heroic Symphony (Beethoven); Topical Talk; Concerto for Cello (Schumann); Variations for Cello (Tchaikovsky); Triptique symphonique (Rassc); followed by News, Esperanto Announcements and Orchestral Music from the Palace Hotel Restaurant. 10.0 (approx.), Close Down.

BUDAPEST (556.6 metres); 20 kW.—3.0, Legal Hints, followed by Time Signal, Weather Report and News. 4.10, Talk on the Bulgarian Nation and Kindred Races. 4.45, Selections by Tzigane Orchestra. 5.50, Talk: Old-fashioned and Modern Fire Brigades. 6.30, Relay from the Opera House. 9.30, Weather Report and Gramophone Selections.

CRACOW (566 metres); 1.5 kW.—4.10, Mr. J. Anisfeld, Talk: The Influence of the Development of Technique on Mankind. 4.35, Talk by Mr. J. Regula. 5.0, Programme relayed from Warsaw. 6.0, Miscellaneous Items. 6.25, Reading in English by Mr. Jean Stanislawski. 6.55, Time Signal from the Observatory. 7.0, Agricultural Report. 7.5, News and Announcements. 7.30, Programme relayed from Warsaw. 9.0, Programme from Warsaw. 9.30, Concert from a Restaurant. 10.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—1.30, Weather Report and Gramophone Concert. 7.20, News. 7.30, Selections by Val Voulosen (Entertainer). 7.45, Irish Lesson by Seamus O'Duinn. 8.0, Schubert Memorial Concert, relayed from Rathmines Town Hall: Station Symphony Orchestra, Overture to Rosamunde; Selection of Schubert's Religious Songs by P. J. Duffy (Baritone), (a) Litanei, (b) Pax Vobiscum, (c) Die Allmacht. Station Symphony Orchestra, Symphony No. 3 in D Major; Soprano Solos by Elizabeth Mellor; Address by Maestro A. G. Viani; Station Symphony Orchestra, Overture to Alfonso and Estrella; The Erl King by P. J. Duffy (Baritone); Station Symphony Orchestra, Ballet Music from Rosamunde; Soprano Solos by Elizabeth Mellor; Station Symphony Orchestra, (a) Menuetto, (b) Polonaise; Baritone Solos by P. J. Duffy, (a) Wiegenlied, (b) Serenade, (c) Du bist die Kuh!; Station Symphony Orchestra, (a) Marche Militaire, (b) Soldier's Song. 10.20, "That Walks by Night": Play by Dorothy Day and Company. 10.30, News, Weather Report and Close Down.

FRANKFURT (428.6 metres); 4 kW.—3.35, Orchestral Concert of Opera Music. In the Interval, Announcements. 5.10, Reading by Herr O. W. Studtmann. 5.30, Talk. 6.0, Answers to Correspondents. 6.15, Lesson in Esperanto by Herr W. Wischoff. 8.45, Talk on the Occasion of the Seventieth Birthday of Selma Lagerlöf, by Dr. Hanna Szass. 7.15 Robert Koppel Programme, followed by Dance Music from Voxhaus. 11.30 (approx.), Close Down.

HAMBURG, Call HA (in Morse) (304.7 metres); 4 kW.—9.15 a.m., News. 10.0 a.m., Programme of Gramophone Records. 11.10 a.m., Weather Report. 11.15 a.m., Exchange Quotations. 11.30 a.m., Concert relayed from Hanover (297 metres). In the Interval at 11.55 a.m., Time Signal. 12.10, News. 1.40 Exchange Quotations. 2.30, Review of Books. 3.0, Illustrated Music Talk, by Dr. Wilh. Heinitz. 3.30, Programme of Recitations, Songs and Orchestral

Programmes from Abroad.—

Talk. 6.0, Accordion Selections by Mr. J. Homan. 6.20, Concert: Orchestral Selection, Rhapsody No. 12 (Liszt); Recitation by Marita Wittenberg; Orchestral Selections, Fantasia Hongroise (Padouk); Recitation by Marita Wittenberg; Orchestral Selection from The Last Waltz (Strauss); Song; Orchestral Selection, Overture to William Tell (Rossini). 7.45, News in Finnish and Swedish and Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—10.10 a.m., Talk: The Choice of Careers. 11.10 a.m., Gramophone Selections. 12.5, Concert: Overture to The Two Hussars (Doppler); Waltz, Die guten alten Zeiten (Strauss); Loewe Mosaik (Ralf); Two Movements from Carmen (Bizet); Serenata (Onesti); Dance Suite from The Nutcracker Ballet (Tchaikovsky); Viennese Waltz Song (Ettinger); Potpourri, Webers Blütenkranz (Schreiner). 1.30, Hints for the Housewife. 2.40, Talk on Legal Questions by Dr. Jost. 3.5, Meta Brentgen, Talk for Women on Commercial Callings. 3.30, Josef Dembeck, Talk: The Blind in Public Life. 4.0, Dr. E. Huber, Talk: Old Babylon. 4.20, English Lesson by Prof. F. Hase. 4.45, Chamber Music: Sonata for 'Cello and Pianoforte, Op. 11, No. 3 (Hindemith); Sonata for 'Cello and Pianoforte (Honegger). 5.30, Ilerr Liertz, Talk: Providing a Town with Water and Electricity. 6.15, Dr. Kraus, Talk for Workers, Welfare Problems of Large Cities. 6.40, Prof. Leyen, Talk: Universal Fairy Tales of the World. 7.0, Popular Programme. 9.30 (approx.), News, Sports Notes, Business Announcements, Orchestral Selections and Dance Music. 12.0 Midnight (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—3.30, Concert by the Station Orchestra: Children's Symphony (Romberg); Overture to The Nuremberg Doll (Adami); Little Grandmother (Jang); Children's Corner (Bizet); Doll's Minuet (Mello); The Toy Shop (Jessel); Doll's Gavotte (Stolz); Children's Song March (Lindemann). 4.45, Wireless News and Talk. 5.20, Weather Report, Time Signal and Labour Exchange Report. 5.30, Programme from Voxhaus. 6.0, Josef Greff, Talk: Psycho-Analysis. 6.30, Dr. Fritz Reuter, Talk: Music as a Profession. 7.0 Concert by the Dresden Madrigal Society. 8.15, Walter Niemann reads from his own Works. 9.0 News, Sunday Programme Announcements and Sports Notes. 9.30, Programme of Gramophone Records. 11.0 (approx.), Close Down.

MADRID (Union Radio), Call EA17 (375 metres); 3 kW.—7.0, Chimes and Sextet Selections: Selection from Alma de Dios (Serrano); Selection from Aida (Verdi); Selection from Boccaccio (Suppe); Interlude by Luis Medina. 8.0, Dance Music relayed from the Alcázar. 8.25, News. 9.45, Market Prices Report. 10.0, Chimes, followed by Selections from (a) "Carceleras"; One Act Musical Play (Peydré—Text by Ricardo de la Vega), (b) "Doloritas" (Vives and Quislaüt—Text by Carlos Araiches). 12.25 a.m. (Sunday), News. 12.30 a.m. (approx.), Close Down.

MILAN, Call IM1 (549 metres); 7 kW.—6.55, Time Signal, Wireless Notes and Announcements. 7.15, Talk by Mr. G. Ardu. 7.25, News. 7.30, Time Signal. 7.32, Variety Concert: Overture to Heinekehr aus der Fremde (Mendelssohn); G. M. Ciampelli, Talk: The History of Aesthetics of Music; French Songs, (a) Si, vous voulez que je vous chante, (b) Ce fut en mai, (c) Marcabru, Villanelle; Pianoforte Solo, Variations s'écrites (Mendelssohn); Soprano Solo from Manon (Massenet); Reading by Angelo Sordini; Quintet Selection, I dispettosi amanti (Parelli); French Songs, (a) Pastourelle (d'Arras), (b) Calendamaio (de Vacquieras), (c) A l'entrada del tems Clar (Germain Deprés); Pianoforte Solos, (a) Fuga (Porpora-Censil), (b) Passacaglia (Handel-Censil); Soprano Solo, Due rispetti (Wolf Ferrari); Quintet Selection from Boris Godounoff (Moussorgsky). 9.55, News. 10.0, Music by the Tzigane Orchestra from the Fiaschetta Toscana. 10.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (290.9 metres), Östersund (720 metres), Sundsvall (545.6 metres).—10.15 a.m., Running Commentary on the departure of "M. S. Kungsholm" on her maiden voyage to America. 4.0, Concert of Light Music. 5.0, Programme for Children. 5.30, Cabaret Programme relayed from Göteborg. 6.30, Talk: Work and Workers. 6.45, Schubert Pianoforte Recital: Impromptu in A Flat Major, Op. 90; Impromptu in A Flat, Op. 142; Moment musical in F Minor; Impromptu in E Flat Major. 7.0, Concert by Military Band: March, Graf Zeppelin (Teike); Fantastic Overture (Foroni); Torch Dance (Meyerbeer); Valse romantique (Heinecke); Suite No. 2 on Swedish motive (Löfgren); Mazurka (Sala); March, National Emblem (Baglery). 8.0, Topical Talk. 8.45, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

Saturday, November 24th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

NAPLES, Call INA (333.3 metres); 1.5 kW.—3.45, Weather Report and News. 3.50, Reading. 3.58, Chamber of Commerce Report. 4.0, Concert of Variety Music. 4.30, Time Signal. 4.35, Foreign Report. 7.30, Wireless Notes. 7.40, Announcements. 7.50, News. 7.58, Harbour Notes. 8.2, Programme of Neapolitan Music from the Works of De Leva, M.E. Murolo, Talk: Thoughts on the Art of De Leva: Suite for String Instruments, Sera di luna, (a) Adagio, (b) Pastorale, (c) Barlesca-Preludio; Reading from the Novel "L'usciera" by the Author, Murolo; Soprano Solos, (a) Romance from La Camargo, (b) Triste aprile, (c) Voce tra campi, (c) Serenata a Pierrot, (d) Bocca dorata; Recitations by E. Murolo of Neapolitan Poems: Uccchie assassine, Lacreme amare, Pastorale, E Spingule francese. 9.50, News. 9.55, Calendar and Programme Announcements. 10.30 (approx.), Dance Music from the Trocadero. 10.30 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (500 metres) and Rjukan (448 metres).—5.0, Programme for Children. 6.0, Children's Birthday Greetings. 6.15, Weather Report, News and Agricultural Prices. 6.30, Talk: The History of the Postal Administration. 7.0, Time Signal. 7.2, Book Talk by M. Charles Kent. 7.30, Orchestral Concert of Light Music: Spanish Dance (Moszkovsky); Melody; Minuet (Bocherini); Sunshine on the Sea (Curtis); Troikafahrt (Tchaikovsky); Träumerei and Cradle Song (Schumann); A Love Letter in G Major (Königsberger); Selection from A Thousand and One Nights (Blyle); Valse infidèle (Mackeben); Ballet Music from Sylvia (Delibes). 8.30, Weather Report and News. 8.45, Topical Talk. 9.0 Songs and Revue. 9.30, Dance Music by the Orchestra of the Grand Hotel. 10.30 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—5.0, Padeloup Concert. 6.30, Radio Journal de France. 8.0, Sports Review. 8.30, Programme relayed from Lille (264 metres), followed by Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW. 5.0, Padeloup Concert. 7.10, Weather Report.—7.30, "Le Journal Parlé."

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Concert: Overture to Die Fledermaus (Strauss); Selection from The Huguenots (Meyerbeer). 9.25, News. 9.30, Symphony Music: Andante from the Concerto for Flute and Orchestra (Mozart); Presto from the Seventh Symphony in A (Beethoven). 10.0, News and Concert: Orchestral Suite from Carmen (Bizet); Bruyères des Préludes (Debussy); March from Tannhäuser (Wagner).

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—12.30, Concert of Gramophone Selections: Overture to Coriolanus (Beethoven) by the Orchestra of the Concert Hall, Amsterdam; Fire Magic from Siegfried (Wagner) by the Bayreuth Festival Orchestra; Les vieilles de chez nous (Levadé) by M. Lucien Fugère; Song of the Black Hussars; Berceuse (Gretchaninoff) by M. Rogatchewsky; Septuor (Saint-Saëns); Pianoforte Solo, Military March (Schubert); Chilly Pom Pom Pee, by Ray Starita and his Ambassadors Band; Fox-Trot, Les Ailes (Zanicnick) by the Cliquot Club Eskimos; Laugh, Clown, Laugh (Gionto) by Grigoras Dinieou and his Tzigane Orchestra; Fox-Trot, Good News, by Fred Rich and his Orchestra; Tango, Alma Criolla (Luchesi) by the South American Orchestra, J. M. Luchesi; News in the Intervals. 2.0, Market Prices and Religious Information. 3.45, Concert arranged by the Rosati. News in the Intervals. 7.0, Agricultural Report. 7.45, Talk arranged by the Union des Grandes Associations Françaises: The Colonial Exhibition of 1931, followed by Market Prices. 8.0, Programme for Children. 9.0, Concert: Melodies and Dance Music by the Joss Chislery Symphonians; News in the Intervals.

POENI (344.8 metres); 1.5 kW.—3.0, Talk. 3.30, Musical Selections. 4.15, Soprano Recital of Italian Songs: Il mio bel focolo (Marcello); Se non fosero (Perti) Tre giorni son che Nina (Pergolesi); Pur dicesti (Lotti); Airs from Italian Opera; Vorrei inorir (Fosti); Anore amor (Tirindelli); Primavera (Tirindelli). 4.45, Talk on Scouts. 5.0, Programme from Warsaw.

6.0, English Lesson by Dr. Arend. 6.25, Mr. Hemiczek, Talk: After the Football Season. 6.50, Talk by Mme. Sabina Swidzinska. 7.15, Finance Report. 7.30, Programme from Warsaw. 9.0, Time Signal and Miscellaneous Items, by Mr. J. Warnecki. 9.20, News and Weather Report. 9.30, Cabaret Programme. 11.0, Concert arranged by La Maison Philippi. 1.0 a.m. (approx.), (Sunday), Close Down.

PRAGUE (348.9 metres); 5 kW.—3.10, Talk for Women. 3.20, Talk. 3.30, Orchestral Concert. 4.30, Talk. 5.0, Programme for Children. 6.30, Dramatic Programme relayed from Bratislava (300 metres). 9.0, Time Signal and News. 9.25, Dance Music from the French Restaurant Sramota.

ROME, Call IRO (447.8 metres); 3 kW.—4.30, Vocal and Instrumental Concert. 6.50, Time Signal, Wireless Notes and Announcements. 7.10, Sports Notes, News, Exchange Quotations and Weather Report. 7.20, Time Signal and Topical Talk. 7.45, "Suor Angelica"—Opera (Puccini), followed by Acts 1 and 2 of "Mephistopheles"—Opera (Boito). In the Interval, Review of Art and Literature by Lucio D'Ambrà. 9.50, News. 10.0, Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.98 and 31.4 metres); 30 kW.—11.58, Weather Report. 12.0 Midnight, Stalder's Pennsylvanians from New York. 12.30 a.m. (Sunday), Musical Selections from the Hotel Sagamore, Rochester. 1.0 a.m., Musical Selections from the Hotel Onondaga, Syracuse. 1.30 to 4.0 a.m., New York Relay. 1.30 a.m., "The Park Bench." 2.0, Symphony in Brass. 3.0 a.m., Lucky Strike Programme. 4.0 a.m., Time Signal and Dance Music from the Hotel De Witt Clinton, Albany. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—3.30, Concert 4.30, Market Report. 5.15, Concert of Turkish Music. 7.30, Weather Report and Time Signal. 7.40, Orchestral Concert: The Third Symphony (Beethoven); Song; Symphonic Poem, Antar (Rimsky-Korsakoff). 9.0, News and Close Down.

STUTTGART (379.7 metres); 4 kW.—2.15, Concert by the Station Orchestra: Overture to Das Spitzentuch der Königin (Strauss); Andante from the Sonata in F Minor (Brahms); Liebestreue (Brahms); Selection from Frauenliebe und Leben (Schumann); Selection from Boris Godounoff (Moussorgsky); Mit dem Püppchen (Moussorgsky); Wiegenlied (Humperdinck); Selection from Hansel and Gretel (Humperdinck). 3.35, Programme from Frankfurt. 5.0, Talk relayed from Freiburg (577 metres). 5.30, Talk from Voxhaus. 6.0, Book-keeping Lesson by Dr. Wolff. 6.30, Concert from the Works of Mozart: Overture and three Contredances; Selection from Mithridates; Symphony; Lieder; Divertimento. 7.30, Time Signal and Sports Notes. 7.45, Variety Concert, followed by Humorous Swabian Programme. 10.30, Dance Music from the Pavillon Excelsior.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.45, Concert. 8.0, Exchange Quotations and News. 8.30, Two Operas (Verdi), (a) "Aida," (b) "La Traviata." 11.0, North African News. 11.15 (approx.), Close Down.

VIENNA (517.2 metres); 15 kW.—2.30, "Horribilicribrifax"—Farce in Five Acts (Gryphus). 4.30, Chamber Music, The Trout Quintet (Schubert). 5.10, Selections from the Works of Reinhold Sternbach (Died August 9th 1920), by Maria Gutmann. 5.40, Dr. Rudolf Krassnick, Talk: Welfare Legislation. 6.10, "Die schöne Müllerin"—Song Cycle (Schubert-Müller). 7.20, Orchestral Concert from the Works of Suppé, Czibulka and Hellmesberger, followed by Phototelegraphy Transmission.

VILNA (435 metres); 1.5 kW.—2.10, Concert of Gramophone Selections. 3.10, News in Lithuanian. 3.30, Announcements. 3.45, Talk for Women by Mme. Ela Buncler. 4.10, Reading of Poems. 4.35, Programme from Warsaw. 5.0, Programme from Warsaw. 6.0, News. 6.30, Programme from Warsaw. 7.0, Art Talk by Prof. Jules Klos. 7.30, Programme from Warsaw.

WARSAW (1,111 metres); 10 kW.—4.10, Education. Talk by Dr. B. Suchodolski. 4.35, Prof. H. Moscicki, Talk: The History of the Nation. 5.0, Programme for Children. 6.0, Miscellaneous Items. 6.30, "Radio-Chronique," by Dr. M. Stepowski. 6.55, Time Signal. 7.0, Agricultural Report. 7.5, News and Announcements. 7.30, "Lilac Time"—Operetta (Schubert). 9.0, Aviation Notes and Weather Report. 9.5, News. 9.20, Police Announcements and Sports Notes. 9.30, Dance Music from the Oaza Restaurant. 10.30, (approx.), Close Down.

ZURICH (588 metres); 1 kW.—6.0, Chimes from the Zurich Churches. 6.15, Time Signal and Weather Report. 6.17, Request Programme by the Yodel Double Quartet. 7.45 (approx.), Symphony Concert relayed from Basle (1,010 metres). 9.0, Weather Report and News. 9.10 Gramophone Selections of Dance Music.

SUNDAY, NOVEMBER 25th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

Programmes from Abroad.—

- BARCELONA** (Radio-Barcelona), Call EAJI (344.8 metres); 1.5 kW.—11.0 a.m., Chimes relayed from the Barcelona Cathedral, followed by Weather Report for Europe and Forecast for North-East Spain and Aviation Route. Conditions. 1.30, Selections of Light Music by the Iberia Trio with Gramophone Records at intervals. 2.45 to 6.0, No Transmission. 6.0, Opening Signal and Stock Exchange Quotations. 6.10, Concert by the Station Orchestra. In the interval from 7.0 to 7.20, Weekly Transmission of the Catalan Agricultural Institute at San Isidro. 8.40, Sports News. 9.0 (approx.), Close Down.
- BASLE** (1,010 metres); 1.5 kW.—Programme relayed from Bern.—7.0, Concert. 9.0, Sports Notes, Late News Bulletin and Weather Report. 9.15 (approx.), Close Down.
- BERGEN** (370.4 metres); 1.5 kW.—9.30 a.m., Relay of Morning Service and Sermon. 11.30 a.m., Weather Report and Forecast and General News Bulletin. 7.0, Concert by the Station Orchestra. 7.20, Organ Recital, by Kantor Karsten Solheim. 7.50, Topical Talk. 8.30, Musical Programme. 9.0, Weather Report and Forecast, Late News Bulletin and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.
- BERLIN** (Königswusterhausen), (1,250 metres); 40 kW.—7.55 a.m., Garrison Church Chimes from Potsdam. 8.0 a.m., Recital of Music and Address relayed from Voxhaus and followed by Berlin Cathedral Chimes. 10.30 a.m. (approx.), Concert relayed from Voxhaus. 1.30 to 2.25, Three Talks for Farmers, relayed from Voxhaus. 2.30, Stories for Children, relayed from Voxhaus. 3.30, Programme of Music followed by relay of another German Programme. 9.15, Late News Bulletin and Sports News. 9.30, Light Music. 11.30 (approx.), Close Down.
- BERLIN** (Voxhaus), (494 metres); 4 kW.—7.55 a.m., Garrison Church Chimes relayed from Potsdam. 8.0 a.m., Choral and Instrumental Concert and Address, followed by Berlin Cathedral Chimes. 10.30 a.m. (approx.), Concert. 1.30 to 2.25, Three Talks on Agriculture. 2.30, Children's Half Hour. 3.0, Talk. 3.30, Light Music, followed by Advertisements. 5.40 to 7.0, Three Talks. 7.0, Concert. 9.15, Weather Report and Forecast, Time Signal, Sports News and Late News Bulletin. 9.30, Dance Music. 11.30 (approx.), Close Down.
- BERN** (411 metres); 1.5 kW.—9.30 a.m. to 10.30 a.m., Religious Address. 12.0 Noon, Time Signal and Weather Report and Forecast. 12.5, Concert. 6.29, Time Signal and Weather Report. 6.30, Reading or Talk. 7.0, Concert. 8.45, Sports Notes, Late News Bulletin and Weather Report, followed by Musical Programme. 9.35 (approx.), Close Down.
- BEZIERS** (158 metres); 0.6 kW.—9.30, General News Bulletin and Sports Notes. 8.45, Concert arranged by "La Maison Relin-Missoles." Gramophone Records of Light Music. 10.30 (approx.), Close Down.
- BRESLAU** (322.6 metres); 4 kW.—Programme relayed by Gleiwitz (329.7 metres).—8.15 a.m., Chimes relayed from Christ Church. 10.0 a.m. (approx.), Morning Concert. 1.0, Ten Minutes for the Amateur Gardener. 1.10, Talk or Literary Programme. 1.35, Chess Talk. 2.0, Stories for Children. 2.30, Agricultural Notes. 7.15, Recitations by the well-known Elocutionist, Käthe Graber. 9.0, Late News Bulletin. 9.30, Dance Music. 11.0 (approx.), Close Down.
- BRUSSELS** (508.5 metres); 1.5 kW.—5.0, Orchestral Concert relayed from the Palace Hotel. 6.0, Children's Corner by Bonzo and Sylvia of the Théâtre des Enfants. 6.30, Concert by the Radio Belgique Trio. 7.30, "La Radio Chronique." 8.15, Orchestral Concert with Solos on the occasion of the Fifth Anniversary of Radio Belgique: Basque Rhapsody (Gabriel Pierné) rendered by the Grand Orchestre conducted by M. René Tellier. 10.10, Late News Bulletin. 10.30 (approx.), Close Down.
- BUDAPEST** (556.6 metres); 20 kW.—8.0 a.m., News from the Press and Talk for Women. 9.0 a.m., Relay of Morning Service and Sermon. 11.30 a.m. (approx.), Concert. 3.15, Concert. 6.30 (approx.), Concert or Relay of an Opera. 9.30, Programme of Tzigane Music. 10.30 (approx.), Close Down.
- COLOGNE** (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres), and Münster (250 metres).—8.45 a.m., Boxing Instruction by Dr. Ludwig Bach. 7.5 a.m., Weekly Summary in Esperanto by Alfred Dormanns. 7.15 a.m., Instruction on the Lute and Guitar by Oly Wirtz-Koort. 7.35 a.m., Esperanto Lesson by Alfred Dormanns. 8.0 a.m., Church Chimes. 8.5 a.m., Evangelical Recital with Address. 12.0 Noon, Concert. 3.30, Concert of Orchestral Music. 6.0, Talk. 6.45, Sports News. 7.0, Choral Concert of Schubert's Church Music. Mass in G Major followed by Late News Bulletin, Sports News and Musical Programme. 11.0 (approx.), Close Down.
- CORK**, Call 6CK (400 metres); 1.5 kW.—8.30, Concert of Vocal and Instrumental Music: Programme Itens by the Cork Municipal School of Music Choral Society, conducted by Herr Aloys Fleischmann, with the collaboration of J. V. Keohan (Tenor), Master Gerard Shanahan (Pianoforte), Elizabeth Mellor (Soprano), and the Station Sextet. 11.0, National Anthem and Weather Report and Forecast. 11.15 (approx.), Close Down.
- CRACOW** (566 metres); 1.5 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 10.56 a.m., Relay of the Fanfare from the Notre Dame Church, followed by Time Signal and Weather Report. 1.0 and 1.20, Two Talks on Agriculture. 1.40, "La Chronique Agricole," by Dr. St. Wasniewski. 2.15, Concert relayed from Warsaw. 7.30, Concert devoted to the works of Richard Strauss. Tennyson's poem "Enoch Arden," with incidental music by Madame Lena Meyerhold and Mr. Casimir Meyerhold. 9.0, Programme relayed from Warsaw. 9.30, Light Music relayed from a Restaurant. 10.30 (approx.), Close Down.
- DUBLIN** (Call 2RN (319.1 metres); 1.5 kW.—8.30 to 11.15 (approx.), Programme relayed from Cork. 8.30, Concert of Vocal and Instrumental Music. Programme arranged by the Choral Society of the Municipal School of Music (Conductor: Herr Aloys Fleischmann), followed by Pianoforte, Soprano and Tenor Solos and Selections by the Station Sextet. 11.0, National Anthem and Weather Report. 11.15 (approx.), Close Down.
- FRANKFURT** (428.6 metres); 4 kW.—Programme relayed by Cassel (252.1 metres).—7.30 a.m. to 8.30 a.m. (approx.), Recital and Address. 12.0 Noon, Transmission arranged by the Wiesbaden Agricultural Institute. 7.30, Musical or Literary Programme. 9.30 (approx.), Dance Music. 11.0 (approx.), Close Down.
- HAMBURG**, Call HA (in Morse), (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres), and Kiel (254.2 metres).—7.25 a.m., Time Signal. 7.30 a.m., Weather Report and Forecast and General News Bulletin. 7.50 a.m., Current Economic Questions. 8.15 a.m., Morning Concert with Instrumental and Vocal Items. 9.55 a.m. (for Kiel only), Service and Sermon relayed from the University Church, Kiel. 10.0 a.m., Technical Talk. 1.0, Programme for Children by Funkheinzelmann. 2.0, Concert of Light Music. 6.30, Talk arranged by the Hamburg School of Physical Training. 6.40, Sports Notes. 6.55, Weather Report and Forecast. 7.0, Concert or Play. 9.30, Weather Report and Late News Bulletin, followed by Popular Concert. 10.50 (for Hamburg, Bremen and Kiel), North Sea and Baltic Weather Report. 11.0 (approx.), Close Down.
- HILVERSUM** (1,071 metres); 5 kW.—12.40, Light Music by the Wireless Trio. 2.10, Concert relayed from the Amsterdam Concert Hall. 3.40, Concert. 7.40, General News Bulletin and Sports News. 7.50, "Tiefand," Opera by d'Albert. 11.0 (approx.), Close Down.
- HUIZEN** (340.9 metres); 4 kW.—Transmits from 5.40 to 1.870 metres.—8.5 a.m. to 9.0 a.m., Relay of Morning Service and Address. 10.0 a.m., Divine Service. 12.10, Trio Concert. 1.10, Talk. 1.40, Talk. 2.10, Concert. 4.40, Relay of Church Service from Hoogveen (on 1,870 metres), Sermon by the Minister, the Rev. A. Meijers. 7.30 (approx.), Orchestral Concert. 10.25, Choral Epilogue, conducted by Mr. Jos. H. Pickkers. 10.40 (approx.), Close Down.
- KALUNDBORG** (1,680 metres); 7 kW.—Programme also for Copenhagen (337 metres).—9.0 a.m., Divine Service relayed from Copenhagen. 10.30 a.m. to 10.40 a.m. (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 12.0 Noon to 12.25, Lesson in German, arranged by "Radiolytteren." 12.30 to 12.55, French Lesson, arranged by "Radiolytteren." 5.50 (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 6.0, News from the Press. 6.15, Time Signal. 6.30 Talk. 7.0, Town Hall Chimes from Copenhagen. 7.5, "Hostgildet," Musical Play in One Act by Thomas Thaarup, Music by J. A. P. Schutz. 10.0, Dance Music relayed from the Palace Hotel, Copenhagen. In the interval at 11.0, Town Hall Chimes, relayed from Copenhagen. 11.30 (approx.), Close Down.
- KATOWITZ** (422 metres); 10 kW.—9.15 a.m., Relay of Morning Service. 11.0 a.m., Time Signal and Weather Report and Forecast. 11.10 a.m., Popular Concert by the Kattowitz Radio Quartet: The Fifth Symphony in C Minor (Beethoven). 1.0, Religious Talk. 1.20 and 1.40, Agricultural Talks. 2.0, Weather Report and Forecast. 2.15, Concert relayed from Warsaw. 5.0, Orchestral Concert. 7.30, Orchestral Concert. 9.0, Weather Report and Forecast, Press Review and Sports News. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.
- KAUNAS** (2,000 metres); 7 kW.—12.0 Noon, Relay of Programme from the War Museum on the occasion of the Tenth Anniversary of the Formation of the Lithuanian Army: President Antanas Smetona will deliver an Address in Honour of those who fell in the cause of Lithuanian Independence. 6.15, Orchestral Concert with Soloists. 9.30 (approx.), Close Down.
- KÖNIGSBERG** (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres). 8.0 a.m., Morning Recital of Choral and Instrumental Music with Address. 10.0 a.m. (Königsberg only), Weather Report and Forecast. 10.15 a.m., Concert by the Königsberg Station Orchestra. 11.55 a.m., Time Signal relayed from Nauen, followed by Weather Report. 3.30, Orchestral Concert. 7.0, "A Drama of Love and Death," by Romain Rolland, Dramatic Scenes from the French Revolution. Produced by Walter Otten-dorff. 9.15, Late News Bulletin and Sports News, followed by Silent Night for reception of Foreign Stations.
- LAHTI** (1,522.8 metres); 35 kW.—Programme also for Helsinki (375 metres). 8.0 a.m., Relay of Morning Service. 9.50 a.m., News from the Press. 10.0 a.m., Concert. 10.50 a.m., Weather Report and Time Signal. 11.0 a.m., Relay of Morning Service in Swedish. 3.0, Musical Programme. 4.0, Talk. 4.25, Concert by the Station Orchestra. 5.40, Selections by the Station Orchestra. "La Poupée," by Audran. 6.0, Recital of Music. 7.45, Late News Bulletin given in Finnish and Swedish. 9.0 (approx.), Close Down.
- LANGENBERG** (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—8.45 a.m., The Art of Self Defence. 7.5 a.m., Review in Esperanto of the week's programmes, by Alfred Dormanns. 7.15 a.m., Music Lesson by Oly Wirtz Koort. 7.35 a.m. to 7.55 a.m., Talk in Esperanto by Alfred Dormanns. 8.0 a.m., Relay of Church Chimes. 8.5 a.m., Evangelical Recital of Choral and Instrumental Music and Address. 11.0 a.m., Organ Recital by Professor Hans Bachem: Prelude and Fugue in E Minor (Dietrich Buxtehude). 12.0 Noon, Musical Programme. 3.30, Orchestral Concert. 7.0, Concert or Play, followed by Late News Bulletin, Sports News and Light Music. 11.0 (approx.), Close Down.
- LEIPZIG** (365.8 metres); 4 kW.—Programme relayed by Dresden (275.2 metres).—7.30 a.m., Organ Recital relayed from the University Church, Leipzig. Organist: Ernst Müller. 8.0 a.m., Choral and Instrumental Concert. 2.0, Selections of Light Music. 4.0, Concert. 5.30, Talk. 6.30, A German Requiem based on the Words of the Holy Scriptures, by Johannes Brahms, executed by the Leipzig Symphony Orchestra under the direction of Alfred Szeidl and the Leipzig Oratorio Society. 9.0, Sports News. 9.30, Dance Music relayed from Berlin. 11.30 (approx.), Close Down.
- LYONS** (Radio Lyon), (291 metres); 1.5 kW.—7.45, "Le Journal Parle," and News from the Press. 8.0, Concert of Instrumental Music. Pianoforte Solos by Madame Ducharme of the Lyons Conservatoire and Cello Solos by M. Testanière. Scènes Alsaciennes by Massenet. 9.0 (approx.), Close Down.
- MADRID** (Union Radio), Call EAJ7 (375 metres); 3 kW.—Programme relayed by Salamanca (EAJ22) (405 metres).—11.30 a.m., Municipal Band Concert relayed from El Retiro (weather permitting). Conductor: Maestro Villa. 2.0, Chimes and Time Signal. 2.5, Concert by the Station Orchestra, with Interlude by Luis Medina. 3.30 to 7.0, No Transmission. 7.0, Relay of Chimes followed by Sextet Music; Selections from "La Verbena de la Paloma" (Breton). 8.0, Dance Music by the Palermo Orchestra relayed from the Alkazar. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Military Band Concert. 12.0 Midnight, Chimes followed by Dance Music from the Alkazar by the Palermo Orchestra. 12.30 (approx.) (Monday), Close Down.
- MILAN**, IMI (549 metres); 7 kW.—9.0 a.m., Opening Signal and Lesson in English. 9.30 a.m. to 10.0 a.m., Recital of Sacred Music. 11.30 a.m., Time Signal and Concert by the Station Quartet. 12.30 to 3.0, No Transmission. 3.0, Opening Signal. 3.5, Concert by the Station Quintet. 4.15, Tzigane Music relayed from the Fiascherteria Toscana. 5.0 to 6.55, No Transmission. 7.30, Time Signal, followed by "L'Amico Fritz," Opera by Mascagni. 10.45 (approx.), Close Down.

Programmes from Abroad.—

MOTALA (1,380 metres); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.0 metres), **Ostersund** (720 metres) and **Sundsvall** (545.6 metres).—10.0 a.m., Relay of Morning Service from a **Stockholm** Church. 4.55, **Stockholm** Town Hall Chimes. 5.0, Divine Service relayed from **Stockholm**. 8.15, Late News and Announcements and Weather Forecast. 9.10, Concert by a String Orchestra, relayed from **Göteborg**. 10.30 (approx.), Close Down.

MUNICH (535.7 metres); 4 kW.—Programme relayed by **Augsburg** (566 metres), **Kaiserslautern** (277.8 metres), and **Nuremberg** (241.0 metres).—2.0, Musical or Literary Programme. 4.30, Violin and Pianoforte Recital. Violin Solos by Professor Leo Petroni. Herr Richard Staab at the Piano. 8.0 (approx.), Late News Bulletin. 10.30 (approx.), Close Down.

NAPLES Call INA (333.3 metres); 1.5 kW.—9.0 a.m., Concert of Sacred Music. 3.45, Programme for Children. 4.0, Vocal and Orchestral Concert. 4.30, Time Signal. 7.30, Topical Talk. 7.50, Bulletin of the Naples Harbour Authorities. 8.02, Orchestral Concert, Selections from "The Flying Dutchman," by Wagner. 9.0, Sports Notes. 9.55, Calendar and programme announcements for the next day. 10.0 (approx.), Close Down.

OSLO (481.5 metres); 1.5 kW.—Programme relayed by **Fredrikstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—9.50 a.m., Carillon. 10.0 a.m., Service relayed from the Garrison Church. 6.15, Weather Report and Forecast and Press News followed by Literary or Musical Programme. 8.30, Weather Report and News from the Press. 8.45, Talk on Current Events. 10.30 (approx.), Relay of Dance Music from the Hotel Bristol. 11.0 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—Programme relayed at intervals by the following stations: **Bordeaux PTT** (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille** (204 metres), **Limoges** (285 metres), **Lyons PTT** (480 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse PTT** (200 metres).—8.0 a.m., General News Bulletin and Time Signal. 9.25 a.m., International Time Signal and Weather Report and Forecast. 12.0 Noon, Concert arranged by "Les Editions Salabert." 1.0, Industrial Notes. 1.30, Concert organised by the General Association of French Wireless Listeners. 4.0, Padeloup Concert of Symphony Music conducted by M. Rhené Bâton; Le Radio Journal de France. 8.0, The Day's Sport. 8.30, Concert organised by the General Association of French Wireless Listeners, followed by Late News Bulletin, Time Signal and Weather Report. 10.30 (approx.), Dance Music relayed from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—7.56 a.m., Time Signal on 32.5 metres. 9.28 a.m., Time Signal on 2,650 metres. 5.0, Relay of Padeloup Concert. 7.10 to 7.20, Weather Report and Forecast. 7.30, "Le Journal Parlé par T.S.F." with Talks by Dr. Pierre Vachet, Detective Ashelbé, and M. René Casalis. 7.56, Time Signal on 32.5 metres. 8.0 to 9.0, Vocal and Orchestral Concert, Nocturne in F Sharp Major (Chopin). 10.28, Time Signal on 2,650 metres. 11.15 (approx.), Close Down.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Records. 8.50, Talk. 8.55, News from the Press. 9.0, Vocal and Instrumental Concert by Artistes from the Paris Opera and the Opéra-Comique; Overture to "The Italian Girl in Algiers," by Rossini. 9.25, General News Bulletin; Symphony Concert conducted by Professor Estyle, of the Paris Conservatoire. 10.0, Late News Bulletin. 10.15, Concert of Orchestral Music. 11.0 (approx.), Close Down.

PARIS (Radio L.L.), (370 and 60 metres); 1 kW.—12.30, Programme arranged by Radio Liberté, Topical Review and News and Announcements, followed by Trio Concert. 1.0, Carillon de Fontenay. 3.0, Concert Programme of Dance Music, arranged by "Les Etablissements Radio L.L." 9.0, Vocal and Instrumental Concert. 10.0, Carillon de Fontenay. 10.15 (approx.), Close Down.

PARIS (Radio Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and News from the Press. 8.30 a.m., Physical Culture Lesson, under the direction of Dr. Diffre. 12.0 Noon, Address by Father Dieux, followed by Programme of Sacred Music arranged by "La Vie Catholique." 12.30, News from the Press. 12.45, Concert of Light Music by the Albert Locatelli Orchestra with an item by Bilboquet in the interval. 4.30, Popular Gramophone Selections organised by "L'Industrie Musicale." In the interval, News from the Press. 7.0, Agricultural Notes and News from the Press. 7.45, The Radio-Paris Guignol. In the interval: "Les Jacasseries

Sunday, November 25th.

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de Polichinelle," by Bilboquet, Zecca, Brinchetays and Madame Karl. 8.30, Concert of Orchestral Music. In the intervals: News from the Evening Press and Late News Bulletin. 10.30 (approx.), Close Down.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.0, Sessions Chimes, followed by Church Service. 7.0, "Roxy's Stroll." Evening Programme from WJZ, New York. 9.45, Vesper Service relayed from the Shady Side Presbyterian Church, with Sermon by the Pastor, the Rev. Hugh Thomson Kerr. 11.30, Orchestral Programme. 12.0 Midnight, Session Chimes, Evening Service with Address from the Calvary Episcopal Church, Pittsburg, Pastor, Doctor E. J. Van Etten. 1.0 a.m., (Monday), National Broadcasting Company Programme from New York. 1.15 a.m., Collier's Radio Hour from New York. 2.15 a.m., The Utica Jubilee Singers' Programme from WJZ, New York. 2.45 a.m., El Tango Romantico from WJZ, New York. 3.15 a.m., Longine Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 11.05 a.m. and 11.30 a.m., Two Talks for Farmers. 11.55 a.m., Talk by Mr. Winiewicz. 2.15, Concert of Symphony Music relayed from the Philharmonic Hall at Warsaw. 6.45, Talk. 7.30, Concert devoted to the works of Polish Composers, with the collaboration of the "Haslo" Choir, under the direction of Professor Stanislas Kwasnik. Choral Selection, Le Signal (Kwasnik). 9.0, Time Signal. 9.5, Variety Items. 9.30, General News Bulletin and Sports Notes. 10.0, Dance Music, relayed from the Carlton Restaurant. 11.0 (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—8.0 a.m., Morning Concert of Sacred Music. 11.0 a.m. (approx.), Concert. 12.05, Commercial Notes. 12.20, Announcements. 3.30, Popular Concert. 4.30, Transmission for Workers. 6.0, German Programme. 7.0, Concert or Play. 9.0, Time Signal and Late News Bulletin. 9.20, Dance Music. 10.15 (approx.), Close Down.

RABAT, Call PTT (416 metres); 2 kW.—12.3 to 1.30, Concert of Orchestral Music. 4.0 to 6.0, Military Band Concert. 8.15, "Le Journal Parlé." 8.20, General News Bulletin. 8.30, Concert by the Station Orchestra and Soloists. 10.30, Dance Music. 11.0 (approx.), Close Down.

RIGA (528.3 metres); 4 kW.—8.0 a.m., Sacred Service. 9.15 a.m., Morning Service relayed from the Mara Church. 12.0 Noon, Music and Stories for Children. 3.0, Orchestral Concert. 4.0, Talks. 6.0, Concert with Soloists. 8.0, Weather Report and Forecast and Late News Bulletin. 8.30, Relay of Dance Music from the Café de l'Opera. 10.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—8.30 a.m., Lesson in German. 9.0 a.m., Vocal and Instrumental Concert. 9.45 a.m. to 12.0 Noon, No Transmission. 12.0 Noon, Opening Signal. 12.5 to 1.0, The Station Trio in a Concert of Light Music. 1.0 to 4.0, No Transmission. 4.0, Opening Signal. 4.5, Variety Concert. 7.15, Sports Notes and News from the Stefani Agency. 7.45, Concert by the Symphony Orchestra, Le Carnaval des Animaux by Saint-Saens. 9.50, Late News Bulletin. 10.0 (approx.), Close Down.

SAN SEBASTIAN (Union Radio), Call EAJ8 (335 metres); 0.5 kW.—10.0, Concert by the Orchestra at the Municipal Casino. 12.0 Midnight (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—6.30 to 7.0, United Radio Corporation Programme. 8.30, Recital of Organ Music by Elmer Tidmarsh from the Union College Memorial Chapel, Schenectady. 9.0, Meeting for Men under the auspices of the Bedford Branch of the Y.M.C.A., with a lecture by Doctor S. Parkes Cadman, relayed from Brooklyn, N.Y. 10.30, Acousticon Programme from New York. 11.0, Stetson Parade and the Band of the American Legion, relayed from Boston, Mass. 11.30, Musical Programme from New York. 11.30 a.m. (Monday), Evening Programme from the Capitol Theatre, New York. 2.0 a.m., Address on "Our Government," by David Lawrence, Editor of the "United States Daily," relayed from Washington, D.C. 2.15 a.m., Atwater Kent Entertainment from New York. 3.15 a.m., Correct Time. 3.17, a.m., Experimental Television Broadcast. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (434.8 metres); 1 kW.—2.0 to 3.0, Concert of Light Music by the Station Orchestra and Gramophone Records in the intervals. 9.30, Orchestral Concert of Spanish Music. 11.0, Flamenco Songs and Dance Music by the Station Orchestra. 11.30, (approx.) Close Down.

STAMBOUL (1,200 metres); 5 kW.—3.30, Concert. 4.30, Stock Exchange and Grain Market Quotations. 5.15, Concert of Turkish Music. 7.30, Meteorological Report and Correct Time. 7.40, Lecture on the History of Music. 7.55, Concert by the Wireless Orchestra. 9.0, Late News and Announcements. 9.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—Programme relayed by **Freiburg** (577 metres).—10.15 a.m. (approx.), Morning Recital. 11.0 a.m. (approx.), Orchestral Concert followed by Gramophone Records. 1.0, Funkheinzelmann's Programme for Children. 5.0, The German Requiem (Brahms) from Heidenheim. 5.30 (approx.), Literary or Musical Programme. 7.30 (approx.), Concert or Play followed by Light Music. Late News Bulletin and Sports News. 10.0 (approx.), Close Down.

TALLINN (408 metres); 2.2 kW.—8.0 a.m. (approx.), Relay of Morning Service. 1.0, Concert by the Station Orchestra. 6.0, Concert of Orchestral Music. 9.0 (approx.), Close Down.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.30, Meteorological Report, Municipal Market Reports and Local Fair Prices. 12.45, Orchestral Concert. 1.0, Correct Time. 1.45, Press Reports furnished by Local Newspapers. 8.0, Parisian Exchange and Grain Prices. 8.15, Press Reports supplied by Parisian Newspapers. 8.30, Orchestral Concert. 9.5, Concert arranged by "L'Association des Commerçants Radio-Électriciens du Midi," Selections from "Thais," Lyrical Comedy in Three Acts, Book by Louis Gallet, based on the Novel by Anatole France, Music by Massenet. 10.15, "Le Journal sans papier," giving North African News, followed by Late News and Announcements. 10.30 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 10.56 a.m., Time Signal. 11.0 a.m., Aviation Route Conditions and Weather Forecast. 11.10 a.m., Concert. 1.0 to 2.0, Agricultural Talks. 2.0, Weather Report and Forecast. 2.15, Concert of Symphony Music from the "Philharmonie de Varsovie," the Orchestra conducted by Mr. B. Szulc. Pianoforte Concerto in G. Major by Beethoven. 4.45, Aviation Talk by J. Osinski. 5.0, Popular Concert. 6.20, Talk. 7.30, Concert. 9.0, Aviation Route Conditions and Weather Forecast. 9.5, Late News Bulletin. 9.20, Police and Sports News. 9.30, Dance Music by the Orchestra of the "Oaza," conducted by W. Roszkowski. 10.30 (approx.) Close Down.

VIENNA (517.2 metres); 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres), and **Linz** (254.2 metres).—8.20 a.m., Morning Recital. 10.0 a.m., Concert by the Vienna Symphony Orchestra, conducted by Professor Paul von Kleinau; Songs with orchestral accompaniment by Emilie Bittner. 2.30, Picture Transmission. 3.0, Orchestral Concert. 6.35, Vocal and Instrumental Programme, followed by Concert or Play and Picture Transmission. 10.15 (approx.), Close Down.

VILNA (435 metres); 1.5 kW.—9.15 a.m., Relay of Morning Cathedral Service. 10.56 a.m., Time Signal. 11.0 a.m., General News Bulletin, relayed from **Warsaw**. 1.0 to 6.0, Programme relayed from **Warsaw**. 1.0 to 2.0, Three Talks on Agriculture. 2.15, Orchestral Concert, Symphonie Blues (Laks) conducted by the Composer. 4.25, Talk. 5.0, Concert. 6.0, Talk in Lithuanian. 6.20 to 10.30, Programme relayed from **Warsaw**. 6.20, Talk. 6.45, General News Bulletin and Time Signal. 7.30, Concert of Light Music. 9.0, Aviation Route Report and Weather Forecast. 9.5, News from the Polish Telegraphic Agency. 9.20, Sports Notes and Police Report. 9.50, Dance Music relayed from the "Oaza" Restaurant, **Warsaw**. 10.30 (approx.), Close Down.

ZAGREB (309.2 metres); 0.7 kW.—10.0 a.m., Concert by the Croatian Philharmonic Society; "Tod und Verklärung," by Rich. Strauss. 4.0, Popular Dance Music relayed from the Club Cabaret. 6.45, Wireless Notes. 7.0, Opera relayed from the Zagreb National Theatre; in the intervals, Late News Bulletin and Sports Notes. 10.0 (approx.), Close Down.

ZÜRICH (588 metres); 1 kW.—10.0 a.m., Concert from the Capitol Theatre. 11.0 a.m., Weather Report and Forecast. 11.30 a.m., The Wireless Orchestra. 3.0, Concert by the Castellano Orchestra relayed from the Carlton Elite Hotel. 6.30, Time Signal and Weather Report. 6.35, Religious Address. 7.0, Programme relayed from the Grossmünster, Zürich; The Station Orchestra conducted by Hermann Hofmann; Organist: Viktor Schlatter. 9.0, Weather Report and News from the *Neue Züricher Zeitung*. 9.30 (approx.), Close Down.

USEFUL DATA CHARTS. (NOS. 17 & 17A.)

Self-inductance of Solenoids.

THE self-inductance of a solenoid of circular section is given by the formula:—

$$L = L_0 N^2 D.$$

where L is in microhenrys

N = total turns.

D = diameter of coil in inches.¹

L_0 is a factor depending on the ratio of length to diameter of the coil.

The construction of the abac is shown as an operation in three stages in Fig. 1. In the first stage the equal lines indicate equal scales increasing upwards as shown by the arrows. On following the dotted lines from right to left we go through the process of finding L by multiplying together the quantities which lie on the right side of the formula.

Stage 2 brings in the simplifications of replacing $D^{1/2}$ (full scale) by D (half scale) and replacing $1/N$ by N with reversed scale.

In stage 3 the abac is folded up to one-third its size, using the scales of $L_0 N^2$ and L_0 as hinges, and as these

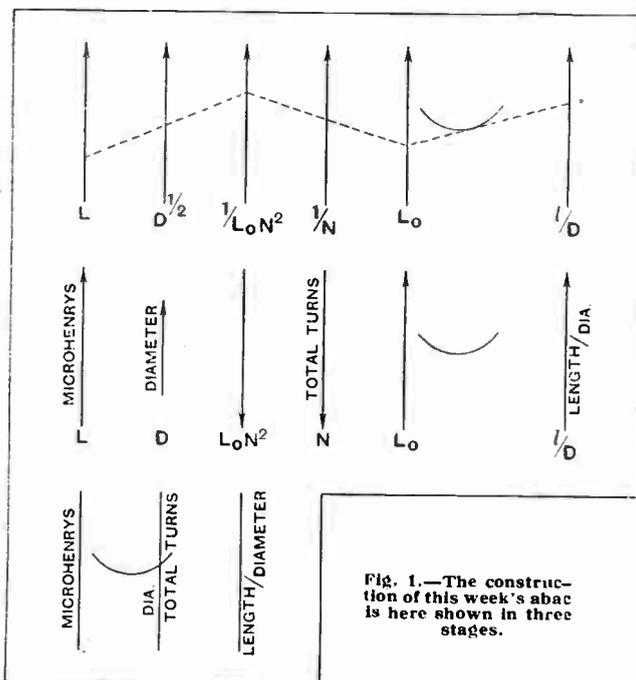


Fig. 1.—The construction of this week's abac is here shown in three stages.

two scales are superfluous in the final stage they are omitted.

The complete abac appears this week, and an inset is given which shows the order of procedure.

An Example.

A single-layer coil of circular section has an inductance of 204 microhenrys, its diameter is 4in., and 44 turns are used. The abac then shows that the corresponding ratio of length to diameter is 0.5; that is,

the winding should be spread over a length of 2 inches.

Again, we might be faced with the problem of designing a coil of given inductance with a certain ratio of length to diameter. Then, as in Fig. 2, the points A and B are fixed while C is free to slide on its vertical scale; accordingly we can choose any diameter of coil

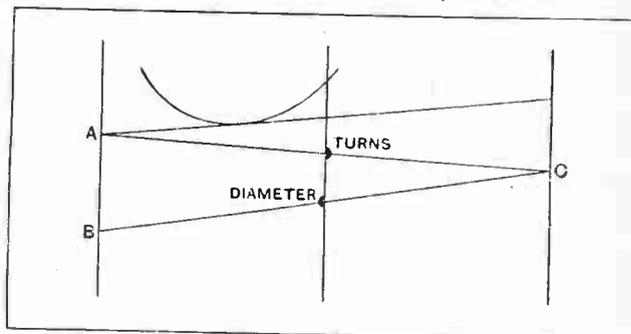


Fig. 2.—If the points A and B are fixed while C is free to slide on its vertical scale, a choice can be made of any diameter of coil and the corresponding number of turns found.

and find the corresponding turns. Thus in the example just given we might have a 4in. coil with 44 turns, 5in. with 39.4 turns, or 8in. with 31.2 turns.

Solenoids of Polygonal Section.

A solenoid wound on a former of polygonal section has the same inductance as a solenoid of the same length and turns wound on a round section former of suitably chosen diameter. This equivalent diameter is given by abac 17a, which is self-explanatory.

Thus a hexagonal ribbed former measuring 3in. when calipered across opposite vertices is equivalent to a round paxolin former of 2.74in. diameter. Strictly speaking, the correction factor should vary with the ratio of length to diameter, but between the limits 2 and 0.1 of this ratio the variation is less than the probable error in working abac 17.

The next useful data chart (Abacs Nos. 18 and 18a) will provide a method of measuring the self-inductance of multi-layer coils. The abac will be similar in construction to No. 17, and several examples will be worked out.

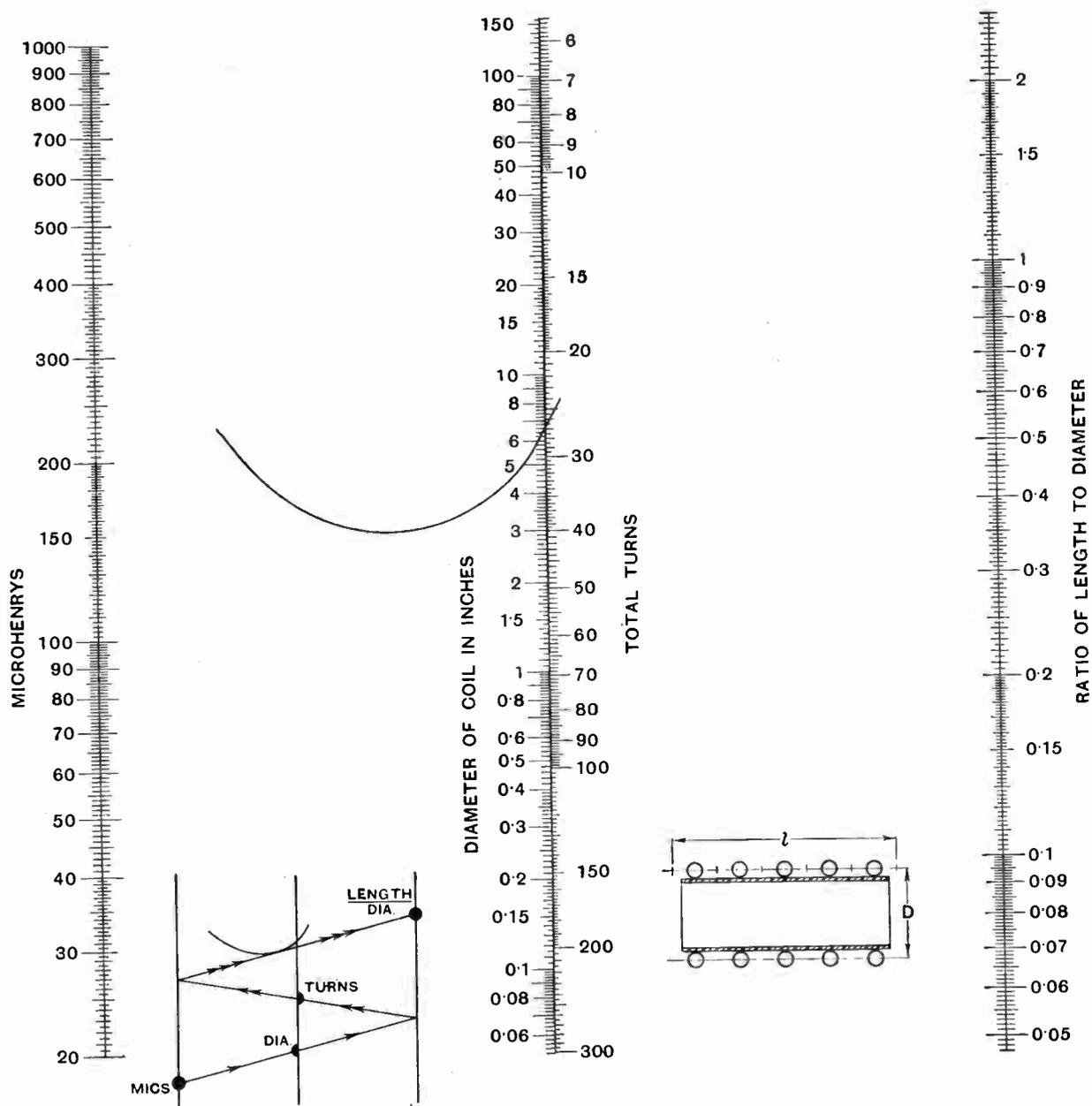
A sectional drawing of a typical coil will make the method of procedure of arriving at self-inductance quite clear to the amateur.

R. T. B.

In abac No. 15, which appeared on November 7th, the value of the capacity given in the example on p. 648 should read 0.0189 instead of 0.0095 microfarads. The error was caused by dropping a 2 in the calculation: if the abac had been used the error would not have arisen.

¹ Diameter = overall diameter of wound coil, less diameter of wire.

Length = number of turns multiplied by pitch

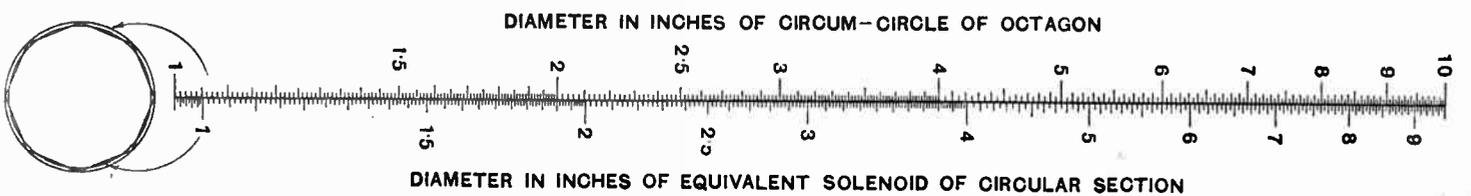
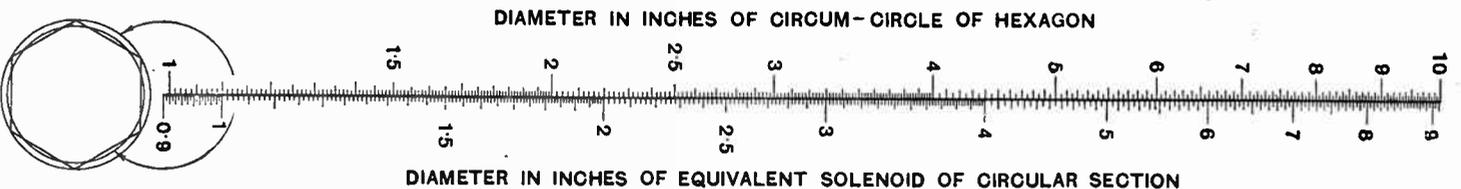
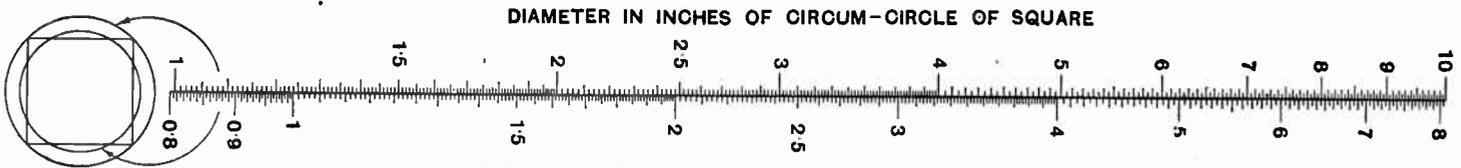


SELF INDUCTANCE OF SOLENOIDS OF CIRCULAR SECTION.

FOR CORRECTION FACTOR REQUIRED FOR SOLENOIDS
OF POLYGONAL SECTION SEE ABAC N^o 17 a.

W. W. ABAC

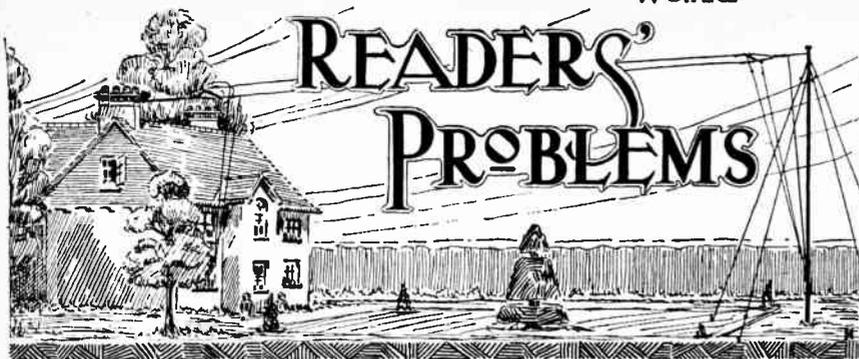
N^o 17



W.W. ABAG

SELF INDUCTANCE OF SOLENOIDS OF POLYGONAL SECTION

NO 17A



"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below in some cases at greater length than would be possible in a letter

The Kilo Mag Four.

Is it possible to substitute condensers of 0.0005 mfd. capacity in the "Kilo-Mag Four" receiver in place of the value specified? If possible, I should like to use those which I already have. H. T. F.

There is little practical objection to using condensers of 0.0005 mfd. in place of 0.0003 mfd. The only real disadvantage is that with coils as specified tuning will be comparatively sharper, but if slow-motion controls are fitted, this will not be serious.

○○○○

Remodelling the Original "All-Wave Four."

I am about to rebuild my "All-wave Four" receiver (the original model), adopting the circuit of the new set described in "The Wireless World" for June 13th. Do you recommend me to retain the separately tuned aerial circuit? Since I have mastered its operation, I believe that it is largely responsible for the exceptionally good results I have obtained, particularly on the long waves.

N. L. C.

If you do not object to an extra control, we would certainly recommend you

RULES.

(1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."

(2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.

(3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.

(4.) Practical wiring plans cannot be supplied or considered.

(5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

(6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

to retain the two-circuit tuner; although, as you probably realise, this will necessitate a slight increase in the size of the set.

○○○○

Differential Reaction.

Is it possible to use the Pye differential reaction control condenser in a receiver for the ultra-short wavelengths? If so, I should appreciate a hint as to how it may be connected.

N. L. E.

This component may certainly be used in a short-wave receiver, and it should be connected in the manner shown in Fig. 1, from which you will see that the moving plates are joined to the anode of the

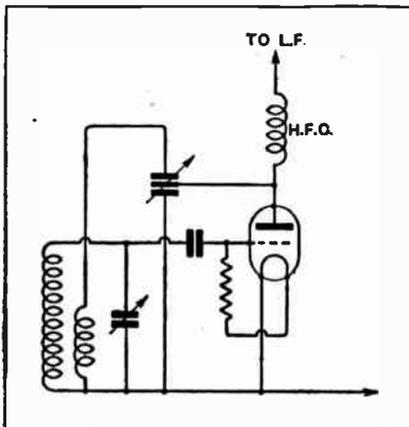


Fig. 1.—A short-wave detector circuit with a differential reaction condenser, which has two sets of fixed vanes.

valve, while one set of fixed plates is connected to negative filament and the other to the reaction coil (marked L₁ in the diagram). The inductance L is of course the grid coil.

The number of turns in the two windings will be more or less the same as in conventional circuits, but we may point out that it is always an advantage to adjust the reaction coil by the method of trial and error.

Reading Milliamps. on a Voltmeter.

I understand that it is possible to use a voltmeter for measuring the value of current flowing in the anode circuit of a valve; my own moving-coil instrument, when connected in this way, gives a deflection, but how can I convert the voltage indicated into milliamperes? P. H. M.

To convert volts into milliamps. you must first ascertain the total resistance of your instrument; unless this is marked, you will be able to obtain the necessary information from the manufacturers. This is generally given in the form of "ohms per volt," so the total resistance is got by multiplying this figure by the voltage indicated at full scale deflection. At this reading the current consumed is ascertained by dividing "voltage applied" by "resistance" (in ohms).

To take an example, we will consider a voltmeter reading from 0.6 and rated at 100 ohms per volt. The total resistance will be $100 \times 6 = 600$ ohms, so when the meter indicates 6 volts, the current consumed will be $6 \div 600 = 0.01$ amp. (or 10 milliamps.). The single volt divisions on the scale therefore represent $10 \div 6$, or about 1.6 milliamp.

You must not forget that the resistance of the voltmeter is much greater than that of a milliammeter, and that this factor may give rise to misleading results, particularly when the instrument is inserted in series with the anode of a low-impedance valve.

○○○○

Voltage Reducing Resistances.

In constructing a set and eliminator (as separate units), is it better to mount the voltage-reducing resistances in the receiver or in the H.T. unit? My set is to have a total of four valves, and the full voltage of the eliminator will be applied only in the output stage; there will be three series anode resistances. D. R. L.

This is not a matter of very great importance, but you will probably find it more convenient to include the resistances in the set; by doing so, the number of connections between receiver and H.T. unit will be reduced.

○○○○

Noisy H.T. Batteries.

Is there any easy way of testing my 120-volt H.T. battery so that I can prove conclusively if it is responsible for noises which have of late given a good deal of trouble? T. F. V.

We suggest that you might connect across the battery a pair of phones in series with a wire-wound resistance of about 100,000 ohms, which will limit the current flowing to about 1 milliampere; this is quite a safe value. You should then listen carefully, and assuming both phones and resistance to be perfect, you can rest assured that any noises heard will be due to the battery.

A still more conclusive test could be carried out by reducing the value of the resistance so that the current passed would approximately equal that taken by the set.

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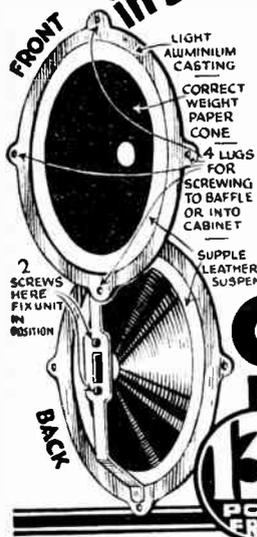
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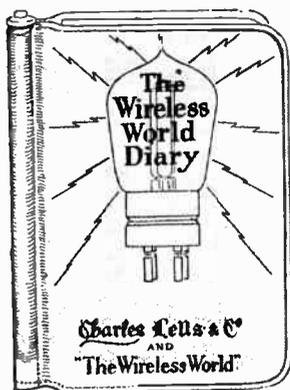
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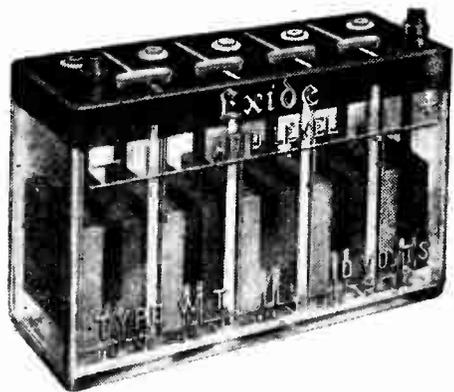
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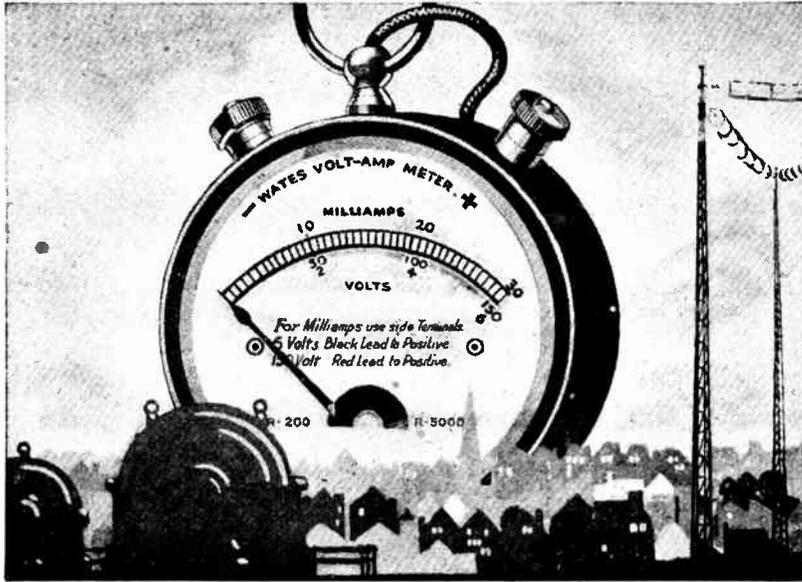
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THIS wonderful meter has provided conclusive proof of its amazing efficiency and range of usefulness. It is now selling as never before, and is the one essential possession of every radio user. It gives the three essential readings direct from one clearly engraved dial. Without it perfect set control is impossible. The Wates Meter does all you want. It has caused a complete revision of all existing standards of meter value. Ask your dealer to supply, or you can obtain direct. Write for interesting descriptive leaflet from Dept. W.W.

Stocked by Halford's Stores, Curry's Stores, and all Radio dealers.

THE STANDARD WET BATTERY CO. (The Wet H.T. Battery Co.),
184-188, Shaftesbury Avenue (near New Oxford Street end), London, W.C.2.

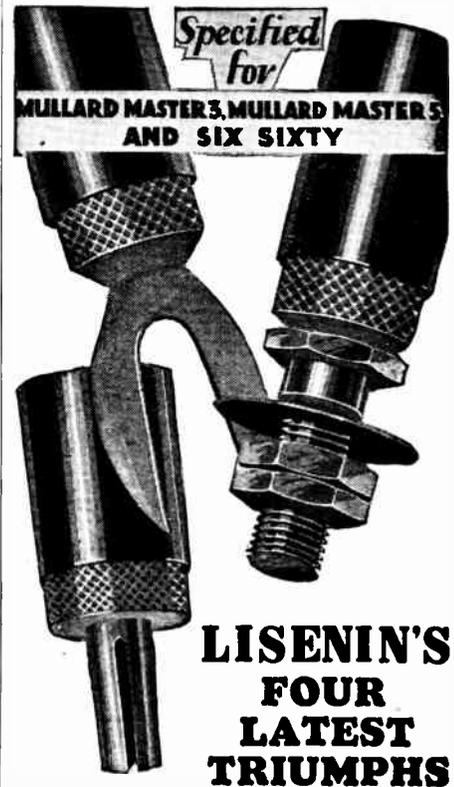
Readings :
0-150 volts.
0-6 volts.
0-30 milliamperes.
5,000 ohms Res.

WATES
"three in one"
VOLT-AMP
RADIO TEST METER

PRICE
8/6
Dead-beat movement, crystallised black finish.



M.B



LISENIN'S FOUR LATEST TRIUMPHS

- SIX-SIXTY MULLARD RECEIVER MASTER 3*
- 2 Spade Ends. 8 Wander Plugs.
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- MULLARD MASTER 5
- 4 Plugs and Sockets. 2 Spade Ends.

Also included in the *Cossor Melody Maker*.

Obtainable from all radio dealers. Look for the Lisenin show-case on the counter. Send for descriptive leaflet X1.

LISENIN

LISENIN WIRELESS CO.,
1d, Edgware Road, London, W.1

VAR-LAC
CONNECTING WIRE

Prevents internal short circuits. Perfect insulation. Ends easily stripped for connecting. No frayed edges. In six colours: Red, Blue, White, Green, Black, Yellow.

10 ft. coil, 18 S.W.G. 7d.
Four 2 ft. lengths, 16 S.W.G. 8d.

COSSOR MELODY MAKER.
Coloured connecting wires, cut, bent and looped to fit every connection, per set, 2/-

MULLARD MASTER THREE,
1/-

FLEXIBLE ELECTRIC CORDS LTD.,
QUEENSWAY, PONDERS END, MIDDX.

Protect Your Set with the

AERMONIC
Safety Earthing Switch.

Scientifically designed to adequately protect your set in all conditions. Has a fuse between the aerial and the set, thus giving security from lightning even if the set is left connected. Specially made with Bakelite cover to keep it waterproof. Price 4/6.

Aermonic List Free.

If dealers can't supply we send post free on Money-back guarantee.
JAMES GERRITS & SONS, Ltd., 246, West Street, SHEFFIELD.
London Agents: A. F. Bulgin & Co., 10, Curator St. London, E.C.4

THE WONDERFUL REINFORCED DIAPHRAGM

CELESTION
LOUD SPEAKERS

The Very Soul of Music

Write for free booklet! Showrooms
106, VICTORIA ST. SW.1
Write to THE CELESTION RADIO CO. WINGSTON-ON-THAMES

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

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DEPOSIT SYSTEM.

Readers who hesitate to send money to unknown persons may deal in perfect safety by availing themselves of our Deposit System. If the money be deposited with "The Wireless World," both parties are advised of its receipt.

The time allowed for decision is three days, during which time, if the buyer decides not to retain the goods, they must be returned to the sender. If a sale is effected we remit the amount to the seller, but, if not, we return the amount to the depositor. Carriage is paid by the buyer, but in the event of no sale, and subject to there being no different arrangement between buyer and seller, each pays carriage one way. The seller takes the risk of loss or damage in transit, for which we take no responsibility. For all transactions up to £10, a deposit fee of 1/- is charged; on transactions over £10 and under £50, the fee is 2/6; over £50, 5/-. All deposit matters are dealt with at Dorset House, Tudor Street, London, E.C.4, and cheques and money orders should be made payable to Iliffe & Sons Limited.

THE SALE OF HOME-CONSTRUCTED UNLICENSED APPARATUS.

A Service to our Readers.

We have made an arrangement with the Patentees whereby readers who wish to dispose of a home-constructed receiver not licensed under the patents made use of, can license the set by means of the Deposit System referred to above.

The person desiring to sell, in sending us particulars for his advertisement, will in every case make use of a Box No., and should add to the price which he requires the amount of royalty customarily paid by manufacturers.

If the purchaser is satisfied with his purchase, the sum realised will be forwarded to the seller, less the amount due in respect of royalties, which amount will be paid by "The Wireless World" to the owners of the patents concerned, and a certificate will be handed on to the purchaser of the set.

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Readers who reply to advertisements and receive no answer to their enquiries are requested to regard the silence as an indication that the goods advertised have already been disposed of. Advertisers often receive so many enquiries that it is quite impossible to reply to each one by post.

A53

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**MORE PROOF
OF EFFICIENCY**

Mr. J. W. Matthews used

B. & J. COILS

for the

**FIRST TWO-WAY COMMUNICATION
on 10 METRES**

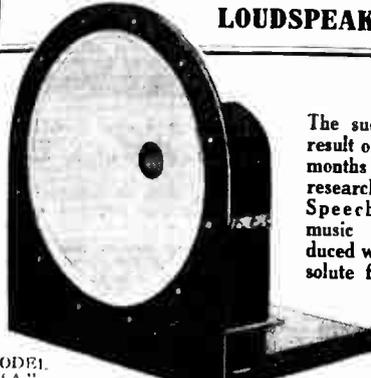
WITH AMERICAN AMATEURS

B & J. Wireless Co.

2, Athelstane Mews, Phone: Mountview 1695.
Stroud Green Rd., N.4.

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MOVING COIL
LOUDSPEAKER



MODEL "A"

The successful result of many months patient research. Speech and music reproduced with absolute fidelity.

Special Features—

The Magnet.—Special Dynamo Steel. Intense Field. Minimum Leakage. Takes 4 amps at 6 volts.

The Diaphragm.—Unique, High Sensitivity. No 'Muffle' or Edge. Minimum 'Focussing.'

Moving Coil.—Precision wound. High Sensitivity.

Suspension System.—Special leather. Full diaphragm movement. Allows full 'Bass' without variation of centering adjustment.

Finish.—Metal parts artistically finished in black cellulose.

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Furnival Road, SHEFFIELD.
'Phons' 21153.

PRICES:

Model A. £4-17-6
Completely assembled ready for use with Oak Cabinet £2-2-0 extra.
With Mahogany Cabinet £2-7-6 extra.

For the Home Constructor.
Complete set of parts ready for assembling, including diaphragm cut to size and magnet assembled, with full instructions. £4-7-0
TRADE ENQUIRIES INVITED.

A demonstration can be arranged on your own set by dropping a postcard to our London address, 16, Boscombe Road, London, S.W.17.

THE MOTOR CYCLE

Every Thursday 3d

RECEIVERS FOR SALE.

YOUR New Set or Your Repairs.—Consult F. D. Armitage, 12, St. Domingo Grove, Everton, Liverpool. [9922

ALEXANDER BLACK. The Wireless Doctor, specialises in quality reproduction. Details under Miscellaneous. [9748

READ and MORRIS, Ltd., for mains sets and components, the mains pioneers in 1924; 28 London hospitals are equipped with Read and Morris mains set, using no batteries; some of these sets have not even required their doors unlocking for over two years—just a switch on the wall used, nothing else touched. Single sets supply over 800 pairs phones and loud speakers. Abroad one of our mains sets functions in a government hospital 600 miles from the nearest broadcasting station.

READ and MORRIS, Ltd.—2-valve set for D.C. mains from £10, A.C. sets from £15.

READ and MORRIS, Ltd.—H.T. eliminators for D.C. mains £4; for A.C. mains, £6/10; eliminator transformers from 15/-; full wave rectifying valves, 10/.

READ and MORRIS, Ltd.—Why use accumulators if A.C. mains are available? The Longton L.T. unit is a complete substitute at negligible cost, always ready, valve rectifier, no batteries, gives 1.2 amps. at 2, 4, or 6 volts, and operates any set; new price, £6/15.

READ and MORRIS, Ltd., for electrolytic condensers; we use them, have used them for 3 years, liquid and dry; we test them all, but find Loughton the best, capacity approximately 1,800 M.F., non liquid; price 12/6, as used in the famous L.T. unit.

READ and MORRIS, Ltd., for moving coil loudspeakers; delivery from stock; also mains-operated receivers and amplifiers of same. Demonstrations continually, service always.

READ and MORRIS, Ltd., undertake the design and construction of any type of radio apparatus. We make for the individual and guarantee results. It will pay you well to consult us before buying elsewhere.

READ and MORRIS, Ltd., have second-hand sets. Best makes only, at junk prices; Marconi V.2 50/-; voice amplifier, 30/-; Burndept Ultra 1V with Mark IV tuner, £10, original price £54.

READ and MORRIS, Ltd., 31, Eastcastle St. (facing back of Waring and Gillows'), Oxford St., W. [1519

SECOND-HAND Receivers, 1-8 valves, perfect; cheap; state requirements.—Coutts, Engineers, Horley. [1424

5-VALVE Set, built specially for quality, 2 power valves in parallel, Weston milliammeter, Weston voltmeter, reads low tension and all high tensions, complete with coil drive speaker in cabinet, battery eliminator, 240 volts D.C., 6-volt accumulator, and valves; £30, or near offer; can be seen working.—Phone after 6 p.m.: Kingston 4368, or BM/SNF's, London, W. [1628

MARCONI 81 (Straight 8), as new; £17/10, with valves. [1628

BURNDIPT 4-valve Set, with valves and coils, £10; another, last season's model, as new, £12; all in good order and carriage paid.—James Scott and Co., Radio Engineers, Dunfermline. [0207

SCOTT SESSIONS for Megavox 3 and latest Circuits; read advertisement under Miscellaneous column. [1726

DEFERRED Terms; Marconiphone wireless apparatus supplied, £1 down, balance over 12 months; any model receiver, battery or mains drive, moving coil loud-speakers, H.T. mains units, etc. installed free within 30 miles of London; state your requirements.—Marconiphone Service Depot, 9, High St., Ealing, London, W.5. [1803

SUPER-F, Super-F, Super-F 1929 models represent the most extraordinary value ever offered in wireless sets.—Below.

SUPER-F Sets have an Ebonite Baseboard and under Baseboard Wiring, mahogany cabinet, with oval ebonite panel, contains all but the loud-speaker.—Below.

SUPER-F—The fretwork front 14in. x 14in. cabinet. Cone speaker supplied is specially designed for bass note reinforcement.—Below.

SUPER-F Sets are supplied, as specified above, with all accessories and spare vacuum tubes, royalty and carriage free, on 7 days' free trial.—Below.

SUPER-F 3-valve, £9/2/6; 4-valve for economy, one H.T. battery a year, £10/15; 5-valve, 4 electrode superhet type, £16/10; 8-valve ditto with frame aerial, £24/15; in upright cabinet, £31.—Below.

SUPER-F—Trade enquiries solicited for sets or components thereof.—Below.

SUPER-F RADIO, 305, Rutherglen Rd., Glasgow. [1829

MARCONIPHONE Wireless Receivers on Deferred Terms, £1 down, balance over 12 months; installed free within 30 miles of London; state your requirements.—Marconiphone Service Depot, 9, High St., Ealing, London, W.5. [1802

MARCONI Straight Eight, gets round Europe easily on speaker, little used, perfect, standard valves; any offer considered; owner now uses portable; Brown headphones, adjustable diaphragm, 12/6.—Windsor, Fernhill, Horley. [1847

HELLESEN DRY BATTERIES



REDUCED PRICES!

I HAVE never expected to get my Hellesen H.T. Batteries at cut-throat prices. After all they are a quality article and their virtue lies in the magnificent service they give, not in a low first cost. However, I am glad to hear from the makers that flourishing sales have enabled them to reduce prices for 1928-9 and I pass the good news on to you. A genuine Hellesen, a better Hellesen and a reduced price, ask your dealer for one to-day.



1928 Reduced Prices.

Standard Capacity.	
"Wiray" 9 volt Grid Bias Type	2/-
"Wirin" 60 volt H.T. Type	10/6
"Wirup" 99 volt H.T. Type	18/-
"Wisol" 108 volt H.T. Type	20/-
Treble Capacity.	
"Kolin" 60 volt H.T. Type	19/-
"Kolup" 99 volt H.T. Type	32/6

Your Dealer Stocks them.

SUPREME
for 27 years.

HUNT'S

HELLESEN DRY BATTERIES · INSTRUMENTS
POLYMET MICA & PAPER CONDENSERS
HAND & CYCLE LAMPS, TORCHES, ETC

A. H. HUNT LTD., CROYDON, SURREY.

Receivers for Sale.—Contd.

GEOPHONE Cabinet 3-valve Set, brand new; £17; can be heard evenings; offers.—42, Eastwood Rd., South Woodford. [1843]

PHENIX Five for Sale, as described in Wireless magazine, best components used, Igranio variable condensers, Igranio dual impedance coupling units, Lewcos dual screened coils, paralleled super power valves in output stage, choke condenser output, mahogany cabinet; price £18, or offer.—Box 8845, c/o The Wireless World. [1841]

3-STAGE Amplifier, with eliminator for D.C. mains, 2 6v. and 2 L.S.5A valves, complete in mahogany case, also 6v. C.T.4 Triode accumulator, also Baker moving coil loud-speaker, 200 volt, also attractive circular baffle board; whole cost £35, accept £15, or would sell separately; all brand new and unused, having been made to special order now cancelled.—Gramophone Mart, 63, New Oxford St., London. [1852]

LOOK! Look! Look!—Complete kit of parts for building the wonderful Public Benefit 45 receiver for £5, cash with order; this is a 4-valve long range receiver and even in Jersey, far from broadcasting stations, will give loud-speaker results on an indoor aerial, we leave you to anticipate what the results will be like in England, full instructions for assembly are given, panel is ready drilled, no soldering, can be completed in one evening; price includes everything, batteries, loud-speaker, valves, etc., no easy payment; this is not an offer of junk but all branded components; send £5 cash and be satisfied.—Public Benefit Radio Stores, 20, Market Arcade, St. Helier, Jersey, O.I. [1857]

3-VALVE Marconiphone, complete, H.T. eliminator for D.C. mains, excellent condition and tone; £10. —Write, BM/UHFG. [1864]

AJ.S. 5-valve Portable, in canvas cover, with spare accumulator and new unused H.T. and G.B. batteries.—Offers over £15 to Godfrey, 3, New End, N.W.3. [1872]

4-VALVE Geophone Receiver, last season's model, with valves and H.T. eliminator (A.O. Atlas), all in perfect working order; £14; our client is going in for larger set.—Fairbairn, 181, High St., Ayr. [1873]

STRAIIGHT Eight Marconiphone, with set of new valves and special Ecco A.O. H.T. eliminator, long wave coils, perfect working order; £25; our client going abroad.—Fairbairn, 181, High St., Ayr. [1874]

CAYDON 5-valve Portable Set, thin walnut case model, recently overhauled by the manufacturers, in good working order; being replaced by more powerful set; £5 for the set with loud-speaker and cover, but without valves or batteries.—Fairbairn, 181, High St., Ayr. [1875]

MICHAEL Super Screened 4-valve Portable Receiver, quite new and in perfect condition; cost 35 guineas; best offers.—Write BM/BB6B, London, W.C.1. [1876]

BARGAIN—All component parts of Selector Super 7-valve Superhydrodyne portable set; £18, or near offer.—BM/ZRMX. [1878]

SIMMONDS BROS.—Receivers constructed to any published design or to your individual requirements, guaranteed, workmanship, repairs, reconstructions, overhauls, modernisations.—Shireland Rd., Smethwick. [9691]

WIRELESS is a Fascinating Subject, but makes heavy demands upon the purses of its devotees. For one who is determined to keep abreast of the times, there are always new components to be bought, and sets and loud-speakers to be superseded.

AT the Same Time, the would-be buyer is often deterred from buying because he knows that there will be still one more piece of apparatus left on his hands, to add to those already in the junk box.

WE Have Opportunities of disposing of semi-obsolete apparatus to those who are not fortunate enough to be able to afford the latest type, and will take such apparatus or components, providing they are in saleable condition, in part, exchange for any new set, loud-speaker or component required.

ALL We Ask is that You should Send Along a List of Your Old Apparatus, together with your new requirements, or, better still, send the apparatus to us to inspect, when we will make you a fair offer.

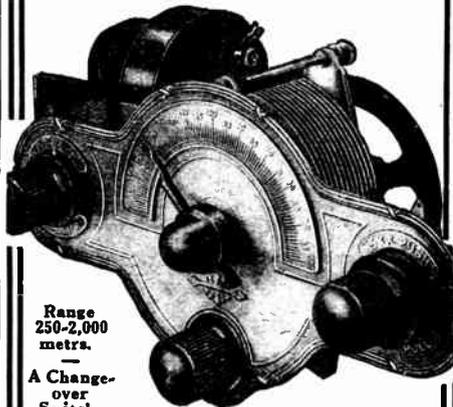
IF You Approve of this You can Send Your Remittance for the balance, and we will forward the apparatus required; if you have sent your old apparatus and you do not approve of our offer, we will return carriage paid.

The Principal of this Firm who has been a professional wireless engineer since 1910, and has been manager for the Sterling Telephone Co., radio expert to the General Electric Co., and Chairman of the Technical Committee of the National Association of Radio Manufacturers, will willingly give advice to those who are desirous of purchasing apparatus; we are entirely unbiased, and will recommend the best apparatus for your particular purpose; you save money by having genuine expert advice.

DON'T Forget We Will Take Your Old Receiver or Components in Part Exchange.

WE Will Also Build Any Sets of Specification (Marconi, Royalties payable), and install anywhere in the British Isles; sets modernised; send for estimate.—Scientific Development Co., 51, Fishergate, Preston. Tel.: 1364. [10226]

Radio's finest tuner



Range 250-2,000 metres.

A Change-over Switch.

The PANEL PLATE UNIT

consists of Double wave-band Tuner, Slow Motion Tuning Condenser, Change-over Switch assembled on an embossed Antique Brass Escutcheon Plate, the whole being mounted on an oak, walnut, or mahogany Panel fitted with angle brackets.

PRICE 35/-

A Collapsible Cabinet is made to fit the above Panel Plate and in the same finish, it is assembled in a few minutes.

PRICE 28/-

The BASE-BOARD UNIT.



By linking five connecting wires from this unit to the Panel Plate or any other Tuner, a complete 2 or 3 Valve Loud Speaker Receiver of amazing performance is built.

2 Valve Transformer,	37/6
3 " " "	50/-
3 " R.C.C.	23/-

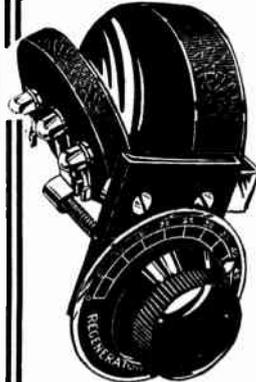
ALL LAMPLUGH RADIO PRODUCTS



are guaranteed for 12 months.

LAMPLUGH

The QUALITY TUNER



An ideal Aerial Tuner for professional and Amateur Radio Set Builders, covers the entire Broadcast band from 250-2,000 metres, only requires Push-Pull Switch to effect the change. Circuit diagram is supplied with each.

PRICE 12/6

Send for lists and wiring diagrams from
S. A. LAMPLUGH Ltd.
KING'S ROAD, TYSELEY, BIRMINGHAM.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

Receivers for Sale.—Contd.

KILO-MAG Screening Boxes, 23/6; set of coils, mounted, 30/-; decoupling resistances, 1/- each; Pentode 2 set of parts, with valves, cabinet, £5/15; coils, 6/- per set; Megavox aerial coils, 22/6 per set; complete sets of parts, valves, batteries, speakers, 2-valve, £4/10; 3-valve, £5/10; screened 3, £8/10; portable 4, £12.—Stott, 63, Syke Rd., Rochdale.

D.O. Current—Complete battery eliminator and 3-valve set, all first class components, choke output, 2 tuned circuits; £12.—Write W., 120, Hampton Rd., Twickenham. [1946]

NEW Portable Roadside Four (Burne-Jones), see May "Wireless Constructor," components and aerial in beautiful Camco cabinet, excellent Amplion speaker, reception alternative programmes; list £17 without royalty, accept 11 guineas cash sale; demonstration.—Box 8911, c/o *The Wireless World*. [1944]

CLEARANCE Sale—Government 2-valve transmitters, with valves, in mahogany cases, fitted with aerial ammeters, slightly faulty, these sets are easily convertible into 2-valve receivers, bargain at 30/-; British Naval heterodyne wavemeters, with valves, perfect, with tuning cards, sacrifice at 25/-; the famous Marconi multiple tuners, 3 circuits, good condition, 50/- each, original cost £40; Radio Communication Co.'s direction finders, 6-valve superhet, amplifier sets, fitted in solid teak cabinets, good condition, £2; Marconiphone long range V2 (2-mv) receiver, with range blocks, reaction units, 35/-, condition good; all carriage forward; cash with order.—J. B. Humphreys and Co., Wireless Telegraph Engineers, 23, College Hill, Cannon St., London, E.C.4. [1942]

MEGAVOX Three Receiver, in mahogany cabinet, with valves, long and short wave coils; £15.—Box 8907, c/o *The Wireless World*. [1940]

SUPERHET, 10 valves, brings in all stations, British and foreign, coil drive loud-speaker, mounted in battle, run off accumulator 1/2 amp., complete new Exide accumulators, H.T. and L.T., frame aerial, and numerous accessories, magnificent set; honestly worth £60, price £22/10; Manchester district.—Box 8899, c/o *The Wireless World*. [1933]

5-VALVE Portable, well known make, in first class order, going abroad, no further use for same; no reasonable offer over £10 refused.—After 7 p.m., C. Hunt, 78, Crawford St., Camberwell, S.E.1. [1926]

PORTABLES!

PORTABLES!

PORTABLES!

THE New Portable Five, all Continental stations loud-speaker, it will pay you to have a demonstration in your own home, demonstrations free, all complete, £15, in beautiful polished oak cabinet, with storm cover; local station Portable Three, a wonderful set, splendid tone loud-speaker, in a polished oak or mahogany case, all complete, £10; demonstrations free in your own home, distance no object.—Ring up Victoria 5977. H. Passmore, 8, Grosvenor Gardens Mews (North), Victoria, London, S.W.1. [1923]

MCMICHAEL 1928 Model 9 Valve Supersonic Receiver, complete with 2-volt valves (2 D.E.P.240 in parallel for last stage of L.F.), 2-volt Exide accumulator, and frame aerial, perfect condition; £30, or near offer.—Kann, 24, Lawrence St., London, S.W.3. Tel.: Kensington 3453. [1922]

THE RECEPTE Co. were the First Firm to Specialise in Designing and Building Receivers to suit customers' own particular requirements, and their policy has met with every success; write for quotation, low prices, and quick delivery; satisfaction guaranteed.

THE RECEPTE Co. also Make a Range of Standard Receivers, among which is the Receptite III, a 3-valve set, screen grid H.F., anode rectifier, resistance coupled to pentode; price £8/12/6; delivery from stock.

THE RECEPTE Co., 1, The Mall, Southgate, N.14. [1906]

CONSOR 3-valve Set, with many extras, gives excellent results; £2/5, offers.—Below.

WAVE Trap, in mahogany cabinet, complete with coil; 10/-, offers.—G. Alderson, Dorrridge, Birmingham. [1893]

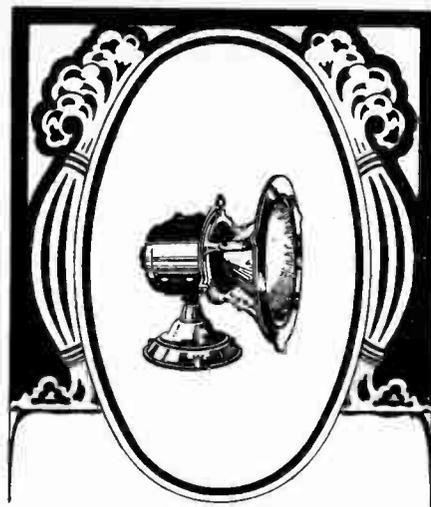
COMPLETE Set of Components, etc., for 3-valve A.C. mains receiver, quite new, for sale; approximately 25% under list.—6, Hauberk Rd., Lavender Sweep, S.W.11. [1891]

ELSTREE 6 Wired Up Panel, minus L.F. transformers, licensed; £7.—Varney, 14, Calthorpe Rd., Banbury. [1886]

BATTERIES.

WET H.T. Batteries—Parts per dozen: Jars, 2/4x 1 1/2 square, 1/5; zincs, 1ld.; sacs, 1/2 dozen; dozen wells (18 volts), complete with bands and electrolyte, 4.3. post pd.; high efficiency, long life, self-charging, upkeep small; send 6d. for sample unit; illustrated booklet free; carriage free orders 10/-; write for free list wireless bargains; trade supplied.—W. Taylor, 57, Studley Rd., Stockwell, London. [0039]

C.D.E.S. Accumulator Charging Service.—Collection and delivery in 5 mile radius of Croydon; send for particulars to Croydon and District Electric Service, Dept. W., 98, Cherry Orchard Rd., Croydon. [1009]



BAKER'S
OUTFITS FOR
MOVING COIL LOUD
SPEAKERS
WILL GIVE YOU THE
MOST REALISTIC
RECEPTION POSSIBLE

Illustration in oval above is
OUR "SUPER" MODEL

(Registered Design applied for. Prov. Patent No. 24571—28.)
 Magnet unit made of Dynamo Steel as recommended by the Wireless Press. The only All-Steel model on the market at anything like the price. **PRICE £4 - 7 - 0**

THIS IS OUR PERMANENT
MAGNET MODEL, A.1

(Registered Design applied for. Prov. Patent No. 24571—28.)
 This wonderful model needs no accumulator or house mains, and gives positively marvellous results. It is several pounds cheaper than any other speaker of its type manufactured.

PRICE
£6 - 5 - 0

SEND FOR OUR FREE BOOKLET! 36 pages of valuable and interesting data about Moving Coils.

BAKER'S
'Selhurst'
RADIO

Offices:
 89, SELHURST ROAD, S. NORWOOD, S.E.25.
 Works: (Always Open)
 42, CHERRY ORCHARD RD., E. CROYDON.

ABERCORN

Batteries.—Contd.

WET H.T. Replacements—Sacs (capped or uncapped), highest grade, No. 1, 10d. per doz.; No. 2, 1/9 per doz.—See below.
ZINOS—Best quality (wired), No. 1, 8d. per doz.; No. 2, 9d. per doz.; orders valued 5/- carriage paid, otherwise 6d. for postage.—British Battery Co., Clarendon Ltd., Watford, Herts. [0258]

BATTERIES Direct, a saving of 40%.—60-volt, 6/3; 108-volt, 10/11; postage 9d. and 1/- respectively; British throughout and fully guaranteed; super and treble capacity also stocked.—The Johnson Engineering Co., Dept. W.W., 86, Great Portland St., W.1. [1074]

STORAGE Batteries, storage batteries. Now's the time; just purchased, leading makers, brand new; 14 cell battery, 40-50 actual amp. hour capacity, half price to clear, £10; 27 cell battery, 40-50 amp. hour, £19; 54 cell battery, 40-50 amp. hour, £37; glass boxes with hydrometer and splash plates; all guaranteed.—T. W. Thompson and Co., Surplus Depot, 1, South St. Greenwich, S.E.10 (Tel.: Greenwich 1259), also 17, Strutton Ground, Westminster, S.W. (Tel.: Franklin 6355). [1855]

HART Comparto Accumulator, 120 volts, only used 3 months, in perfect condition, with Phillips charger, 220 volts, 50 cycles, or altered to suit purchaser's supply; total price £5.—Write Box 8833, c/o *The Wireless World*. [1836]

BATTERIES—This week's special offer: Treble capacity H.T. 60-volt batteries, 1,000 hours service, 12/6 each, carriage paid; also 36-volt grid bias batteries, 4/6 each; 66-volt double capacity, 7/6 each; 115-volt double capacity, 12/- each; all batteries are guaranteed British throughout and are obtainable only from Ford Battery Works, New Rd., Ponders End, Enfield. [1951]

CHARGERS AND ELIMINATORS.

RUNBAKEN H.T. and L.T. Chargers for A.C. and D.C., you may try 14 days.—Ardwick, Manchester, and 39, Victoria St., London, S.W.1. [0222]

TANTALUM and Liumion for A.C. Rectifiers; make up your own inexpensive chargers; blue prints for H.T. and L.T. Liumion electrodes fitted with terminals 2-3 amps, and 5-8 amps.—Bluckwell's Metallurgical Works, Ltd., Liverpool. [9603]

ELIMINATOR Kit, comprising mains transformer, full wave output, 200 volts 30 milliamperes, 32 henry choke, 2 4 mfd. condensers, 500 volts, test, variable potential divider, valve holder, 0/50 milliammeter and base board; price £3; other outputs at slight extra cost; state mains voltage when ordering.—H. Goodwin, Woodcock Hill, Elstree. [0257]

ELECTROLYTIC Condensers.—For these go to the specialists, Read and Morris, Ltd., 31, Eastcastle St., London W.1. [1520]

MARCONI D.C.1, all mains, £3; similar, Ekco, £5; H.T. only Ekco 2v. 60, £2/10; radielle D.C.100, £4; all perfect; carriage paid.—Whittaker, Higher Limes, Waterfoot, Rossendale, Lancs [1850]

A.C. Eliminator Kits, comprising shielded power transformer, choke and 700v. test condensers, output to 40M.A. at 170v. and 2 variable lappings incorporating anode feed resistance scheme; no hum or motor boating; complete with diagram, £3/5/6; U5 valve, 20/-; state mains voltage.—Gray's, Queen's Rd., Watford. [1844]

ELIMINATOR, Atlas model, A.C. (2-505x) (200-250v.), full wave rectification, perfect order, little used; selling because have no current; cost £8/15, sell for £3/10.—Whittle, Poplars, Iial Lane, Hindley, Wigan. [1868]

TRANSFORMERS, chokes, etc., guaranteed, wound to any specification; phone for quotation.—Kirby (Wimbleton) Ltd., 72, Merton Rd., Wimbledon, S.W. Tel.: Wimbledon 2814. [8987]

POTENTIAL Dividers, Always, absolutely guaranteed efficient, 5 tappings, all values from 1,000 ohms to 500,000 ohms; price 2/3.—Abingdon Wireless Supplies, 45, Sturt St., Abingdon. [1929]

TRANSFORMERS and Chokes for H.T. and L.T. Battery Eliminators, transformers and chokes for all wireless purposes wound to any specification, transmitting transformers supplied; enquiries invited.—Chester Bros., 244, Dalston Lane, Hackney, London, E.8. [1952]

TUNGAR Rectifier, 200-250 volts, output 5 amp. 6 volts; £3/10.—Box 8902, c/o *The Wireless World*. [1941]

ECKO H.T. Eliminator, 2 F.10, for sale, D.C., as new £1.—Box 8900, c/o *The Wireless World*. [1934]

10/-—Combined H.T. and L.T. battery chargers, for any voltage, D.C. mains; write for particulars.—B. O. Priestley, 46, Glasslyn Rd., Crouch End, N.8. [1914]

CHARGERS for L.T. Accumulators, foolproof; 10/- each complete; guaranteed output 1 to 4 amps., cost 1/- to 4/- per year from D.C. mains; send cash to-day, only few left.—Robin Hood Electrical Co., Primrose Lane, Birmingham. [1898]

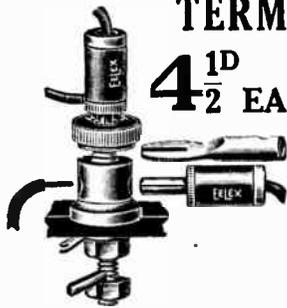
RADIELLE M.S.B. Eliminator Components, complete, 200v.; 45/-.—1, Norbury Hill, S.W.16. [1945]

CABINETS.

CABINETS—First class goods at competitive prices; send for lists.—Gilbert, Cabinet Maker, Swindon. [9833]



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40 Different indicating tops.

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Name plates 40 varieties 1d. each.

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DIGBY'S Cabinets.—Write for new 16-page art catalogue.—F. Digby, 9, The Oval, Hackney Rd., E.2. Phone: Bishopsgate 6453. [0128]

RAMSEY for Distinctive Cabinets.—Portable cabinets, cone speaker cabinets, moving coil cabinets, radio-gramophone cabinets; call and inspect.—Illustrated folder free from F. W. Ramsey, 63, Shaftesbury St., London, N.1. Tel.: Clerkenwell 7139. [1315]

SUPER-F for Latest Style in Artistic Cabinets, hinged top, front with 13in. x 6in. oval for panel, solid mahogany, 17in. x 8in. x 10 1/4in. and 20in. x 9in. x 11in., 19/6 and 22/6, post free; with 3-ply wood baseboard, oval ebonite panel 13in. x 6in. to fit above, 3/3; complete with fasteners.—Below.

SUPER F Mahogany Loud-speaker Cabinets, the home for your cone, 14in. x 14in. x 5in., with fret-work front, 13/6, post free; fretwork panels, beautiful designs, all sizes to order. 11in. to 14in., 2/9.—Below.

SUPER-F RADIO, 305, Rutherglen Rd., Glasgow. [1820]

PORTABLE Leather Covered Case, complete, ready for set; £2/10.—Cooper, 20, Heyford Av., South Lambeth Rd., S.W.8. [1881]

SIMMONDS BROS.—Cabinets for sets and loud-speakers in oak and mahogany; your own ideas carried out; best materials and workmanship.—Shireland Rd., Smethwick. [9692]

QUALITY Cabinets Provide for Every Need, American type, enclosed type, pedestal models, speaker cabinets, etc.; also made to special requirements.

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QUALITY Cabinets.—Send for new illustrated list and compare with others.

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POLISHED Oak Cabinets, hinged top and baseboard; 18x7x10 15/-; 16x8x8 12/6, 14x7x8 10/6, post free; any size supplied.—Phenix Wood Engraving Co., 28, Market St., Manchester. [1907]

COILS, TRANSFORMERS, ETC.

B. & **J.**—All "Wireless World" coils from stock.

B. & **J.**—Megavox Three coils; see displayed advert.

B. & **J.** Guarantee Every Coil under Money Back Conditions.

B. & **J.** All-British Super Four Portable, employing the Mullard pentode valve; £18/10, plus the new scale of royalties.

B. & **J.** WIRELESS Co., 2, Athelstane Mews, N.4. [0043]

COILS.—New All-wave Four, Regional Three, A.O. Three, short wave with bases, 35/-; long wave coils only, 40/-; above are Litz wound, long wave coils wound with 28 D.C.C., 27/- per pair; all tested and guaranteed.—Redgwell New Rd., Rayne, near Braintree, Essex. [1558]

KILO-MAG Coils, 30/- per set, mounted; Megavox aerial coils, 22/6; Pentode 2 coils, 6/- per set.—Stott, 63, Syke Rd., Rochdale. [1904]

SIMMONDS BROS., Shireland Rd., Smethwick.

CROSSOR Coils.—B.B.C. band, 15/- pair; 5XX band, 17/- pair; accurate in size and performance; prompt deliveries.

TOUCHSTONE.—Mr. James's latest, pair coils and bases, 30/-; screen, 4/6.

PENTONE TWO Coils, with bases, 13/- pair; Pyc differential condenser, 5/6.

MEGAVOX.—Pair coils and base, 33/-; screen, 7/6.

NEW All-wave Four.—Berclif standard coils, 77/9 set of 4, with bases; the actual coils used and specified.

EVERYMAN FOUR Coils, 33/- pair, with bases; the pioneers, still the standard of excellence.

EVERYMAN FOUR Conversion, L.W. coils and bases with instructions, 43/3; alteration present coils, 9/6; approved by "The Wireless World."

BERCLIF Coils for all "Wireless World" sets; special coils to your own requirements in all quantities; cabinets, screens, all up-to-date components, complete receivers; trade enquiries invited.—London Depot: Appley's, 44, Chapel St., London, N.W.1.

SIMMONDS BROS., Shireland Rd., Smethwick. [1956]

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The All-British
MOVING COIL
LOUD SPEAKER.

£3.15.0
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Pot Magnet wound for D.C. Mains. 12/6 Extra.

The Steel Pot Magnet, wound for 2, 4 or 6 volts, requires only 3 to 4 watts. At 4 volts the current is between 75 and 75 amperes.
The Moving Coil has a large tapered fange at one end which makes certain of the coil keeping its shape. Our cone is made up with three-ply paper. This has entirely got over the objectionable hissiness to be heard from some moving coil speakers.
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WOOD HORNS
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Wood Bells fitted to your old Loud Speaker neck. Wood Bells with polished Aluminium Castings to which any Gramophone unit can be attached. Write for Illustrated Price List.

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EVERYMAN Coils, exact to specification, 15/ each; 2 H.F. complete set and bases, 63/-; Selection 4, complete set and bases, 2/-.—Jennens.
EVERYMAN Coils, approved plug in type, set of 2 low wave and 2 high wave, with bases; 72/6.—Jennens.
LITZ Wire (genuine), 27/42, 70 turns, 4/8; tubes L and Mikapac, 3in x 3 1/2in. 1/4, 3in. x 4in. 1/6. 7in. x 4in. 2/-.—Jennens.
EVERYMAN Coil, ebonite bases, 1/6 each, screens, 3/-; spacers, grooved, with screws, aerial or anode, 1/-; all wave, short, 1/-; long, 2/6.—Jennens Radio, 30 Chapel St., Birmingham. [0075]
PENTODE—Star Engineering, Didsbury, Manchester. are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1335]

DYNAMOS, ETC.

500-750 Volts D.C. 0.2 amp. Generator, direct coupled to a 220-volt D.C. motor on cast iron bed plate by Cromptons; bargain, £10.—L. Lipton, 614, Old Ford Rd., Bow. East 3345. [1856]

LOUD-SPEAKERS.

GOODMANS Can Give Prompt Delivery of Moving Coil Units; the lowest prices consistent with highest possible grade workmanship; list MC3 on request.—Goodmans, 27, Farringdon St., E.C.4. [0089]
IF You are in London Call and See Goodmans' Coil Drive and Reed Units before purchasing elsewhere.—Goodmans, 27, Farringdon St., E.C.4. [0090]

AIR-CHROME Type Speaker Parts to build the speaker that has taken America by storm can be obtained from Components Production Co., Honley, Huddersfield. Send for list. [0130]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0231]

COIL Drive Units from Stock, the usual high standard of workmanship associated with the name of Goodmans, 27, Farringdon St., E.C.4. [0091]

RED Movements.—Double acting reed movements specially designed to operate cone and other large diaphragms extremely sensitive on small input, yet capable of enormous volume with sufficient input; will work up to 3ft. cone with ease; no rattle or distortion; 27/6 each; fair allowance on Brown A earpieces, or Lissencolas and other units in part exchange; send stamp for illustrated lists of these and reamless cones.—Goodmans, 27, Farringdon St., E.C.4. [0066]

VIBRO-SKIN, special leather for fixing the diaphragm of the moving coil loud-speaker; price 2/6 per piece 1 1/2in square, 2/- per piece 9in. square, post free, cash with order; special terms to the trade.—The Alder Leather Co., 3, Southwark St., S.E.1. Tel.: Hop 4448. [0224]

AIR-CHROME Type Loud-speakers Parts, as described in the June 6th issue of this paper, can be obtained from Components Production Co., Honley, Huddersfield. Send for list. [0129]

MOVING Coil Loud-speaker Parts of Quality are made and fully guaranteed by Components Production Co., Honley, Huddersfield. Send for lists. [0149]

THE New Goodman Junior Reed Movement, 14/6, the finest unit, at anywhere near the price, for driving cone and other large disc type speakers; this unit should not be confused with converted earpieces or gramophone attachments; second only in efficiency and performance to our double acting reed movement; full description in our illustrated lists, free on request.—Goodmans, 27, Farringdon St., E.C.4. [0092]

AIR-CHROME Typ. Loud-speakers Give Wonderful Results, and, with the assistance of a screw-driver and hammer, can be easily built from parts supplied by Components Production Co., Honley, Huddersfield. Send for list. [0151]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0232]

MAKE Your Coil Driven or Cone Speaker a Success; use the cone paper that speaks for itself.—See below.

GILBERT Pampas Fibre Cone Paper, light, strong, non-resonant, pleasant copper brown shade, tonal qualities absolutely unequalled, ideal for use with the Blue Spot, Goodman's, or Zaapa units, and the Lissen or Bull-Phone units; marked and instructions for making ordinary or coil driven cones; price 1/9, post free.—Gilbert Industries, 519, London Rd., West cliff-on-Sea.

TRADE Enquiries invited for this increasingly popular line (Lib. dis.)—Apply Trade Dept. W/P/P, address as above. [1686]

PENTODE—Star Engineering, Didsbury, Manchester. are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1336]

WRITE for Appointment to Hear My New Loud Speaker, which is the only one in existence that reproduces naturally; no resonance whatever; one type only, one price only.—Colato, 33, Edgware Rd., W. [1536]

MAGNAVOX Moving Coil Speaker, 200/240 D.C. mains, perfect order.—Cross, "Burnside," Storeton Rd., Birkenhead. [1845]

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Make perfect reproduction certain by insisting on Pye L.F. Transformers. The high standard set by this ideal form of intervalve coupling remains supreme. Compact, efficient in action, and robust. Entire absence of noise and crackling. Tested by actual measurement of amplification and guaranteed. Terminals and soldering tags provided.

RATIO	2.5 : 1	- -	17/6
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Absolutely noiseless, constant in action and guaranteed. Pye Grid Leaks should always be used, especially for choke or resistance coupled amplifiers.

25 Megohm	1/-	15 Megohm	1/-
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FINEST Suspension Leather, for fixing cones to moving coil or reed units, as supplied to principal makers; 2/- per sq. ft., post free, cash with order.—Dilley, 8, Ashby Rd., Essex Rd., London N.1. [1810]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0235]

DEFERRED Terms: Marconiphone moving coil loud-speakers, any model, £1 down, balance over 12 months.—Marconiphone Service Dept., 9 High St., Ealing, London, W.5. [1804]

EPOCH—When better moving coil speakers are built they will be called Epoch.
EPOCH Model 66 Employs Super-compound Steel Magnet Pot, superior to dynamo steel.

EPOCH Moving Coil Now Obtainable with Copper Foil, as recommended by "Wireless World."

EPOCH Moving Coil Parts are Guaranteed to give the Finest Performance yet possible on any speaker.

EPOCH Moving Coil Parts are Instruments of Precision; every part interchangeable.

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EPOCH Moving Coil Parts.—Examine every make, but compare with an Epoch before parting with money.

EPOCH ELECTRICAL SOCIETY, Ltd., 53, Gracechurch St., E.C.3. Royal 8570. [1954]

EXCEPTIONAL Offer: "Wireless World" moving coil loud-speaker parts (Haynes model); owing to alterations in design all stocks of the above are being cleared out at bargain prices; write for list.—Pearson, 80a, Newland Av., Hull. [1776]

STAR High Resistance Moving Coil Speaker, 6-volt field, 1/2in. gap; £3.—Harroway, Bamford Grange, Stockport. [1851]

CONE Units, work 1 1/2in. cone with ease, splendid value; 8/-, post free.—Conex, 2, Marlton Rd., Blackburn. [1868]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0234]

BROWN 15-guinea Super Q. Speaker, unsoiled, perfect; £7/7, or best offer; must sell.—Monk, Golf Club, Felixstowe. [1862]

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YOUR Old Loud-speaker Taken in Part Payment for the latest type, see our advert. under column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0227]

MOVING Coil Enthusiasts.—£1/5 secures the following while they last, impossible to repeat: complete assembly comprising special soft grey iron pot and lid with small gap, aluminium spider and front ring, bakelite moving coil wound to low resistance, mounted on cone and special leather for suspension; field windings supplied if required.—Brew, Pylchley, Kettering. [1918]

GILT-EDGE Bargain in the Famous Magnavox Loud-speakers; a limited quantity of these magnificent loud-speakers mounted in burr walnut baffles, at £4/2/6.

THE Highest Quality Collapsible Frame Aerial on the market, made by Deutschmann, works of the finest drawing room, and represents the highest efficiency at £2/10; these two items represent the best in radio; orders strictly in rotation; cheques, which must be crossed, and money orders, made payable to H. B. Schofield, 180, Murray Rd., Ealing, London, W.5. [1948]

AMPLION (£3/5), horn model, slightly soiled, new; £2/10 secures.—Box 8901, c/o The Wireless World. [1935]

AT Last!—Moving coil loud-speaker, complete with cabinet for £6. See it! Hear it! Compare it! The finest proposition in the world of wireless; get in on the ground floor; cease paying fancy prices; enquiries attended to in strict rotation; sent on 14 days' approval; carriage paid.—M.C. Company, 36, Amlerly Station Rd., London, S.E.20. [1921]

SCIENTIFIC DEVELOPMENT Co. Moving Coil Loud-speaker, complete 6 volts; £2.—Stewart, Lilla Villa, Uphall. [1915]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0235]

KUSHA Pick-up Arm.—Are you wearing your records unnecessarily? Weight should not exceed 2 1/2 ozs. on light records, or 4 ozs. on heavy records; with the Kusha weight can be regulated; angle and length are adaptable; finest die-cast production, cheapest and most generally useful; 15/6 by post, on approval.—R. H. Glascoe, 3 and 4, Water Lane, E.C.3; or from G.E.C. Hobday's, etc. [1909]

BRAND New Marconiphone Cone Loud Speaker; cost 75/-, bargain at 50/-.—Mortimer, Lindley, Brighton Rd., Horley. [1901]

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TERMINAL
CANNOT
COME OFF**



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THE unique advantages of Belling-Lee insulated terminals are world famous, but probably the most important feature of these perfect terminals from the constructor's point of view is that the Head cannot come off. We all know the danger of exchanging heads of terminals, and Belling-Lee designers have successfully nullified this danger.

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Type "B." Standard large insulated model. Polished black bakelite. 6d. each.

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EPOCH Moving Coil Speaker Parts.

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EPOCH.—The Junior model, the greatest marvel on the market; nothing to touch it at any price; 50/- complete; permanently centred.

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EPOCH Junior is a Masterpiece of Perfection, and the greatest value ever offered.

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EPOCH Junior Orders are Pouring in Fast; place yours now, and avoid disappointment.

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EPOCH Model 66 has become the Standard by which Moving Coil Speakers are compared.

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EPOCH.—There is nothing so perfect on speech as the Model 66.

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EPOCH.—"What Manchester says to-day the rest of the country says to-morrow." Did you hear them at the Exhibition against all comers?

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EPOCH 66; apologies for delays; factory is working two shifts to improve deliveries.

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EPOCH 66; don't be put off with substitutes from stocks; inferior makes are not behind on deliveries.

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EPOCH 66; place your order immediately with your dealer and avoid disappointment.

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EPOCH Dealers Don't Push Substitutes for a little Extra Profit; every sale of an Epoch 66 means an enthusiastic customer-friend, which will repay you with interest.

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EPOCH Model A; price £3/3 plain finish, £3/10 De Luxe finish; further improvements without increase in price.

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EPOCH Improved Model A; by far the best full size home assembly kit yet produced.

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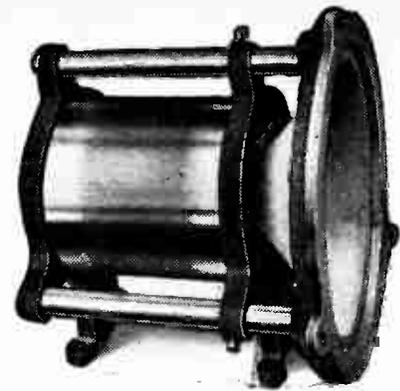
EPOCH.—All models obtainable in 20 different moving coil windings, including pentode; copper foil (as recommended in "The Wireless World") for all windings; 14 different field windings to select from; super steel magnet pots for Model A and Junior for a small extra charge.

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EPOCH.—Full particulars from the actual manufacturers, Epoch Radio Manufacturing Co., Ltd., 53, Gracechurch St., London, E.C.3 (1st floor). Phone: Royal 4135. Factory, Willesden. [1955

WE Could Tell a Long Story with Plenty of Superlatives about the merits of the Veravox Moving Coil Speaker, but plain speaking is a feature of this instrument itself, and it can tell its own tale; we sell strictly an approval; write for lists, and a leaflet giving a little information on obtaining moving coil standard of purity from early type receivers.—Eta Tool Co., 70a-70c, Aylum St., Leicester. [1894



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Ask anybody who has heard them in the Manchester Exhibition!

Model 66 (shown above). The finest moving-coil speaker the world has yet seen. In a class by itself. £4-7-6 complete.

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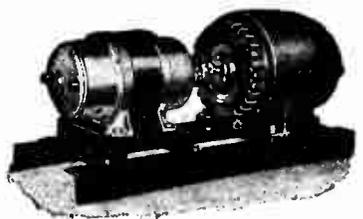
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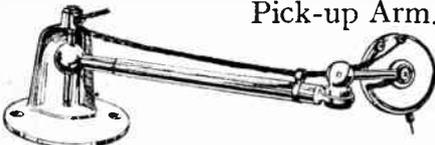
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THREE Mullard Valves, 1 P.M.1 H.F., 1 P.M.1 L.F., 1 P.M.2; 20/- lot; sealed, unused.—F. H. Monkhouse, 75, Lidderdale Rd., Sefton Park, Liverpool. [1849]

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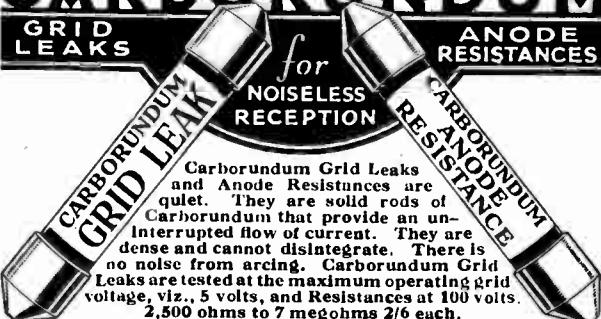
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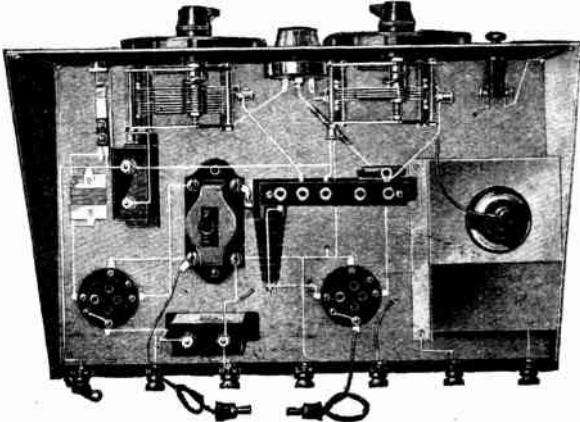


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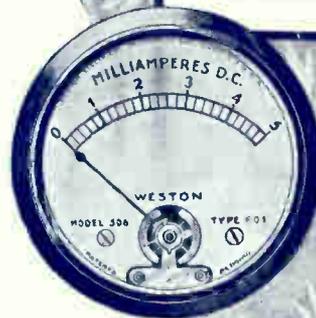
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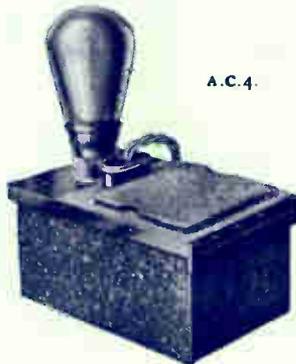
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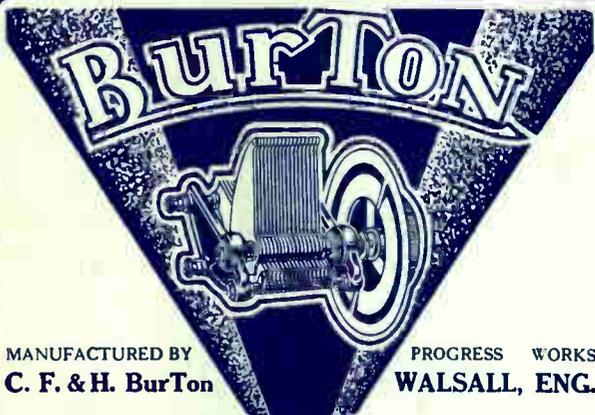
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The Paper for Every Wireless Amateur

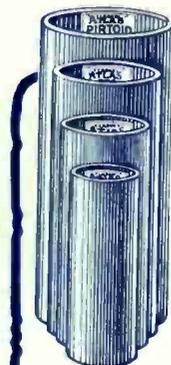
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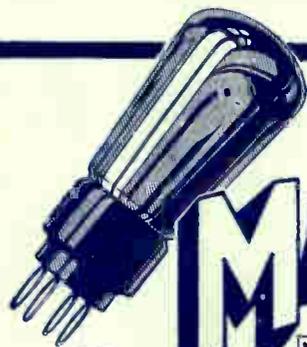
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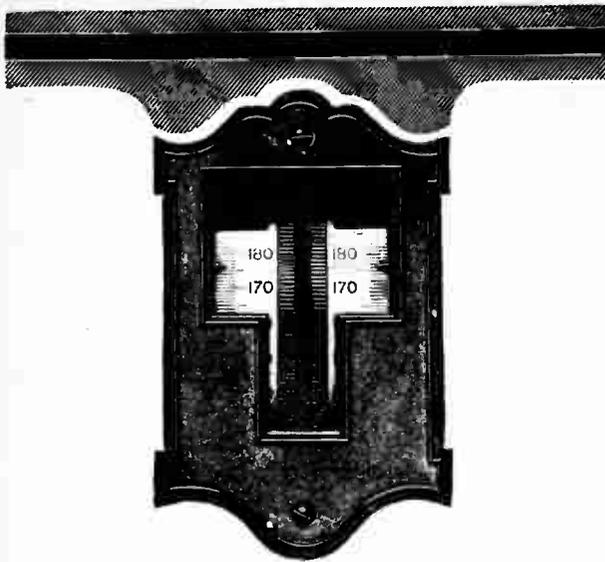
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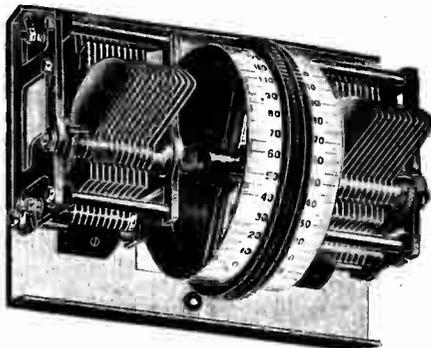


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All valves with directly heated cathodes ("Raw" A.C. Valves as they are called) operate with hum. This hum even if small, makes them quite unsuitable as detectors—the most critical position. Cosmos A.C. Valves do not Hum, and are suitable for all stages.

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A valve that emits from the grid, cannot be used in R.C.C. Sets, nor, if serious, in transformer coupled Sets. Grid emission is a more serious defect than "softness" and no one would dream of using a "soft" valve. Cosmos A.C. Valves do not grid-emit.

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A.C. Sockets 3/- each and Met-Vick Disc Adaptors 6d.	

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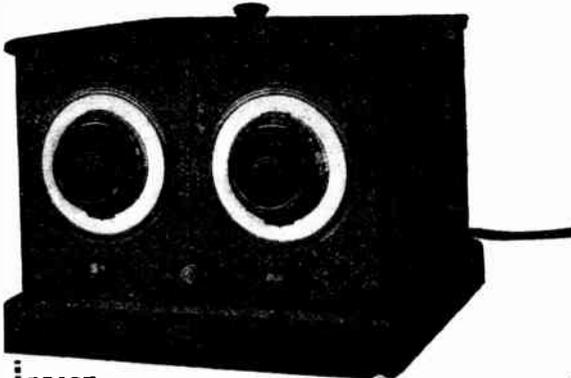
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50 Stations!

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October 7th.

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CARDIFF
COPENHAGEN
COLOGNE
DU LIN
FRANKFURT
HAMBURG
LONDON
LEIPZIG
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PRAGUE
ROME
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BRUNN
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(dry charged).

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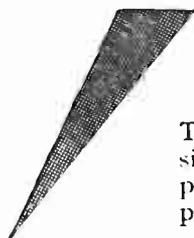
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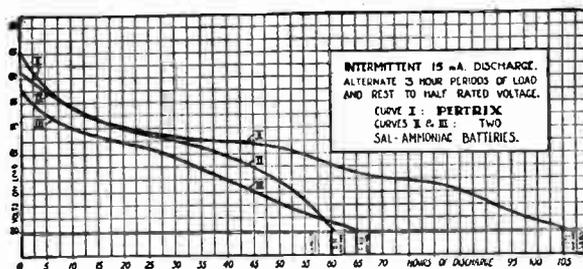
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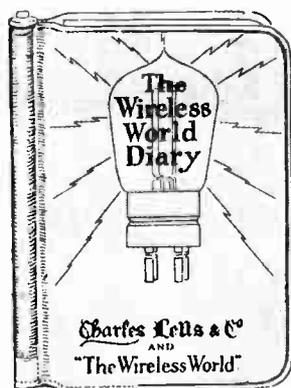
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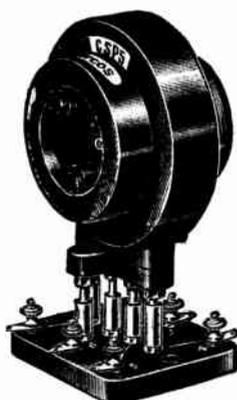
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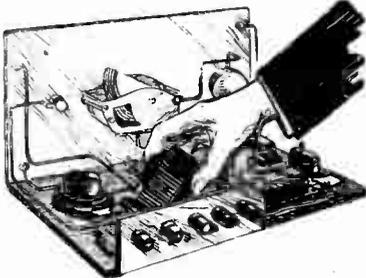
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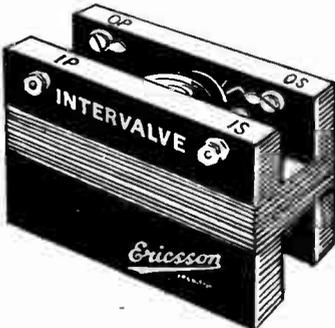
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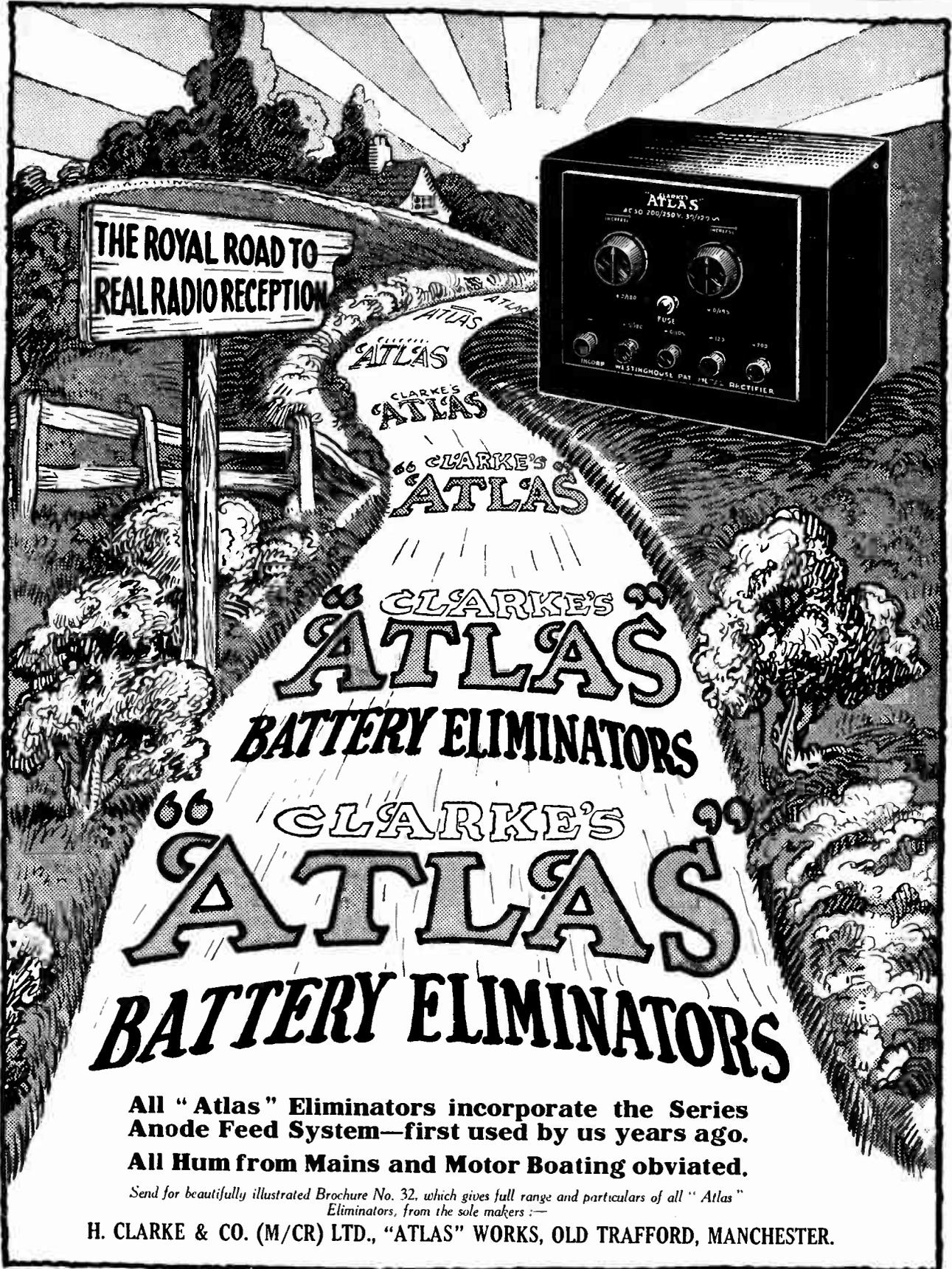
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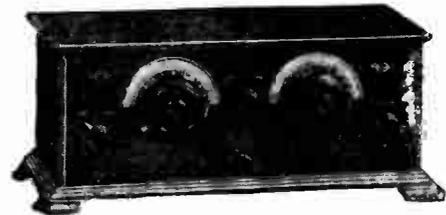
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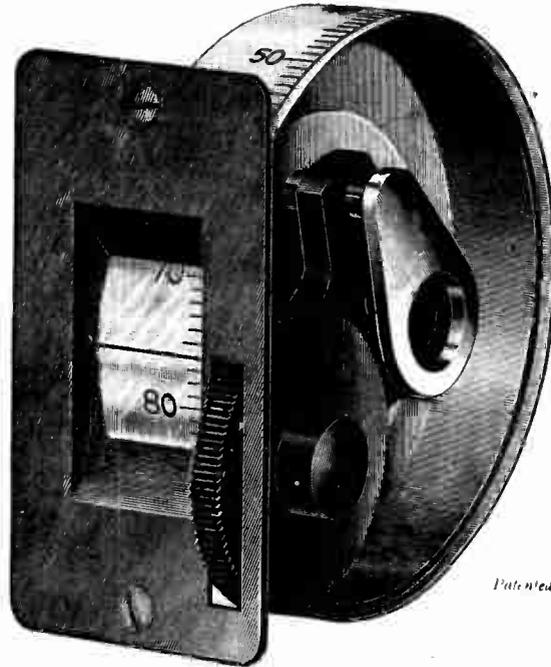
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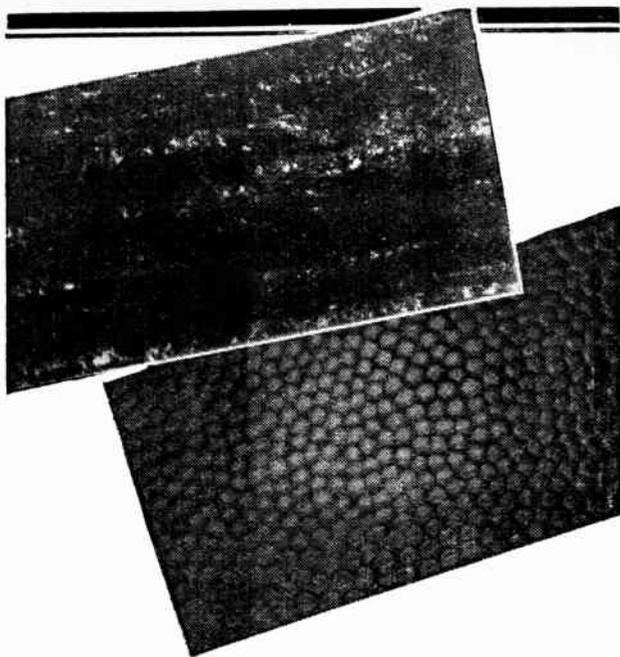
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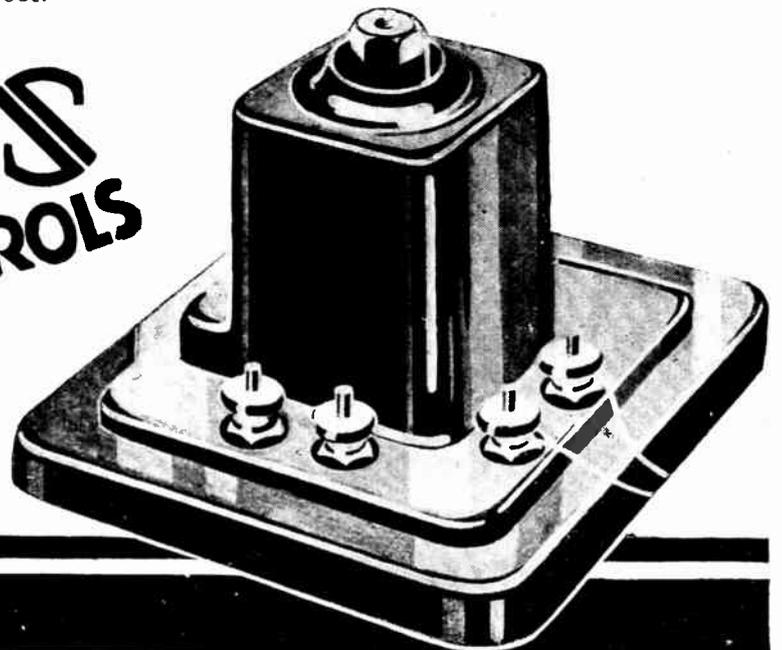
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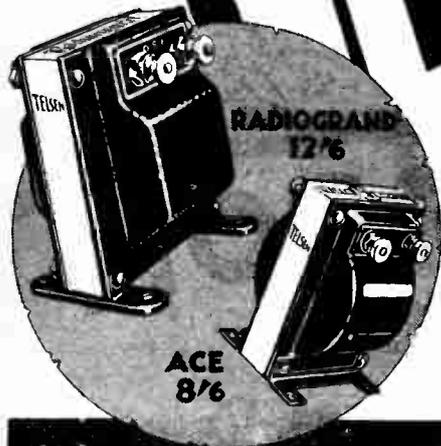
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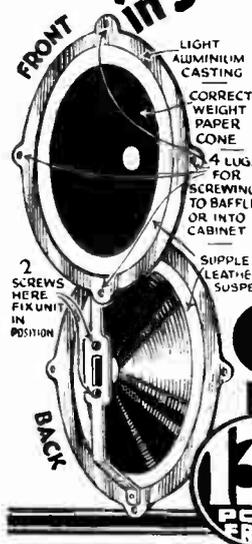
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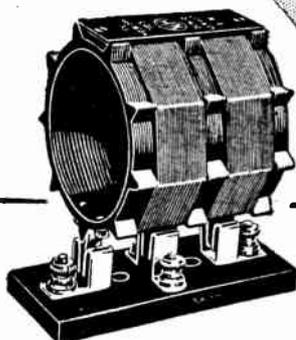
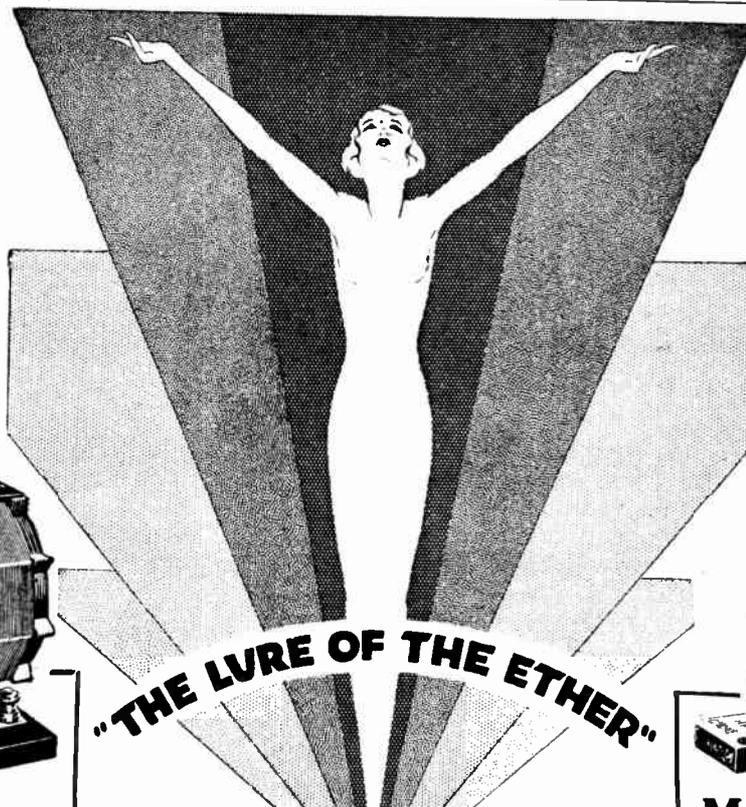
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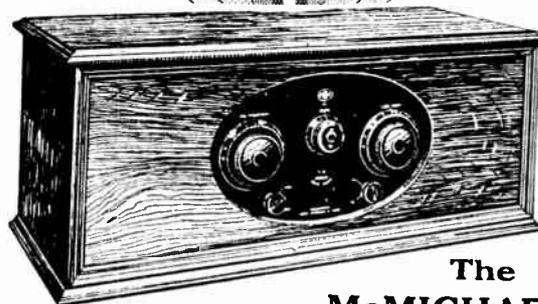
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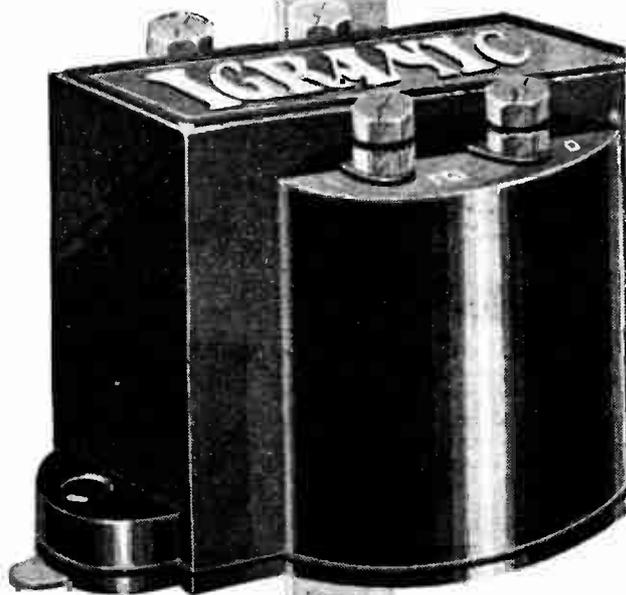
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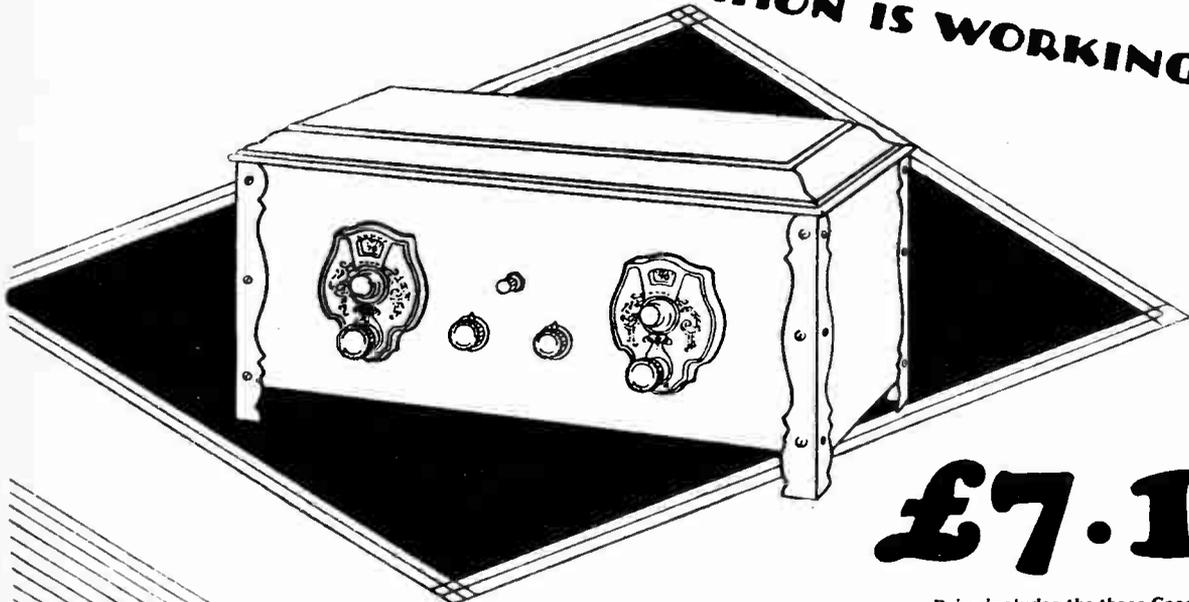
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The Wireless World

AND
RADIO REVIEW
(16th Year of Publication)

No. 483.

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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TRANSMISSION QUALITY.

CRITICISM of quality in the B.B.C. transmissions is a comparatively new phase in broadcasting, but the strength of evidence that all is not well is sufficient to impress upon us the need for enquiry into the matter. Now, the only people who are in a position to check the transmissions satisfactorily are the B.B.C. engineers themselves, and that, of course, at once places the listener at a disadvantage.

A New Phase.

When we speak of criticism of the transmissions as "a new phase in broadcasting," we do so intentionally and not merely using the expression as a convenient phrase. In the early days of broadcast telephony transmissions any sort of transmission which was intelligible was accepted by the public as wonderful, and almost as soon as broadcasting on an established basis in this country began, improvements in transmission quality shot ahead so rapidly that in the race reception quality was outstripped.

The B.B.C. was entitled to boast at that time that its

transmissions were, if anything, too good for any receiver available to pick them up. The B.B.C., in fact, were somewhat severe in their criticisms of the standard of reception, and we believe that at one time the B.B.C. had recourse to a definite "cooking" of the transmitter output in order to put in, say, the bass register which they considered would be inadequately reproduced by the vast majority of receivers. But matters have changed since those days, and it would seem that we are fast approaching (if we have not already reached) a stage when a reversal of the old order of things has come about. The performance of the receiver as a unit has progressed to such an extent that it has, we believe, overtaken transmission, so that to-day, transmissions with certain exceptions, do not do justice to the standard of reception which has been attained.

Quality Variations.

We know that the B.B.C. suffers from very severe handicaps when transmissions are carried over landlines to the transmitter, yet strangely enough, some of the very best of their transmissions—those which stand out in the minds of listeners as exceptionally good, have been over landlines of considerable length; also, a very large proportion of the complaints of transmission quality relate to broadcasts from the studios associated with the transmitter.

We know that for some time past opinions have differed amongst experts on transmission as to the degree of studio draping which is desirable. Unfortunately, broadcast transmission experience is limited to those few who are actually engaged on the work, so that it might be very difficult to argue the case with B.B.C. engineers or their colleagues who are musical experts, but we do suggest that when transmissions, as for instance, those from the Grand Hotel, Eastbourne, have been generally considered so successful, that greater attention should be paid to endeavouring to repeat more nearly those conditions in studio broadcasting.

Views of our Correspondents.

In the correspondence pages of this issue several letters on this topic are published, out of a very large number which have been received, and we shall publish a further selection in future issues. The views expressed by most of our correspondents seem to us to be based on intelligent observation over a long period, and in the face of this evidence we think it would be very rash on the part of anyone who, as spokesman for the transmitting authorities, would contend that there is not at least some foundation for the accusations made.



Short-wave Signals which Travel Over a Million Miles and Return.

By R. T. BEATTY M.A., B.E., D.Sc.

IN the summer of last year Engineer Jørgen Hals, of Oslo, while listening to the Dutch short-wave station PCJJ at Eindhoven, heard a remarkable echo; unlike the usual echo to which he was accustomed it occurred at the huge interval of three seconds after the signal had been received. Hals perhaps felt some diffidence in making this strange story public, for it was not till February of this year that he wrote to Professor Størmer as follows¹:

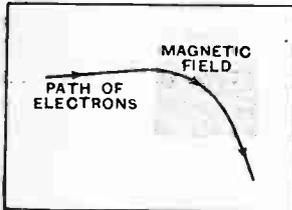


Fig. 1.—The bending of a beam of electrons into an arc when passing through a uniform magnetic field whose direction is at right angles to the plane of the paper.

... I heard the usual echo which goes round the earth with an interval of about $1/7$ th second, as well as a weaker echo about three seconds after the principal signal had gone. When the principal signal was especially strong, I suppose that the amplitude for the last echo three seconds after lay between $1/10$ th and $1/20$ th of the principal signal in strength. From where this echo comes I cannot say for the present. I will only herewith confirm that I really heard this echo."

Størmer lost no time in setting to work on this effect. With the help of Dr. Van der Pol, of the well-known Philips Radio Company, he organised a long series of observations, but for some time no results could be obtained. However, on October 11th both he and Hals, while listening to a 30-metre signal, heard echoes after an interval of from 3 to 15 seconds. Sometimes two echoes were

heard with four seconds between them. Similar effects were noticed by van der Pol.

Echoes from Beyond the Moon?

Where had these waves been during those 15 seconds? They flash round the earth in $1/7$ th second, and they have even been registered on their second lap, but we are faced here with an interval 100 times as great. We cannot imagine that they have scored a century round the globe; surely the intensity would have fallen to a negligible value in doing so; besides, no series of intermediate echoes was heard. Perhaps the moon, 240,000 miles away, reflected them. Not so, for the echo would have returned in 2.6 seconds.

Størmer gives an explanation² which may seem fantastic, but the 15-second interval is almost incredible, so that any explanation sounds comparatively rational.

Over twenty years ago Størmer³ investigated the paths of electrons shot out from the sun and deviated by the magnetic field of the earth. We know that electrons when in motion are affected by magnetic forces,

¹ *Nature*, November 3rd, 1923, p. 681.

² *Archives des Sci. phys. et nat.*, Geneva, 1907.

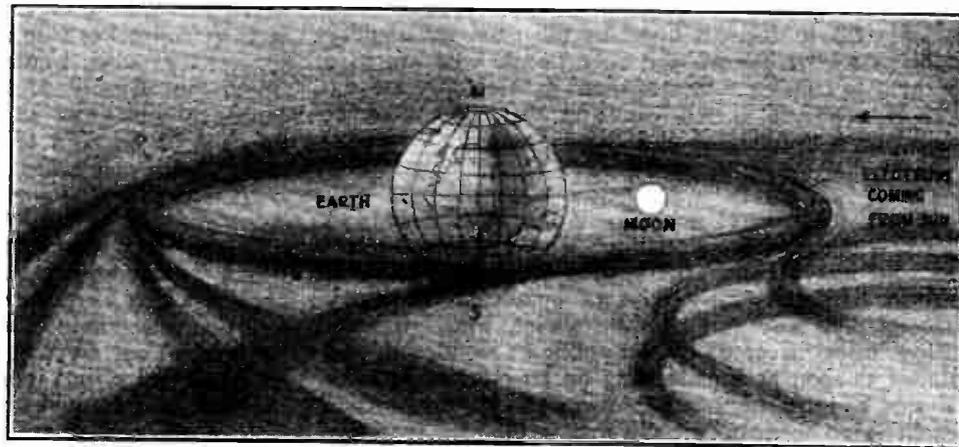


Fig. 2.—Electrons captured by the earth's magnetic field form a great ring in the plane of the equator whose radius may exceed 1,000,000 miles.

³ *Nature*, November 3rd, 1923, p. 681.

Echoes from the Depths of Space.—

as shown in Fig. 1, and the streak of light in a cathode-ray oscillograph tube can be seen to curve when a bar magnet is brought near. The earth may be considered as a bar magnet with its poles near the geographical N. and S. poles. Electrons shot from the sun and directed towards the earth's equator will be deflected, and though many of them will pass on, some will be captured and revolve in a great belt or anchor ring round the earth in the plane of the equator, like the rings which envelop Saturn.

Of the electrons which pass farther north or south, some will travel in ever-narrowing spirals till they plunge into the upper atmosphere near the poles. Many investigators see in them the cause of the Aurora.

Echoes, Auroras, and Magnetic Variations.

Assuming that wireless waves can penetrate the Heaviside layer of the upper atmosphere, they will travel on till they meet this great electron ring which will reflect them and, on account of its enormous extent, will return an appreciable amount of their energy to the earth's surface. To account for the 15-second interval, the radius of the ring must be $1\frac{1}{2}$ million miles! Theory shows that this radius should be larger the smaller the speed of the electrons, and that this particular radius would correspond to electrons travelling at 0.89 of the velocity of light, a speed which is attained by β -particles emitted by radium. The shorter intervals would call for electrons of still higher speed. There is no difficulty in imagining that in the enormous play of energy at work in the sun voltages may be produced sufficient to eject electrons at such velocities.

Since in the course of a single night's observations the echo intervals varied from 3 to 15 seconds, the radius of the electron ring must have been subject to enormous changes. It should be remembered that similar spasmodic changes occur in the Aurora and in the strength of the magnetic field of the earth, and that these fluctuations are attributed to external electric currents.

Whistling Echoes.

When a telephone is connected directly to a large aerial with no H.F. apparatus or rectifier in the circuit, noises are heard at times which start as a high whistle and quickly drop to a low note. These effects have been studied by T. L. Eckersley at Chelmsford during the last nine months, and he finds⁴ that during a magnetic storm there is also a storm of whistles, and that frequently a violent click is first heard, followed at intervals of a few seconds by a series of whistles. He suggests that the click is due to some sudden disturbance in the upper atmosphere which spreads into space and is reflected from different parts of the electron ring, so that on the home journey the pulse is drawn out into a series of pulses which form a whistle.

The Heaviside Layer can be Penetrated.

If the above views are correct, the Heaviside layer of ionised air in the upper atmosphere is not the in-

superable barrier to 30-metre waves which we have imagined. The fact that the strength of the echo amounted to 5 per cent. of that of the original signal points to a fair degree of transparency. Our area of communication is extending. With signals flung through a million miles of space and with the 17ft. telescope

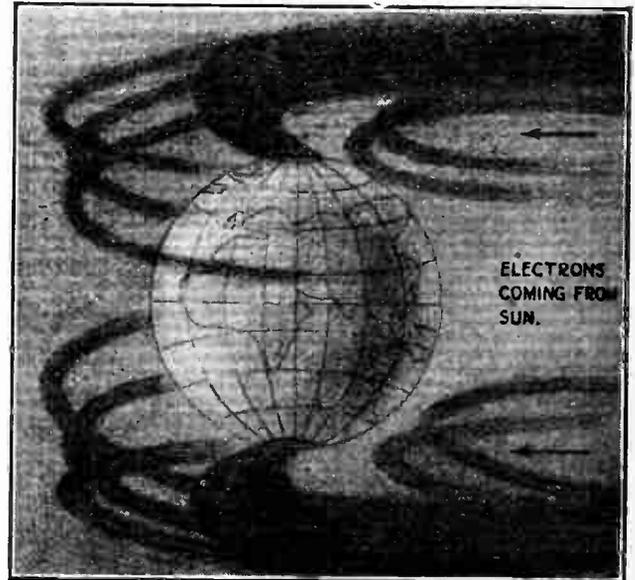


Fig. 3.—Electrons arriving in higher latitudes may become entangled in the earth's atmosphere. The Aurora is probably caused in this way.

reflector now under way for an American observatory we may yet send greetings to a possible decaying brotherhood of life on Mars and receive their message in return: *ave atque vale*.

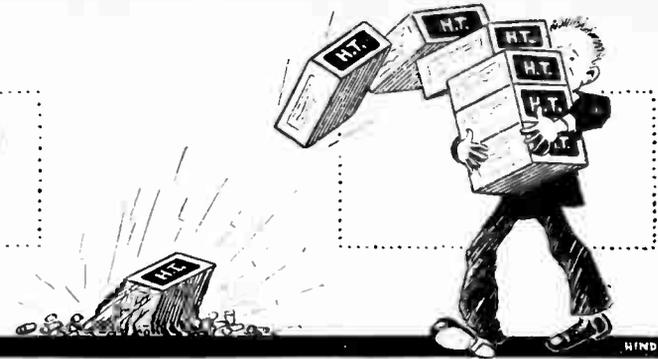
A New Opening for Research.

When wireless communication attained to such a stature that one transmitting station could dominate a continent, splendid opportunities arose for tracking down the puzzling effects of fading, of atmospherics, and the remarkable behaviour of short waves, which may disappear over a range of a thousand miles and reappear farther on with almost undiminished intensity. From such observations we learnt a great deal about the Heaviside layer, its probable height and density, its seasonal changes and its fluctuations in sympathy with those vast disturbances in the sun which occur so frequently.

Practically nothing is known to-day about the electron sheath, of which Figs. 2 and 3 give a primitive picture. If we imagine these figures combined we should see an envelope like a Rugby football lying horizontally, with deep dimples on its upper and lower surfaces and vortex rings rotating in its equatorial surface. The picture would be further complicated by the presence of positively charged atoms which must also be shot out from the sun during the atomic explosions which take place within it. Up to now these phenomena have only been inferred from the behaviour of magnetic storms and auroras, but the long-period echo may allow the problem to be attacked from a fresh angle.

⁴ *Nature*, November 17th, 1928, p. 768.

Dropping Volts!



Some Notes on the H.T. Feed to Modern Sets with Special Reference to the Megavox=Three.

By W. I. G. PAGE, B.S.E.

THE anode feed resistance scheme, sometimes known as the H.T. de-coupling, battery filtering, or anti-coupling scheme, which has for its main object the prevention of back-coupling and distortion by isolation of the output oscillatory circuit of a valve, has been widely adopted in modern receivers. The method, which has been described from time to time in the pages of this journal, consists essentially in providing a separate low resistance path to the filament negative for the anode A.C. component, as shown in Fig. 1(a).

Here we have a penultimate L.F. valve coupled to the output stage by a transformer where the H.T. current is fed through a resistance R_1 of, say, 20,000 ohms.

Taking for example a speech frequency of 200 cycles, the 2 mfd. condenser (Fig. 1(a)) offers the comparatively low resistance of about 400 ohms, so that the A.C. component will be almost entirely diverted to the filament and will not circulate through the H.T. battery. Not the least attractive feature of interposing anode feed resistances is that by a suitable choice of values one H.T. tapping can be used for a multi-valve set where various H.T. potentials are required for each stage.

In sets where high-frequency amplification is carried out by means of triodes followed by leaky grid detection and low-frequency amplification, and where only one H.T. positive lead is desired, the general principles of Fig. 1(a) can be carried out with every valve without any difficulty, provided that the value of the feed resistance is arrived at by dividing the volts to be dropped by the current in amperes. When we come, however, to con-

sider the feed to the screen of a screened grid valve or to the plate of an anode bend detector in a set where it is desired to use one H.T. tapping and where the maximum H.T. voltage is considerably above that required, the problem is not so easy. Let us assume in a screened grid valve that 0.5 mA. is the screen current when the screen voltage is 80 and that our H.T. supply is 200 volts; clearly we shall require a feed resistance of $120 \div 0.0005 = 240,000$ ohms to drop the necessary volts.

If for experimental purposes the anode voltage or the

grid bias (or the valve itself) were changed, involving a rise in screen current to, say, 0.7 mA., then the voltage on the screen would be changed to 200 less $240,000 \times 0.0007 = 200$ less 168 = 32 volts, but screen voltage is critical, and in the case quoted should not vary more than perhaps 10 volts above or below 80. It is thus evident that a single series resistance is inadmissible for the purpose of dropping an appreciable voltage where the feed current is very small, such as that in the screen circuit of a screened grid valve. For the same reason it is inadvisable to use a single series resistance in the H.T. feed to an anode bend detector when more than 40 or 50

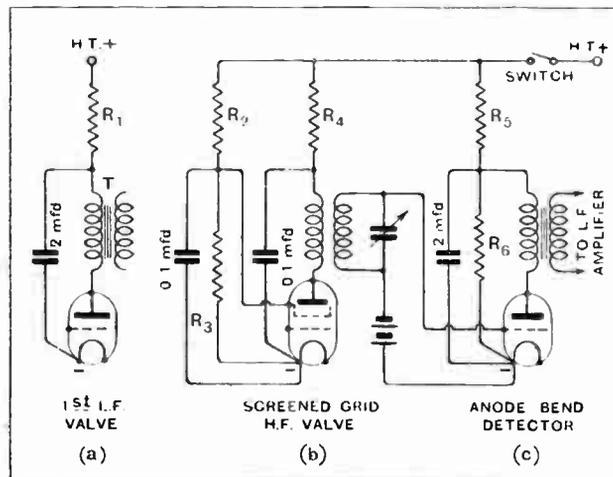


Fig. 1.—(a) The anode feed resistance scheme as applied to a first L.F. valve. At two hundred cycles the 2 mfd. offers about 400 ohms resistance, whilst R_1 is, say, 20,000 ohms. (b) Potential-divider feed to the screen of a screened grid valve. (c) Potential-divider feed to the plate of an anode bend detector where an appreciable voltage has to be dropped. Note the H.T. + switch.

volts have to be dropped. There is, moreover, a further complication in this case, for when the signal input to the grid is increased in amplitude the mean value of the steady D.C. anode current rises, with consequent fall in potential on the anode due to the presence of the feed resistance. This would mean that a different operating point on the curvature of the characteristic would result for strong and weak signals. In practice, however, it would not be very serious, since the valve would be

Dropping Volts!—

biased to give probably best rectification on loud signals. From the foregoing considerations it would appear more satisfactory to remain content with a tapping to the necessary voltage on the H.T. battery, and rely on a small de-coupling resistance of about 600 ohms (with by-pass condenser) in the case of the screen of a screened grid valve to deflect the high-frequency A.C. component from the H.T. battery. Where mains voltages are used, or where it is *specially desired* for reasons of even discharge to employ one H.T. tapping with an H.T. battery, separate potential dividers are necessary in a set incorporating screened grid and anode bend detector valves.

Potential Divider Values.

In Fig. 1(b) we will consider that the screen voltage must be 80; we therefore connect a potential divider, consisting of two clip-in resistances, R_2 and R_3 , across the H.T. supply, which we will assume is 200 volts. A lead from the junction of the two resistances is taken to the screen, which will have an applied potential of 80 volts if the values of the resistances are to one another as 80 is to 120, that is, the voltage across one resistance will have to be two-fifths, and across the other three-fifths, of 200 volts, *provided that no current is taken by the screen*. The total value of the resistances in the potential divider should be such that the constant current flowing is considerably greater than that of the feed current to the valve concerned, which in the case under discussion we will take as 0.5 mA. (with 150 volts on the anode).

A convenient value is 100,000 ohms, which will pass at 200 volts a current of 2 mA. (this is four times greater than the valve current). In these circumstances it would appear to be necessary to make R_2 and R_3 respectively 60,000 and 40,000 ohms, but unfortunately we are faced with a slight complication since, as already stated, the screen *does take current*, a condition which in effect adds another resistance in parallel with R_3 and is tantamount to reducing it in value. In Fig 2(a) the potential divider of Fig. 1(b) has been redrawn to show the screen resistance as R'_3 ; its value is taken as 160,000 ohms (as it passes 0.5 mA. at 80 volts), and by reference to *The Wireless World* Abac No. 11 it will be seen that 40,000 (R_3) and 160,000 (R'_3) in parallel are equivalent to a single resistance of 32,000 ohms. The potential difference between A and B (*i.e.*, the screen voltage) now becomes $\frac{32,000}{92,000} \times 200 = 69.5$ volts, and not 80 volts. In

working out values of potential-divider resistances it is thus necessary to take the D.C. resistance¹ of the valve circuit into account, as it makes it necessary to raise the tapping point on the potential divider nearer to H.T. +. By making R_2 and R_3 respectively 55,000 and 45,000

ohms, by similar calculation we get a screen potential of about 78 volts, which is more satisfactory. It can easily be shown that a rise in screen current to 0.7 mA. is now accompanied by a drop in potential to just over 70 volts, which is rather different from a drop to 32 volts when a single series resistance is used in similar circumstances; this incidentally proves the case for the potential divider. When a screened grid valve (Fig. 1(b)) is fed from H.T. batteries a sufficient by-pass in association with the de-coupling resistances is effected by 0.1 mfd. condensers; but it is usual to replace these by 2 mfd. condensers if the receiver is mains fed, since ripple current may have to be passed.

The battery filtering effect of the potential divider is the same as that of a single series resistance; in fact, R_2 and R_3 of Fig. 1 perform precisely the same function as R_1 , but since a steady current is always flowing across the potential dividers, whether or not the filaments are alight, it is necessary to fit a switch in the common H.T. + lead. The feed to an anode bend detector is shown in Fig. 1(c).

Those who wish to feed a *Megavox-Three* receiver from a single tapping on an H.T. battery of 130 volts would be well advised to include a potential divider for the screen and retain the original resistance in the plate circuit of the detector, also that in the screen circuit of the pentode.

In an eliminator for the *Megavox-Three* shortly to be described separate potential dividers will be used for the H.T. feeds to the screen of

the screened grid valve and to the plate of the anode bend detector, while the other H.T. feeds will have series resistances. The incorporation of separate potential dividers together with series resistances provides no common paths for speech currents, and from the point of view of avoiding back-coupling is equivalent to having series feeds throughout. Care must be exercised to differentiate between the system just described and the method of providing several H.T. potentials from a single potential divider shunted across the H.T. supply. How L.F. oscillation or distortion can occur when employing this latter system was dealt with recently in an article² by the author.

The Case of the Megavox-Three.

A switch is provided in the *Megavox-Three* to change over from leaky grid to anode bend detection and automatic correction of the anode voltage is effected by a 20,000 ohm feed resistance. What method shall we employ to create the necessary reduction when the source

¹ This is not the same as the impedance of the valve, which is the differential resistance, *i.e.*, change in anode volts ÷ change in anode current.

² Back Coupling in Eliminators *The Wireless World*, September 26th, 1928.

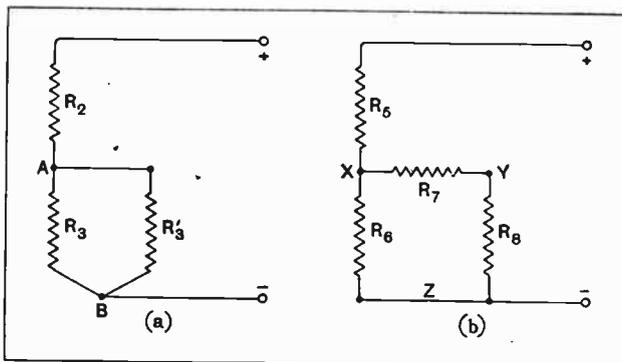


Fig. 2.—(a) The equivalent screen circuit of Fig. 1(b). (b) The equivalent diagram for the anode feed circuit of the *Megavox-Three*, where optional anode bend or leaky grid detection is used.

Dropping Volts !—

of H.T. supply is 200 volts? Earlier in this article it has been shown that a potential divider is preferable for anode bend, and that the constant current flowing should be much more than that of the feed current to the valve. Presumably we shall use the same potential divider for leaky grid where the anode current is approximately 3 mA., thus necessitating a constant current of at least 6 mA. The total potential-divider resistance required is thus about 35,000 ohms, and before we can decide on the position of the tapping point it is necessary to study the equivalent circuit of Fig. 2(b), where R_5 , R_6 is the 35,000 ohm potential divider across 200 volts H.T.; R_7 is the 20,000 ohm resistance already in the receiver, and R_8 the D.C. resistance of the valve.

Let us take R_5 as 10,000 ohms and R_6 25,000 ohms, and work out the difference in potential between X and Z. The lower limb (XZ) of the potential divider has an effective resistance when leaky grid detection is used of R_6 (25,000 ohms) in parallel with R_7 (20,000 ohms) + R_8 (23,000 ohms obtained by assuming 3 mA. anode current at 70 volts H.T.), which works out at 16,000 ohms; therefore the volts across XZ are $\frac{16}{35} \times 200 = 123$ volts, while the volts across YZ, that is the actual plate voltage, will be approximately half 123 volts, i.e. 60 volts, representing a satisfactory applied potential for leaky grid detection.

With anode bend R_8 becomes about 240,000 ohms (0.5 mA. at 120 volts), so that the lower limb XZ of the potential divider becomes R_6 (25,000 ohms) in parallel with R_7 (20,000 ohms) + R_8 (240,000 ohms), which equals 23,000 ohms; and the difference in potential between X and Z now equals about 140 volts and between Y and Z (the plate of the valve) about 130 volts—a satisfactory potential for anode bend detection.

It is hoped that the examples given will assist readers to calculate the resistances required when employing separate potential dividers to break down either mains or battery voltages for the H.T. feeds in a multi-valve receiver embodying an anode bend detector and one or more screened grid valves.

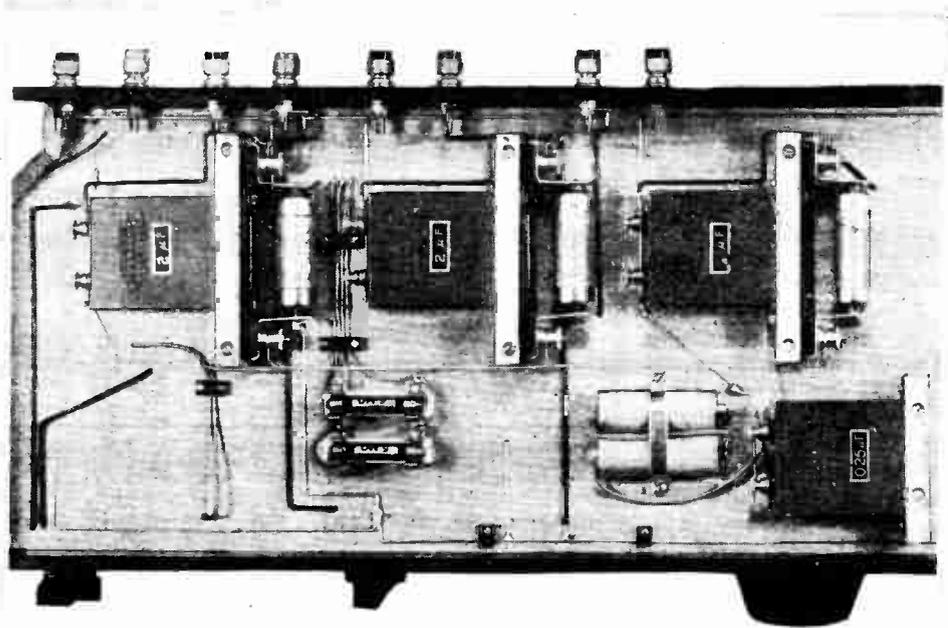
The salient points in connection with the accommodation of the H.T. supply for various anode requirements can be summarised as follows:—

1. *H.T. Dry Batteries and H.T. Accumulators* probably give the simplest and most certain way of providing the correct plate voltages for each valve by reason of the large number of tapping points which can be used without the complication that change in

feed current is associated with serious change in voltage. Any appreciable internal resistance of the battery, however, is accompanied by back coupling and probably distortion if this type of feed be employed without anode feed resistances.

2. *Anode Feed Resistances*, used in conjunction with suitable by-pass condensers, when embodied in a receiver combine the dual function of preventing back-coupling and distortion due to the internal resistance of a battery and provide a means of feeding from one H.T. tapping a set where various H.T. potentials are required for each stage. This method holds good where triodes are used in the H.F. stages and where leaky grid detection followed by triode or pentode L.F. valves is employed.

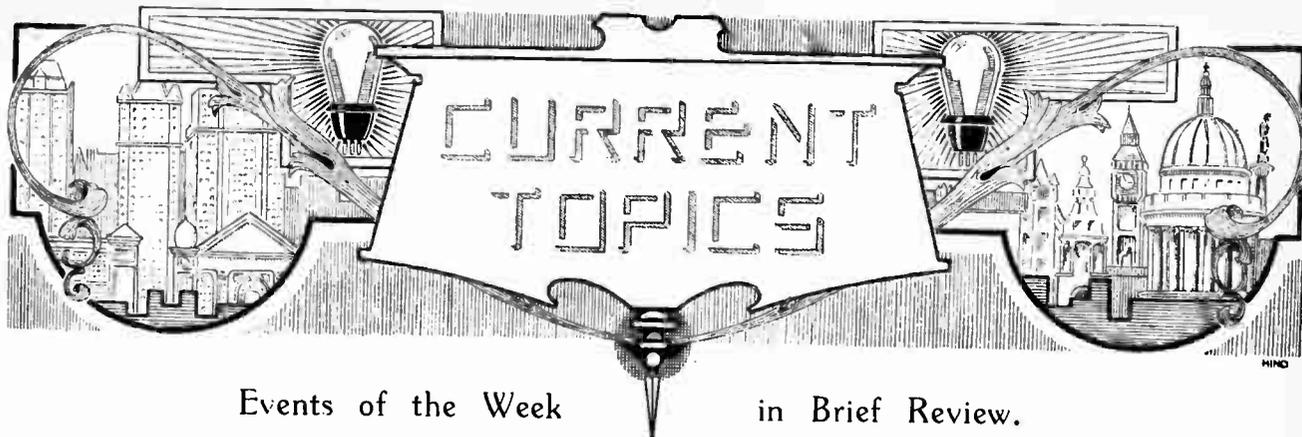
3. *The Screen of a Screened Grid Valve* should be fed from a potential divider if many volts have to be dropped either from a battery or from the mains.



A typical H.T. battery filtering scheme making use of only one H.T. tapping. The illustration shows the sub-baseboard layout of *The Wireless World* "New All-wave Four" receiver.

4. *An Anode Bend Detector*, if any appreciable voltage has to be dropped (from a battery or from mains equipment) should be fed from a potential divider because the anode current is relatively small and because the mean D.C. feed current alters with change of amplitude of signal impressed on the grid.

5. *Potential Dividers* (which can consist of clip-in resistances in series) of suitably high resistance not only provide a means of supplying H.T. from one tapping where screened grid and anode bend detector valves are used, but also perform the same function as single series anode resistances as regards preventing back-coupling. In working out the values of potential-divider resistances it is necessary to take into account the D.C. resistance of the valve circuit in parallel with one limb.



Events of the Week in Brief Review.

POPULAR PICTURE TRANSMISSION.

"Wireless Pictures" were placed first in a competition to discover the most popular exhibit at the Manchester Wireless Show.

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RUSSIA BUYS AMERICAN RADIO GEAR.

The Soviet Government is reported to have signed an agreement with the Radio Corporation of America for the purchase of £60,000 worth of wireless equipment.

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AN ENTERPRISING CORPORATION.

It is believed that the enterprise of the Middlesbrough Corporation in initiating a scheme for the hire purchase of battery eliminators by electricity consumers has aroused considerable interest among other municipalities. Similar schemes are likely to be tried in other parts of the country.

Middlesbrough listeners obtain their eliminators on the deposit of £1, the remainder of the purchase price being payable in half-yearly instalments of £1, extending over a period of five years.

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MARCONI ROYALTIES APPEAL.

In the Chancery Division on November 20th Mr. Justice Tomlin declined to fix a date for the pending appeals by Marconi's Wireless Telegraph Co. against the decision of the Patent Comptroller in respect of the "Brownie" and "Loewe Radio" royalty cases.

Mr. Justice Tomlin informed the Attorney-General (who has been added as a party) that if one of the prior cases now in his list were settled, further application could be made.

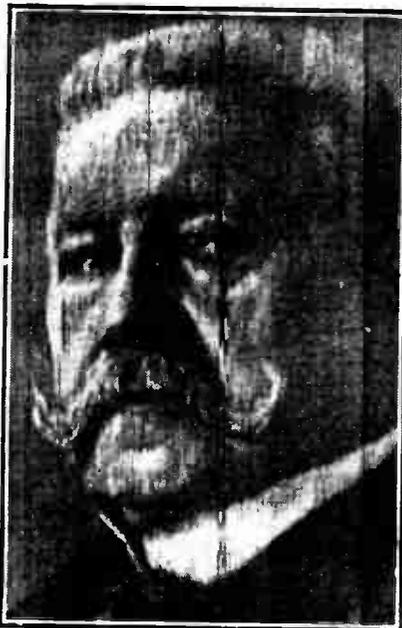
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MEMORIAL SERVICE FOR WIRELESS OPERATOR.

More than 2,000 people attended a memorial service on November 18th at Old Trinity Church, Wall Street, New York, for Mr. Michael O'Loughlin, the senior wireless operator of the "Vestris." The congregation included members of the crew, representatives of the Veteran Wireless Operators' Association, Army and Coastguard officers, and Sir Harry Gloster Armstrong, the British Consul-General in New York. The service was broadcast.

LONG-DISTANCE PICTURE RECEPTION.

The distance possibilities of the "Fultograph" system were successfully demonstrated on Tuesday, November 20th, when a number of London listeners equipped with "Fultograph" receivers were able to pick up the inaugural picture transmission from Königswusterhausen,



PICTURES FROM BERLIN.—President Hindenburg's portrait as received in London on a "Fultograph" set during the inaugural picture transmission from Königswusterhausen on November 20th.

Berlin, on 1,649 metres. A portrait of President Hindenburg came through well, despite the nearness in wavelength of 5XX, which caused only a few blemishes.

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CHINA'S WIRELESS PLANS.

The Nationalist Government of China has signed an agreement with the Radio Corporation of America for the institution of a high-speed radio circuit between

Shanghai and the United States. A similar agreement has been concluded between the Chinese Government and Trans Radio, Berlin.

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A WIRELESS BANQUET.

Sir William Bull, M.P., will preside at the annual banquet of the Radio Manufacturers' Association on Thursday, December 6th.

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STOCKBROKERS AT SEA.

Wireless facilities for the establishment of stockbrokers' offices on transatlantic liners are being considered by the General Post Office.

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IRISH AMATEURS TO UNITE.

A fusion of the Wireless Society of Ireland with Irish Radio Transmitters' Society is to be recommended at the annual general meeting of the former on Friday next, November 30th.

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FREE STATE WIRELESS.

The establishment of a large wireless factory in the Irish Free State has been suggested to Mr. Heffernan, Minister of Posts and Telegraphs, for consideration by the Dail. It is urged that such a factory would mean cheaper wireless apparatus for Irish listeners, besides giving employment.

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NE PLUS ULTRA—SHORT WAVES?

"Radio waves too small for science to measure—" says a Scottish newspaper—"so small that the actual amount of energy exerted was a million times less than the pressure of a fly's foot—were used by Maurice J. Francill, the radio engineer, to secure this wonderful result."

The result referred to was the distant control of four ears in Chicago. But more wonderful than the distant control is surely Mr. Francill's discovery of the really ultra-short waves. 5-metre work has lost its glamour.

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STOCK EXCHANGE WIRELESS.

Doupevitich, a Parisian gentleman who had erected a wireless transmitter in his house with a telephone line to the

Bourse, is now in prison. He has been sentenced to one year's imprisonment and a fine of 5,000 francs (£40) for communicating exchange prices by wireless to friends in other countries, thereby enabling them to use their first-hand information to the detriment of other speculators.

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FRENCH RIVAL TO WIRELESS-CABLE MERGER?

A French wireless-cable merger is reported to be under consideration. Radio-France, which controls wireless communication from France to Britain, Austria, Spain, Norway, Yugo-Slavia, Rumania, and Czecho-Slovakia, is understood to be in negotiation with the French Cable Company, the owners of cables connecting Europe with North and South America, New Caledonia, and Australia. The merger, if formed, would be a reply to the British proposals and new American schemes for placing world communication under a single control.

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BRITISH WIRELESS EXPORTS.

During August last, says *The Wireless Trader*, radio exports from this country were valued at £69,974, values accounting for £12,617. The principal market was Australia. Continental customers included Spain (£4,830), France (£3,781), Norway (£2,473), and Belgium (£2,009).

SETS ON HIRE.

A Warninster firm advertises the free installation of a receiving set, "including erection of aerial, earth, loud speaker and all accessories" at a charge of 4s. 9d. per week, with a minimum contract of six months. Query: Who pays for the receiving licence?

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SHORT WAVES FROM AFRICA.

An opportunity is available to short-wave listeners to hear 30-metre telephony transmissions from wildest Africa. We understand that, until further notice, Major Court Treatt is transmitting on this wavelength from Bahr-el-Arab, Southern Sudan, between 6 and 8.30 p.m. G.M.T., using the call-sign FXCT. He is engaged with Mrs. Court Treatt in the production of two pictures for British Instructional Films, Ltd.

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"WIRED WIRELESS" FOR AMERICA.

In view of the recent publication of articles on broadcasting by "wired wireless" (*The Wireless World*, November 14th and 21st), it is interesting to note that the Kolster Radio Corporation and the North American Company are pooling their resources to develop a "wired radio" system throughout the United States, involving the use of the North American Company's network of electric wires throughout the country. A "unique broadcasting service" is to be provided which, according to present

plans, will ultimately include television. Receiving sets are shortly to be available at a nominal rental.

"Wired wireless" has peculiar advantages in America, where the existing broadcasting conditions are still far from the ideal. Atmospheric are troublesome, but the greatest bugbear is mutual interference between the 650 stations, despite the prolonged endeavours of the Federal Radio Commission to bring order out of chaos.

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WIRELESS-CABLES MERGER BILL.

In the House of Commons last week the Imperial Wireless and Cables Bill was read a second time, the Labour amendment for the rejection being defeated by 258 to 134. The Bill was committed to a Committee of the whole of the House.

In the course of the debate, Labour Members contended that the bargain was a bad one for the Government. In reply, Sir John Gilmour said that the scheme had been unanimously recommended by an authoritative and representative Imperial Conference when faced by the common Imperial problem of preserving the cables. Some kind of fusion was agreed to be essential.

Government influence in the new company would be preserved by two Government directors, one of whom must be chairman.

SCIENTIFIC FOUNDATIONS OF BROADCASTING.

New German Work on Electro-Acoustics.

THE flood of German scientific treatises shows no sign of abating: as the reader wades each autumn in the rising tide he is inclined to say: "Is it worth while?"

This book* seems to be well worth while for the first third of its course, in which an excellent account is given of the nature of speech and music and of the fascinating but difficult subject of electro-acoustics. But the treatment of electric waves, valve theory, amplifiers, transmitters and receivers, has little to distinguish it from the subject-matter of any of half-a-dozen English books on similar subjects.

Chapter 2 treats of the modern work on the analysis of speech sounds. The old controversy between Helmholtz's view that the upper partials of any vowel are fixed in pitch, whatever the pitch of the fundamental, and the rival theory that the partials rise as the fundamental rises, as when a gramophone record is rotated at higher and higher speeds, has now been definitely settled. It appears that Helmholtz was nearly right: the group of overtones which characterises any vowel rise in pitch, but only slightly, as we pass from bass to soprano voices. Thus when the vowel A is sung by two

voices, the relative frequencies of the fundamental pitches being 5 to 1, the relative frequencies of the important overtones are only in the ratio 5 to 4. "U" sounds contain the lowest overtones, "A" sounds the highest: the variations are due to the different sizes of the cavities of the mouth and throat, which act as resonators when these vowels are spoken or sung.

The microphone is unkind to soprano voices. The soprano's fundamental is already far out on the sideband; her overtones, which are still farther away from the carrier frequency, are frequently suppressed entirely.

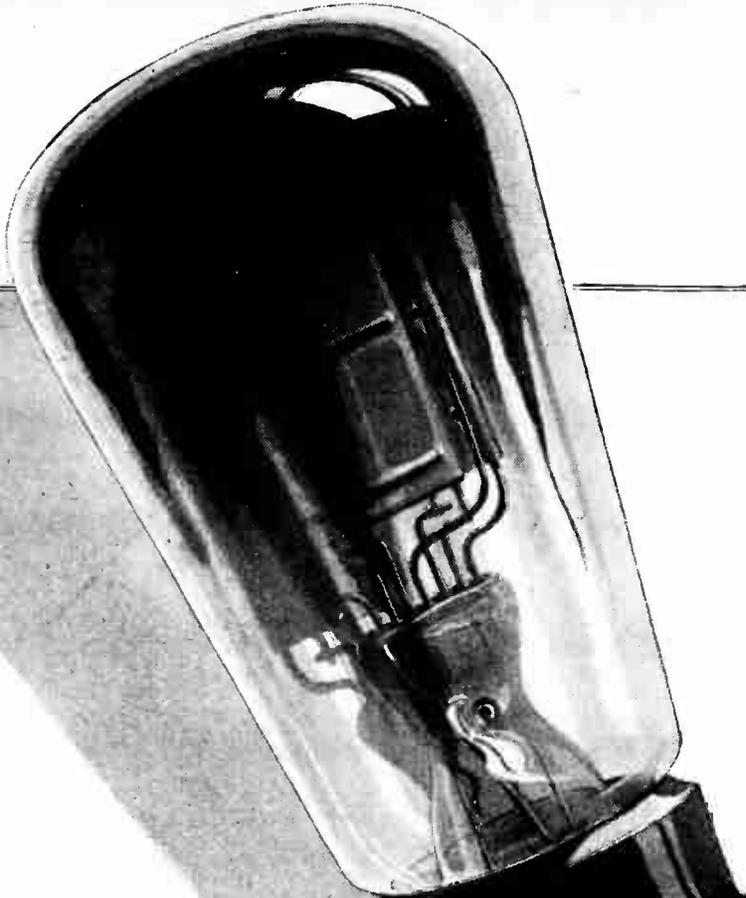
A summary is given of recent work on the acoustics of concert halls: echoes from bare walls are distressing; on the other hand, walls clothed entirely with tapestries cause a dull and stifled effect. Formulæ have been worked out to give the correct amount of "absorption loading," partly due to the audience, partly to wall hangings, so as to produce an agreeable result. The theory of combination tones is touched upon: the ear possesses the power of supplying fundamental tones which the loud speaker may omit to supply; thus two defects unite to improve reception provided the sound is sufficiently loud. Sound-producing instruments are divided into three classes; those of zero order emit radiation equally in all directions; this class is typified by pulsating spheres: oscillating spheres and diaphragms open to the air on both

sides belong to the first order with one nodal line or circle. Instruments with two or more nodal lines or circles, such as bells, belong to the second or higher orders. In each case the device is loaded by the air (or in submarine transmitters by the water) which is set in motion; and this resistance loading, which varies with the wavelength, can be found by simple approximate formulæ; expressions are also given for the change in resonance frequency due to the surrounding medium.

In the chapter on electro-acoustics the general theory of telephones and loud speakers is given, these devices being considered as coupled to the electrical driving system, and this section alone would justify the production of the book. A long discussion lays down clearly the relations which should exist between the impedances of the driving system, the loud speaker mechanism, and the air loading, the result being expressed as a factor of merit. Exponential horns, coil-driven diaphragms, and the "Blatt-haller" are thoroughly dealt with.

The rest of the treatise treads well-worn paths in wireless engineering, but a flash of interest is excited by the section on strays, atmospheric and otherwise. The author surveys the geographical distribution of atmospheric and their relation to thunderstorms and seasonal weather changes, and has a good deal to say about the superiority of transmission on short wavelengths. R. T. BEATTY.

* Die Wissenschaftlichen Grundlagen des Rundfunkempfangs [The Scientific Foundations of Broadcast Reception]. Edited by K. W. Wagner. Pp. 418. 25 marks. Julius Springer, Berlin. 1927.



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How the Relative Constants of the Output Stage and the Moving Coil affect the General Character of Reproduction.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

IN a previous article¹ on the moving coil loud speaker, I showed that (1) the impedance of the moving coil increased at low frequencies owing to the back e.m.f. caused by its motion in the magnetic field of the pot; (2) there was electro-mechanical resonance (apart from the influence of any mechanical support) at some frequency in the middle register, this point corresponding to *minimum* impedance; (3) above this frequency the impedance increased due to the inductance of the coil. Using the theory and data given in the above article, the impedance of the coil can be calculated over a certain band of frequencies. Now it is important to observe the conditions under which the impedance is calculated. These are as follows: (1) The coil was a *high resistance* type of 1,000 turns 46 enamelled s.w.g., 2in. in diameter. This avoided any complication due to a transformer. (2) The diaphragm was about 9½in. in diameter (*The Wireless World*, August 8th, 1928, p. 157, for actual size) and free from resonances. (3) The resonance of the diaphragm on its surround is assumed to be below the lower limit of audibility (see footnote *re* this on page 94, "Loud Speakers," 2nd Edition). (4) The inductance and resistance of the coil are assumed to be constant at all frequencies.

These conditions are conducive to simplicity, but hardly fit in with the practical case. There is a variation in inductance and resistance, with the frequency which we shall discuss later, but it merely alters the magnitude of the impedance in a certain degree. Condition (3) relative to the absence of surround resonance can be fulfilled by taking the necessary precautions, but there are coil drive loud speakers where this resonance exists in a marked degree. This was shown clearly in another article². In Fig. 1 is reproduced a curve showing the current in a moving coil loud speaker as specified in the explanatory matter beneath the diagram. The current falls from a maximum value of 42 mA. to a minimum value of 27 mA. This is clearly due to an increase in the impedance of the moving coil system (not the moving coil, *per se*). Turning to Fig. 2 we have an equivalent diagram of the power valve stage, with the loud speaker. The voltage of the

fictitious alternator is constant, so that the current will depend upon the impedance of the complete circuit, i.e., two power valves in parallel plus the loud speaker. The internal resistance of the valves was not measured, but it can be assumed as 1,350 ohms. without introducing serious error.

We know that impedance = $\frac{\text{volts}}{\text{current}} = \frac{m \times V_g}{\text{current}}$. Now m for an L.S.5A is about 2.2, whilst the r.m.s. voltage applied to the grid³ was 45. The value of mV_g is

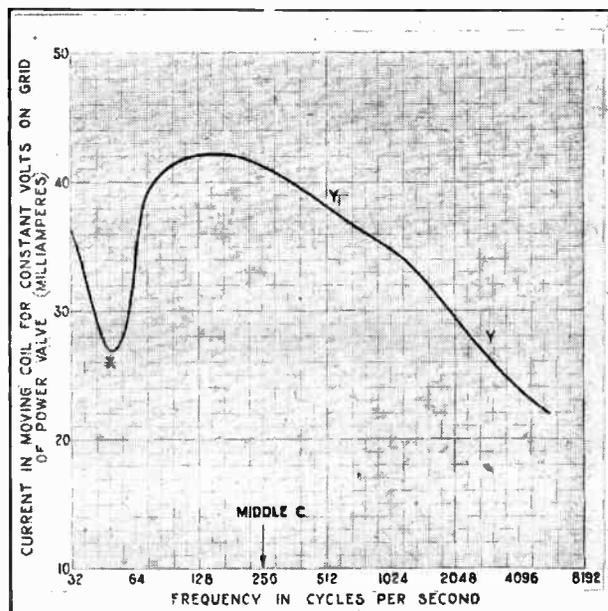


Fig. 1.—Curve showing alternating current in moving coil loud speaker. The moving coil was wound with 1,000 turns, and the flux density in the air gap 8,300 lines per square cm. The power stage contained two LS5A valves in parallel. The fall in current at X is due to mechanical resonance of diaphragm, and the fall in current at YY is due to inductance of coil and also increase in A.C. resistance due to iron loss.

³ This applies to the present Fig. 1 and to Figs. 3 and 4, *The Wireless World*, August 8th, 1928. In Fig. 5 (August 8th, 1928) the input voltage was 34. Owing to the large amplitude of the cone, to sideways motion, and to the general mechanical properties of the rubberised silk, the minimum current at 50 cycles was difficult to secure accurately. I have another current value of 23 mA. (for Fig. 5) which gives an impedance in accordance with Fig. 1.

¹ *The Wireless World*, March 30th, 1927, p. 372.

² *The Wireless World*, August 8th, 1928, p. 154.

The Impedance of a Moving Coil Loud Speaker.—

therefore $2.2 \times 45 = 99$. The current in the denominator is read from Fig. 1. Thus by dividing the ordinates of Fig. 1 into 99, we still obtain the total impedance of the loud speaker plus power valve. This is plotted in Fig. 3, from which we see that the impedance has a

(mathematical) maximum value at 50 cycles and a minimum value about 170 cycles. To secure the loud speaker impedance it is necessary to subtract the resistance of the power valves from the total circuital impedance. Since the loud speaker impedance is not a pure resistance (except at 50 cycles and 170 cycles) its value cannot be found by simple subtraction of

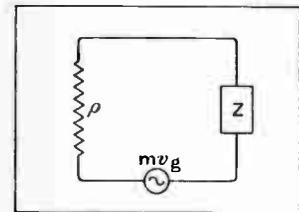


Fig. 2.—The equivalent circuit of power valves and loud speaker. ρ is the resistance of power valves in parallel; Z the impedance of loud speaker, and $mv g$ the voltage of fictitious alternator.

valve resistance from the ordinates of Fig. 3. However, at 50 cycles and 170 cycles this subtraction is permissible. The circuit impedance (a resistance in these two cases) at 50 cycles is 3,660 ohms. The valves account for 1,350 ohms, leaving 2,310 ohms as the impedance of the loud speaker. At 170 cycles the total impedance is 2,350 ohms, leaving 1,000 ohms for the loud speaker. This has been confirmed by measurement of the effective A.C. resistance of the loud speaker. The D.C. resistance is 930 ohms, so that the

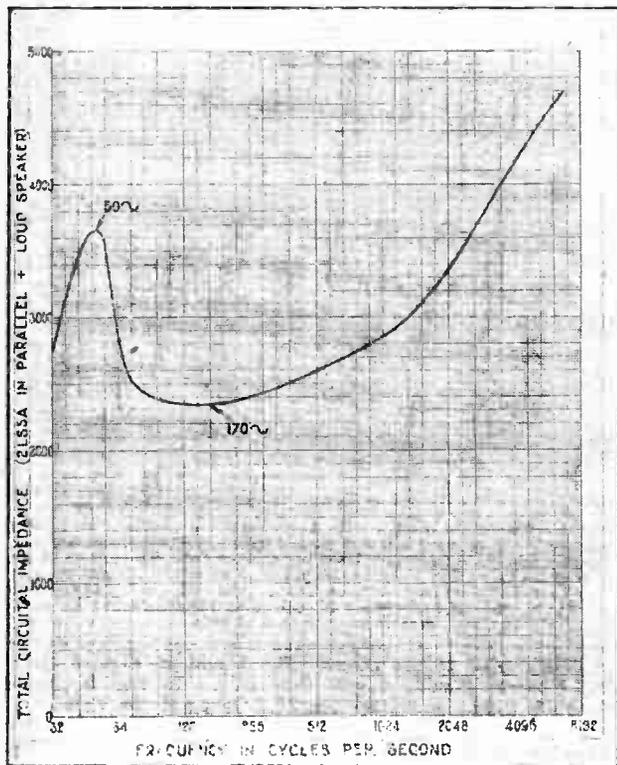


Fig. 3.—Curve showing total impedance of two LS5A valves in parallel together with coil drive loud speaker as specified under Fig. 1.

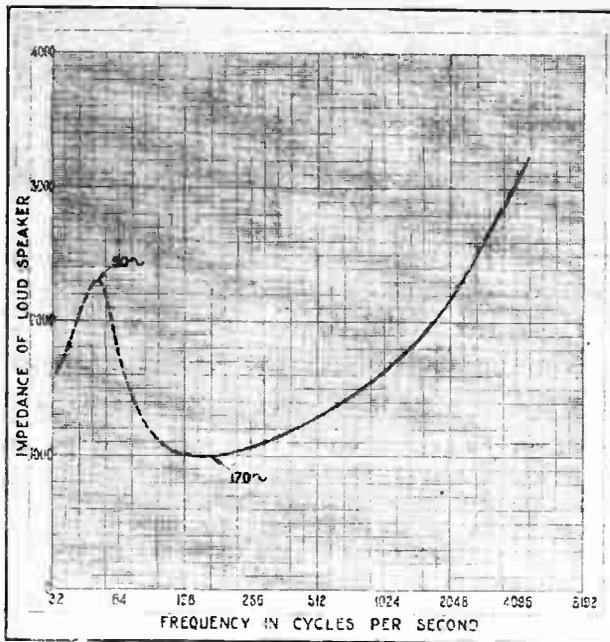


Fig. 4.—The impedance of coil drive loud speaker as specified under Fig. 1. At 50 cycles the rise in impedance is due to resonance of the surround, whilst at the higher frequencies it is due to the inductive reactance. The ordinates of Figs. 3 and 4 are ohms. In all curves the irregularities due to diaphragm resonances have been omitted deliberately.

iron loss does not cause a serious rise in resistance at the frequency under consideration. The influence of the surround resonance, in this particular case, is substantially to double the loud speaker impedance. As indicated in an earlier footnote the actual current at resonance was difficult to measure owing to the peculiar action of the rubberised silk and to the large amplitude. Using data from *The Wireless World*, August 8th, 1928, Fig. 5, the loud speaker impedance is about 4,000 ohms, i.e., a fourfold increase over that at 170 cycles. Using a rubber surround the impedance was greater than 4,000 ohms, but as this occurred *below the limit of audibility*, it does not affect the problem at issue, namely, the impedance variations over the *audible* frequency range. Of course, by increasing the radial tension on the rubber (or other supporting material) it would have been possible to secure a greater impedance due to the surround resonance. The increased tension would be accompanied by resonance at a higher frequency where its effect would be noticeable. The object in designing a coil drive loud speaker, however, should be to place the surround resonance well below the working frequency range.

The impedance of the loud speaker, apart from the valves, is given by the curve of Fig. 4.

So far our attention has been confined to a certain type of loud speaker operated by a high resistance coil. This is a simple mode of procedure since it eliminates any complications which may arise when using an output transformer and a low resistance coil. As a number of readers use output transformers, I think it will be of interest to add an impedance curve—better still, a current curve—relating to this case. In Fig. 5 is

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depicted a current-frequency curve for a certain loud speaker with transformer and low resistance coil³. Neither the speaker nor the transformer was designed by me. The diaphragm is a good deal smaller than that used with the high-resistance coil. The surround resonance occurs consequently at a higher frequency, viz., 75 cycles. This resonance is pronounced and objectionable in the reproduction of speech and music. With one LS5A power valve the coil current at 4,000 cycles was reduced to half its value at 250 cycles, due mainly to coil inductance and transformer leakage. Nevertheless, there was a definite tendency in reproduction to accentuate the upper register. This is due to con-

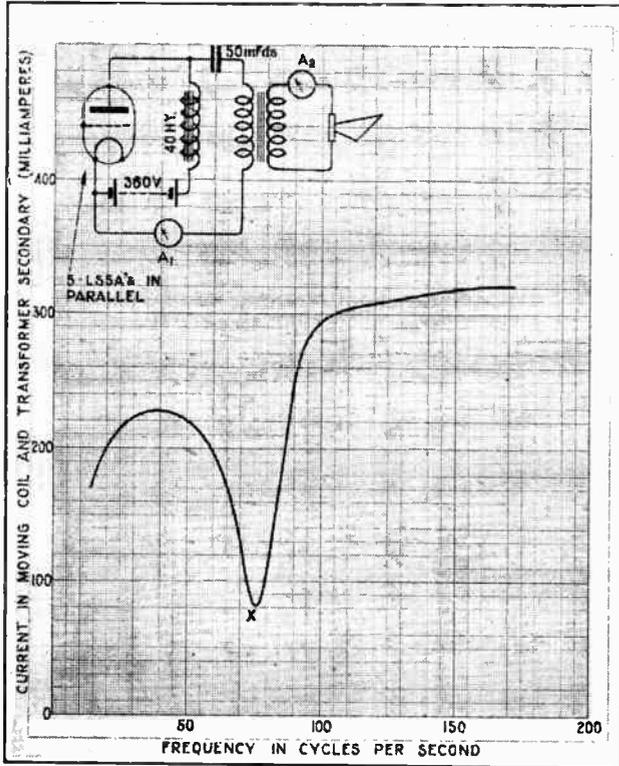


Fig. 5.—Curve showing current in moving coil loud speaker with transformer output from power valves. X is the resonance frequency of the surround. At 4,000 cycles the secondary current was 82 mA. with five LS5A's in parallel.

certina action as stated in a previous article⁴. Although the surround resonance with a diaphragm of this type is unpleasant, it counteracts the effect of the upper register to an extent. When the low frequency resonance is eliminated the upper register is distressing.

The transformer is rather a unique piece of apparatus. Owing to its low primary inductance, the ratio of the secondary to the primary current falls from nearly 16 at 100 cycles to 3.2 at the resonance point of the surround. This is portrayed by the curve of Fig. 6. Using another transformer of higher primary inductance the ratio was substantially constant. Even at the resonance frequency there was no marked change in

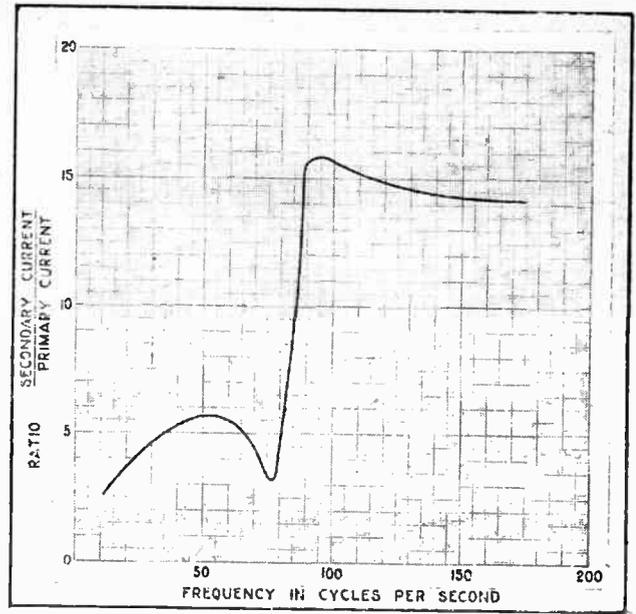


Fig. 6.—The curve given here shows current ratio of transformer used with low resistance coil drive loud speaker.

ratio. To deduce the primary current of the transformer it is merely necessary to divide the secondary current by the ratio of transformation. The reader can easily do this for himself.

We have now to compare the variations in loud speaker impedance with the internal resistance of the power valve. Taking the 1,000 turn high resistance coil and one LS5A valve we see from Fig. 7 that the impedance of the coil at 50 cycles and at frequencies

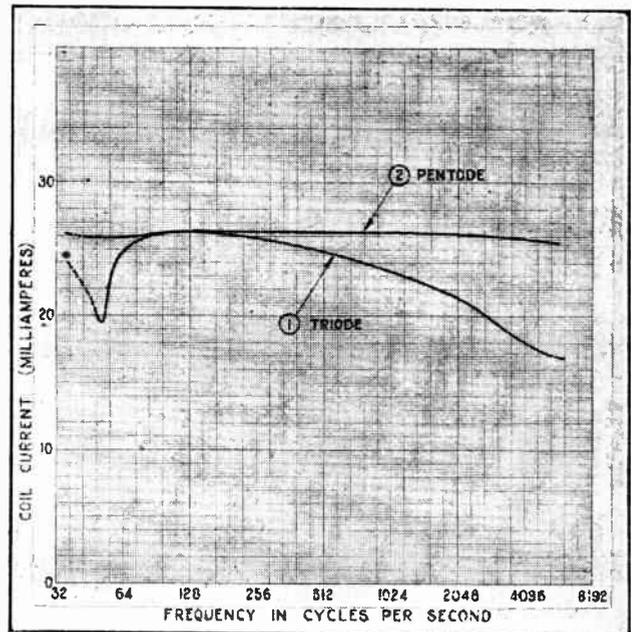


Fig. 7.—Curves showing variation in coil current when loud speaker specified under Fig. 1 is used with one LS5A (2,700 ohms; curve 1), or one pentode (60,000 ohms; curve 2). It is clear that there is no appreciable current variation with the pentode, which proves that the coil impedance is relatively negligible.

³ This is the case cited in my letter to *Experimental Wireless*, October, 1928.

⁴ *The Wireless World*, October 17th, 1928, p. 542.

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above 2,000 cycles causes an appreciable reduction in current. Thus the variation in impedance of the loud speaker is not negligible. When, however, the same coil is used with a pentode of 60,000 ohms resistance, the variation in current and therefore in loud speaker impedance is negligible. This will be clear from Fig. 7. Since the current at 50 cycles and at the higher frequencies is greater with a pentode than with a triode, the acoustic output will also be greater. Thus the surround resonance at 50 cycles and the upper frequencies will be more pronounced than they are with a triode. In practice, however, there is a certain degree of balance, but the proper course to pursue is to reduce the surround resonance below the audible range. This enables a better upper register to be secured without the L.F. resonance effect. If the higher frequencies are too strong there are several well-known methods of reducing them. (1) The H.F. by-pass condenser on the detector can be increased; (2) the selectivity of the H.F. circuits can be enhanced;

(3) the number of turns on the moving coil can be increased. By utilising the scheme of item (3) the acoustic output can be augmented very materially. This increased output is a definite asset, a point which I have corroborated in practice.⁵

The general character of the output from the loud speaker depends upon the receiver, the relative impedance of power valve and speaker, the size and shape of the diaphragm, together with the material used in its construction. A small cone of very stiff paper usually results in a powerful upper register, which makes the letter "S" whistle. Thus the receiver, coil, valve, and cone must be blended. If we secure uniform input to the grid of the power valve at all frequencies, it is necessary to deal with the coil, valve, and cone only. It must be left to the experimenter himself to choose his own quantities. There is such a variation in individual tastes that one man's meat is another man's poison.

⁵ See *The Wireless World*, July 25th, 1928.



CLUB REPORTS AND TOPICS

Factors in Cone Construction

Cones for loud speakers provided a subject for keen discussion at the last meeting of the South Croydon and District Radio Society. The outcome of the debate was the discovery by many members that the construction of suitable cones presents more difficulties than is often realised. Much may depend upon the size of the cone having regard to the particular purpose to which it may be put. The evening was a profitable one in that it served to reveal many factors which must not be neglected if a cone speaker is to give anything approaching perfect reproduction.

Hon. Secretary, Mr. E. L. Cumbers, 14, Campden Road, South Croydon.

Wembley's Winter Programme.

The latest type of screened grid valve was described by a Marconi engineer at the meeting of the Wembley Wireless Society on Friday last, Nov. 23rd. The Society has prepared an interesting list of fixtures for the coming months. Particulars of membership may be obtained on application to the Hon. Secretary, Mr. H. Comben, 24, Park Lane, Wembley.

"Inveterate Oscillator" Captured.

Mr. O. U. Howler, described as an inveterate oscillator, whose ham-handedness has been responsible for howls of annoyance in the neighbourhood, has been run to earth by the Wimbledon Radio Society. His misdemeanours will be exposed at a "Mock Trial by Jury," which the Society will hold early in the New Year.

In a fault-finding competition recently organised by the Society, Mr. E. A. Fielder was successful in tracing 14 out of 16 mistakes present in six circuits.

The Society has prepared a very interesting programme, and new members will be welcomed. Hon. Secretary, Mr. P. G. West, 11, Montana Road, West Wimbledon, S.W.20.

Fault-finding Step by Step.

The wireless set that won't work is a familiar phenomenon to most owners of receivers, and many find themselves at a loss to know how to go about tracing the fault. For all in trouble of this sort, the demonstration given by Mr. E. H. Laister at the last meeting of the North Middlesex Radio Society was extremely useful. The lecturer had brought his own receiver, which was shown to be in working order, and he then asked for faults to be introduced into it in his absence. This was done, and he then proceeded to locate the faults systematically.

Secretaries of Local Clubs are invited to send in for publication Club News of general interest.

FORTHCOMING EVENTS.**WEDNESDAY, NOVEMBER 28th.**

Muswell Hill and District Radio Society.—At 8 p.m. At Tollington School, Tetherdown, N.10. Lecture: "This Season's New Valve Developments," by Mr. F. E. Henderson, A.M.I.E.E.

Wigan and District Technical College Radio Society.—Lecture: "Valve Manufacture," by Mr. J. E. Clarke, of Messrs. Edison Swan Electric Co., Ltd.

Tottenham Wireless Society.—At 8 p.m. At 10, Bruce Grove, N.15. "The Latest Valves," a lecture-demonstration by the Mullard Valve Co.

THURSDAY, NOVEMBER 29th.

Lepton and Leptonstone Radio Society.—At 8 p.m. At Grove House, High Road, Lepton. Demonstration of Short-Wave Receiver and Wavemeter.

FRIDAY, NOVEMBER 30th.

South Manchester Radio Society.—At the Co-operative Hall, Wilmslow Road, Disbury. Ten-Minute Papers and a demonstration.

MONDAY, DECEMBER 3rd.

Newcastle-upon-Tyne Radio Society.—At 7.30 p.m. At 11, Saville Row. Open Night.

Croydon Wireless and Physical Society.—At 7.15 p.m. At 5, Altyre Road, East Croydon. Annual General Meeting, to be followed by a demonstration of Moving Coil Loud Speakers by Mr. A. Baker. At Hackney Radio and Physical Society.—At 8 p.m. At Electricity Show Rooms, Lower Clapton Road, E.5. Public Meeting.

Beginning with the output stage it was first found that the valves did not light. By a process of elimination and with the aid of a voltmeter this was found to be due to a faulty connection in the accumulator. Having rectified this, the lecturer discovered that no anode current was flowing. This was tracked down to a broken flex lead between the two H.T. batteries. The lecturer worked back in this way to the detector stage and then the H.F., exposing the various defects as discovered until finally the receiver was again in working order. It became obvious that in fault-finding a meter of some kind was almost indispensable.

Hon. Secretary, Mr. E. H. Laister, Endcliffe, 7a, Station Rd., Winchmore Hill, N.21.

Mains Drive Problems.

At a meeting of the Kensington Radio Society on Nov. 20th, Mr. A. W. Knight read a paper on "Various Problems around Mains Drive Instruments," in which he gave some reasons for the "hum" so frequently experienced, and described a method of "stepping up."

Mr. Maurice Child will demonstrate a straightforward broadcast receiver at the Society's meeting on December 13th.

Hon. Secretary, Mr. G. T. Hoyes, 71a, Elsham Rd., W.14.

A Vote for Professor Ohm.

Who is the best-known scientist, past or present, connected with radio? The vote of the Alma Radio Society (Battersea) goes to Professor Ohm. Members of this Society have come to the conclusion that they can solve most radio and electrical problems by the correct application of Ohm's Law. Anyone in the district having doubts upon this point, besides those who have not, is invited to join the Society and discuss the question at one of the meetings. These are held on Tuesdays and Thursdays from 7.30 to 9.30 p.m. at the Alma Institute, Southwark Park Road. Enquiries should be addressed to the Hon. Secretary, Mr. S. F. Harris (G&SII), 13a, Winstead Street, S.W.11.

Valves, Yesterday and To-day.

Mr. Burgess of The Mullard Wireless Service Co., Ltd., lectured on "Valve Progress" at the last meeting of the Ilford and District Radio Society. The lecturer covered a great deal of ground from the early days to the present time, when valves are to be had in a bewildering variety.

Hon. Secretary, Mr. C. E. Largen, 16, Clements Road, Ilford.

PROGRAMMES FROM ABROAD



SATURDAY, DECEMBER 1st.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

BARCELONA (Radio Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—8.0, Market Report and Exchange Quotations. 8.10, Sextet Selections: Paso-doble, La estocá de la tarde (Vivas); Selection from Madame Angot (Lecocq-Tavas); Aubade (Pierné); La Gilie de Waltz, Joli printemps (J. Strauss). 8.30, Elementary French Lesson, by Prof. Martin. 8.0, Chimes and Weather Report. 9.5, Exchange Quotations and News. 9.10, Orchestral Selections: Hungarian March (Liszt); Selection from Marina (Arrieta); Près du Berceau (Moszkovsky); Waltz, Les fleurs (Waldteufel); Delicadeza (Solér); Overture to The Siren (Auber). 10.0, Programme relayed from Madrid, EAJ7.

BERGEN (370.4 metres); 1.5 kW.—5.30, Programme for Children. 6.0, Programme for Girls. 7.0, Orchestral Concert. 7.50, Topical Talk. 8.0, Concertina Recital by Einar Bolstad and A. Wergeland. 8.30, Mr. Schroder-Nielsen, Talk: A Hunting Expedition in Nigeria. 9.0, Weather Report, News and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40kW.—3.0, Prof. Lampe, Talk: From Modern Educational Periodicals. 3.30, Programme relayed from Hamburg. 4.30, Herr Winters, Talk: Ten Years of The League of German Officials. 5.0, Talk between Industrial Workers, by Prof. Woldt. 5.30, Elementary Spanish Lesson. 5.55, Prof. Wagner, Talk: The Technical Application of Acoustics. 7.0, Programme from Vohhaus.

BERLIN (Voxhaus) (484 metres); 4 kW.—9.10 a.m., Market Prices. 9.15 a.m., Weather Report, News and Time Signal. 10.0 a.m., Programme of Gramophone Records. 10.30 a.m., Exchange Quotations. 11.55 a.m., Time Signal. 12.30, Weather Report and News. 1.0, Programme of Gramophone Records. 2.0, Exchange Quotations. 2.10, Agricultural Report and Time Signal. 3.0, Illustrated Music Talk, by Dr. James Simon. 3.30, Orchestral Concert: Overture, Sonnet (Craven); Cortège oriental (Heymann); Liebeserklärung (Bauer); Largo from Katzensterg (Beccé); Serenata d'Amalfi (Beccé); Mongolian Love Dance (Marsden); Intermezzo (d'Albert); Lyric and Dramatic Suite (d'Albert); Romance Op. 5 (Tchaikovsky); Andante from the Fifth Symphony (Tchaikovsky); Liebesfeier (Weingartner); Lied (Arnold); Tango, Mirage (Larento); A Wedding in Lilliput (Translatour); Serenata appassionata (Steiner); Eine kleine Nachtmusik (Mozart); followed by Advertising Notes. 5.25, Wolfgang Schwarz, Talk: Problems of the Preservation of Peace. 5.55, Prof. Wagner, Talk: Acoustics. 7.0, Octet in F Major, Op. 106, for Two Violins, Viola, Cello, Double Bass, Clarinet, Horn and Bassoon (Schubert). 8.0, Modern Musical Selections: Introductory Talk; Four Songs (Hebbel), (a) Abendgefühl, (b) Schläfe, schlafe, (c) Heimkehr, (d) So sollt' es immer sein (Jiráky); Hühnchen und Hühnchen (Nemcova). 8.30, Dr. Ludwig Berger, Talk: German Film Work in Hollywood; followed by Weather Report, News, Time Signal, Sports News and Dance Music. 11.0, "Jenseits," Play (Hasenclever).

BERN (411 metres); 1.5 kW.—4.0, Orchestral Concert. 6.20, Time Signal and Weather Report. 6.30, Dr. Gustav Hans Graber, Talk: The Meaning of Dreams. 7.0, "Requiem" (Berlioz), relayed from the Basle Cathedral. 9.15, News and Weather Report. 9.30, Wireless Variety Programme. 11.0 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—6.20, Shorthand Lesson. 6.50, Georg Lichey, Talk: Peter the Great. 7.15, Concert: Overture to Preciosa (Weber); Concerto in E Minor Op. 61 for Violin and Orchestra (Mendelssohn); Concerto grosso in D Minor for Strings (Vivaldi, arr. Franko); German Dances (Beethoven); Three Ballet Pieces (Rameau, arr. Mottl); Reitermarsch (Schubert-Liszt). 9.0, News and Announcements. 9.30, Dance Music from Vohhaus. 11.0 (approx.), Close Down.

BRÜNN (441.2 metres); 2.5 kW.—3.30, Programme for Children. 4.30, Dr. Vetterl, Talk: The Essential Facts about Music for Listeners-in. 4.45, German Transmission. 5.15, Journalistic Review by Dr. Cestmír Jerábek. 6.0, Yugo-Slavian Programme. 7.0, Programme from Prague. 9.25, Dance Music by Tzigane Orchestra, relayed from Bratislava (300 metres).

6.0, Talk: The Birth-place of the Christmas Tree. 6.55, Weather Report. 7.0, "Jean de Paris"—Opera-comique (Boieldieu). 9.30, Weather Report, News, Sports Notes and Programme Announcements. Followed by Cabaret Concert. 10.50, North Sea and Baltic Weather Report.

HILVERSUM (1,071 metres); 5 kW.—9.40 a.m., Divine Service. 11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Programme relayed from the Tuschinski Theatre, Amsterdam. 3.40, Italian Lesson. 4.40, French Lesson. 5.30, Concert: Overture to Marinarella (Fueik); Selection from the Works of Waldteufel (Kling); Dutch Fisher Girls—Interlude (Joan Fresco); Selection from The Desert Song (Romberg); Waltz, Wiener Praterleben (Translatour); March, Klingende Grusse (Blankenburg). 6.30, German Lesson. 7.40, Programme arranged by the Workers' Radio Society. 11.16 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,852 metres from 3.40 p.m. 12.10, Concert of Trio Music. 2.40, Programme for Children. 6.10, Gramophone Selections. 6.30, Catholic Bulletin. 6.40, English Lesson. 7.10, Lesson in Dressmaking. 7.40, Talk by Dr. Kaag. 8.0, Concert of Choral Music and Soprano Solos.

JUAN-LES-PINS (Radio L.L.) (244 metres); 1.5 kW.—1.0, Orchestral Concert. 8.0, News, Talk for Women by Mue. la Comtesse de Tréneuge, and Concert. 10.0, Dance Music. 10.30 (approx.), Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres).—6.30 a.m., Morning Gymnastics. 10.0 a.m., Weather Report. 11.15 a.m., Educational Talk. 2.0, Concert of Instrumental Selections; in the Interval, Reading by Carl Schiöning. 5.20, Arnold Richard Nielsen, Talk: Jes Petersen, the Danish Champion Wrestler. 5.50, Weather Report. 6.0, News and Exchange Quotations. 6.15, Time Signal. 6.30, Hartvig Frisch, Talk: Bernard Shaw. 7.0, Chimes from the Town Hall. 7.2, Reading from Selected Works of George Bernard Shaw. 7.30, Concert of Old Dance Music: March, Hand in Hand (v. Blon); Mazurka (Suppe); Amalie Polka (Jensen); Den gamle Sekstur; Waltz, The Swimmer (Lanner); Dagmar Mazurka (Norup); Polka, Euphrosyne (Lumbye); Tyrolese Waltz and Hopsa; Kontraseje; Waltz, North Sea Pictures (Joh. Strauss); Gallop, Northern Foster Brothers (Lumbye). 8.30, News and Announcements. 8.45, Concert of Light Music: The Dwarfs' Patrol (Noack); Intermezzo, Niniche (Ohlsen); Recitation (Vilh. Kræg); Serenade (Gade); March, En avant (Gung'l); Recitation (Vilh. Kræg); Waltz and Sabot Dance from Molboerne (Jespersen); Wireless Listeners' March (Hechmann). 9.45, Dance Music by the Industri Restaurant Orchestra. 11.0, Chimes from the Town Hall. 11.15 (approx.), Close Down.

KATFOWITZ (422 metres); 10 kW.—2.45, Financial Report. 3.0, Programme for Children. 3.55, Announcements. 4.10, Talk by Dr. V. Francic. 4.25, Children's Letter B.x. 5.0, Programme from Vilna. 6.0, Announcements and News. 6.30, Talk. 6.56, Time Signal and Agricultural Report. 7.5, Mr. K. Rutkowski, Talk: Impressions of a Journey to Greece. 7.30, Concert, relayed from Warsaw. 9.0, Weather Report and News. 9.30, Dance Music.

KAUNAS (2,000 metres); 7 kW.—3.0, Talk by Mr. Z. Kuzmickis. 3.30, Concert. 4.0, Talk. 4.15, Agricultural Talk, by Herr Strazdas. 4.45, Announcements. 5.30, News. 6.0, Weather Report. 6.15, Aviation Notes. 6.45, Popular Concert by Soloists from the National Opera. 7.45, Herr J. Slapsinskas, Talk: A Strong Will. 8.15, Concert of Light Music.

LAHTI (1,522.8 metres); 35 kW.—6.10, Accordion Selections by Ekman and Konno; in the Interval, "Neropatti," Play. 7.10, Talk; followed by Orchestral Selections. 7.45, News in Finnish and Swedish, and Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (490 metres), Cologne (283 metres) and Münster (259 metres).—10.10 a.m., Talks: The Choice of Careers for Girls. 11.10 a.m., Gramophone Selections. 12.5, Orchestral Concert. 1.30,

Programmes from Abroad.—

Hints for the Housewife. 2.40, Herr P. Brülls, Talk on Wireless Technique: Magnetic and Electric Induction. 3.5, Talk: Healthy Youth—Girls in the Field of Sport. 3.30, Talk for Women. 4.0, Dr. E. Huber, Talk: Pictures of Ancient Babylon. 4.20, English Lesson by Prof. F. Hase. 4.45, Concert of Quartet Music: Cornet Quartet, March from The Magic Flute (Mozart); Double Quartet, (a) Nachtzauber (Storch), (b) Das Grafenkind (Hosse); Cornet Quartet, Two Minuets (Schubert); Double Quartet, (a) Slavonic Serenade (Jungst), (b) Indian Cradle Song (Bungart); Cornet and Vocal Quartet, Selection from Preciosa (Weber). 5.30, Dr. Hans Zbinden, Talk: Intellectual Problems of America. 6.15, Prof. Honigsheim, Talk: Educational Problems in Large Cities. 6.40, Prof. Leyen, Talk: Fairy Tales in the Literature of the World. 7.0, "Papa hat's erlaubt," Wireless Play, after von Moser and l'Arronge (Müller). 9.30 (approx.), News, Sports Notes, Business Announcements, Orchestral Selections and Dance Music. 12.0 Midnight (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—1.30, Concert of Gramophone Selections. 2.0, Weather Report. 3.30, Orchestral Concert. 4.45, Wireless News and Talk. 5.30, Weather Forecast, News and Labour Market Report. 6.30, Programme from Königswusterhausen. 6.0, Prof. Lichtenberger, Talk: Nietzsche in France. 6.30, Josef Greff, Talk: Psycho-analysis. 7.0, Variety Programme by Marianne Rauböglauer (Vocalist), Anna Eisele (Piano), Karl Münch (Violin), and Hans Reimann (Elcutionist). 9.0, News, Sunday Programme Announcements and Sports Notes. 9.30, Dance Music from Voxhaus. 11.30 (approx.), Close Down.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—7.0, Chimes, followed by Concert of Sextet Selections: Selections from El asombro de Damasco (Luna); Faust (Gounod); La balada de la luz (Vives); Interlude by Luis Medina. 8.0, Dance Music from the Alkazar. 8.25, News. 9.45, Market Prices Report. 10.0, Chimes, followed by Comic Opera Selection from "La del Soto del Parral" (Soutullo and Vert); in the Interval, News. 12.30 a.m. (approx.) (Sunday), Close Down.

MILAN, Call 1MI (549 metres); 7 kW.—7.15, Talk, News and Time Signal. 7.31, Variety Concert: Overture to Maritana (Wallace); Talk on Verdi with Pianoforte Illustrations; Baritone Solo, Nearing the utmost limit, from Mephistopheles (Boito); Pianoforte Solos, (a) Two Sonatas (Scarlatti), (b) Scour Monique (Couperin); Selected Item; Violin Solos, (a) Turkish March from The Ruins of Athens (Beethoven), (b) Elegy (Rachmaninoff), (c) The Bee (Schubert); Reading; Tenor Solos, (a) Dream from Manon (Massenet), (b) Air from L'Amico Fritz (Mascagni); Pianoforte Solos, Three Fragments from the Manuscripts of Anna Maria Bach. Selected Item; Violin Solos, (a) Nocturne in E Minor (Chopin), (b) La Chasse (Cartier), (c) Old Dance (Dunsek); Quintet Selections, (a) Selection from Madame Butterfly (Puccini), (b) Prelude and Minuet (Andreoli). 9.55, News, followed by Tzigane Music from the Fiaschetta Toscana. 10.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (260.0 metres), Östersund (720 metres).—1.0, Concert of Light Music from Göteborg. 5.0, Programme for Children. 5.30, Selection of Old-time Dance Music. 6.15, Reading from the Works of Edgar Allan Poe. 6.45, Pianoforte Recital, from the Works of Chopin, Nocturne in C Sharp Minor; Etude in A Flat Major; Berceuse in D Flat Major; Waltz in E Minor. 7.0, Time Signal. 7.2, Popular Concert: Cello Solos, (a) Stor och ringa (Norman), (b) Jag ville vara tårar (Norman); Harp Solo, A Fairy Tale (Godefrid); Cello Solos, (a) Cantabile (Cui), (b) La Cinquantaine (Gabriel-Marie), (c) Canonetta (Pergament); Harp Solos, (a) Arabesque in E Major (Debussy); Harp Solos, (a) Arabesque; Jeg ser for mit öie (Sjögren); Lockit (Peterson-Berger); Fjällvandring (Peterson-Berger); Cello Solos (a) Visa (Norman), (b) Minuet (Debussy), (c) Habanera (Ravel). 8.0, Topical Talk. 8.15, News and Weather Report. 8.45, Dance Music. 11.0 (approx.), Close Down.

NAPLES, Call 1NA (333.3 metres); 1.5 kW.—4.0, Concert of Vocal and Instrumental Selections. 4.30, Time Signal. 4.35, Foreign Report by M. R. Lotto. 7.30, Wireless Talk. 7.40, Announcements. 7.50, News. 7.55, Harbour Notes. 8.0, Time Signal. 8.2, Variety Programme: Orchestral Selections, (a) Triumphant March (Hartmann), (b) Serenade (Lange-Müller), (c) In the Blue Grotto (Gade), (d) Champagne Gallop (Lumby); "The Secret"; Comedy in One Act (Sabatino Lopez); Orchestral Selections, (a) Overture to The Love Potion (Auber), (b) Berceuse (Van Westerhout), (c) Barcarolle (Siede), (d) Gavotte

Saturday, December 1st.

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célèbre (Gossec), (e) Selection from Oberon (Weber); "I Due Paperi"; Comedy in One Act (Giuseppe Baffico). 9.0, Review of the Week. 9.50, News. 9.55, Calendar and Programme Announcements. 10.0 Dance Music from the Trocadero. 10.30, (approx.) Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (500 metres) and Bjekan (418 metres).—5.0, Programme for Children. 6.0, Children's Birthday Greetings. 8.15, Weather Report and News. 8.30, M. Sverre Iversen, Talk: The Question of the Organisation of Spas in Norway. 7.0, Time Signal. 7.2, Dance Music by the Station Orchestra. 8.30, Weather Report and News. 8.45, Topical Talk. 9.0, Dance Music from the Grand Hotel. 11.0 (approx.), Close Down.

PARIS (Eiffel Tower), Call P1. (2,650 metres); 5 kW.—5.0, Pasdeloup Concert. 7.10, Weather Report. 8.30, Le Journal Parle.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Musical Selections: Overture to The Caliph of Bagdad (Boieldieu); Selection from A Voyage in China (Bazin). 9.25, News and Symphony Concert: Forest Murmurs from Siegfried (Wagner); Finale from the First Symphony in D Major (Schubert). 10.0, News and Concert: Scènes pittoresques (Massenet); Irish Melodies (Myddleton); Monôme d'étudiants (Casadesus).

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—8.45 a.m., Physical Culture Lesson, by Dr. Diffe. 7.30 a.m., Physical Culture Lesson (continued). 8.0 a.m., News. 10.45 a.m., News and Exchange Quotations. 12.30, Concert of Columbia Gramophone Records; News in the Intervals. 2.0, Exchange Quotations. 3.45, Dance Music by the Joss Ghisley Synphonians; News in the Intervals. 7.0, Agricultural Report. 7.45, Talk arranged by the Union des Grandes Associations françaises, followed by Market Prices, Announcements and News. 8.0, Concert arranged by "Le Matin"; "Madame L'Archiduc" (Offenbach), News in the Intervals.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—11.30 p.m., Concert from the William Penn Hotel. 12.0 Midnight, Sessions Clock Chimes and Address from the University of Pittsburgh. 12.15 a.m. (Sunday), Home Radio Club. 12.30 a.m., Readings by Elbert R. Moses. 12.45 a.m., Dr. Julius Klein, Talk: A Week of the World's Business. 1.0 a.m., Selections by Godfrey Ludlow. 1.30 a.m., Songs. 1.45 a.m., Instrumental Selections. 2.0 a.m., "The Philco Hour." 3.0 a.m., Longine Time Signal and Eddie Kern and his Egyptian Serenaders. 3.30 a.m., Weather Reports. 3.35 a.m., Selections by Don Bestor's Orchestra from the William Penn Hotel. 4.0 a.m., Special Arctic and Antarctic Broadcast.

POSEN (344.8 metres); 1.5 kW.—6.50, Literary Talk and Reading. 7.30, Yugoslavian Evening: Talk and Vocal Selections. 9.0, Time Signal and Miscellaneous Items. 9.20, News and Weather Report. 9.40, Dance Music from the Carlton Restaurant. 11.0, Concert arranged by La Maison Philippi. 1.0 a.m. (approx.) (Sunday), Close Down.

PRAGUE (348.9 metres); 5 kW.—6.0, Programme from Brunn. 7.0, "Boccaccio"; Operetta (Suppé). 9.0, Time Signal and News. 9.25, Tzigane Music relayed from Bratislava (300 metres).

ROME, Call 1RO (447.8 metres); 3 kW.—7.10, Sports Notes, News, Exchange Quotations and Weather Report. 7.23, Time Signal and Topical Talk. 7.30, Report of the International Labour Office, Geneva. 7.45, "Cendrillon"—Opera (Massenet). In the Interval—Review of Art and Literature and Talk for Women. 9.50, News and Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—12.0 Midnight, Statler's Pennsylvanians, from New York. 12.30 a.m. (Sunday).

Concert from the Hotel Sagamore, Rochester. 1.0 a.m., Concert from the Hotel Onondaga, Syracuse. 1.30 to 3.0 a.m., New York Relay. 1.30 a.m., "The Park Bench." 2.0 a.m., Programme by the Adler Quartet with Contralto Solos by Sonia Essin. 2.30, a.m. Selections by Male Quartet. 3.0 a.m., Lucky Strike Programme. 4.0 a.m., Time Signal. 4.2 a.m., Dance Music from the Hotel Ten Eyck, Albany.

STAMBOUL (1,200 metres); 5 kW.—3.30, Concert. 4.30, Market Prices Report. 5.15, Concert of Turkish Music. 7.30, Weather Report and Time Signal. 7.40, Vocal and Orchestral Concert: Orchestral Selections, (a) Overture to Don Juan (Mozart), (b) Hungarian Dance No. 4 (Brahms); Songs; Orchestral Selections, (a) Nocturne (Borodine), (b) Wedding March (Mendelssohn). 9.0, News and Announcements. 9.10 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—2.15, Concert of Songs, Duets and Orchestral Selections. 3.45, Programme from Frankfurt. 6.0, Time Signal and Weather Report. 5.15, Dr. Carol Ring, Talk in English—English Sport and Sports. 5.45, Talk by Prof. Kutscher. 6.15, Hans Brandenburger, Talk: Our Christmas Manger. 6.45, Time Signal and Sports Notes. 7.15, Chamber Music from the Works of Johannes Brahms: Sonata in E Minor for Cello and Pianoforte; Sonata in E Flat Major No. 2 Op. 120, for Clarinet and Pianoforte. Followed by Variety Concert: Orchestral Selections, (a) Prelude (Rachmaninoff), (b) Dance of the Witches (Leuschner); "The Haunted Castle"—Sketch (Carl Struve); Orchestral Selection, Overture to Die Fledermaus (Strauss); Delilah (Bernard); The Sparrow in Winter (Benatzky); Die ungleichen Eheleute; Man schenkt sich Rosen (Egen); Oh, weisst du, schöne Frau (Grün); Orchestral Selection, Chatterbox Rag (Botsford); Der schönste Duft (Volker); Kurios (Seidl); All for Love (Benatzky); The Love Oracle (Arnold); Katinka from Prague (Ligi); Kling-Klang (Raymond); Orchestral Selection, Waltz, Roses of the South (Strauss); In the Night from 12 to 1 (Benatzky); Love Idyll (Saimmestorf); My Sweet Monkey (Cleaver); Orchestral Selection, March to Bed, Sweetheart! (Kollo); followed by News and Dance Music from Voxhaus.

TOULOUSE (Radiophonie du Midi), (389.6 metres); 8 kW.—12.45, Concert. 8.0, Exchange Quotations and News. 8.30, Concert: Military March from the Algerian Suite (Saint-Saëns); Overture to The Thieving Magpie (Rossini); Second Waltz (Godard). 8.50, Selection from Carmen (Bizet). 9.0, Time Signal. 10.5, Dance Music. 10.15, North African News. 10.30 (approx.), Close Down.

VIENNA (517.2 metres); 15 kW.—3.0, Programme for Children. 4.30, Recital of Fairy Tales. 5.0, Rosa Meyreder in Selections from her own Works. 5.30, Reading of Modern Lyrics and Prose by Ilse Kamnitzer. 6.0, "The Canary Bird," by Hans Kretzer. 6.30, Chamber Music: Trio in D Minor, Op. 63 (Schumann), followed by Song Recital from the Works of H. Wolf, by Dr. Hans Schwarz-Glossy. 7.15, Julius Karsten, Talk: The Life and Works of Ottakar Kernstock (died November 5th, 1928), with Illustrations. 7.50, "The Pannicke Case"—Play (Auditor), followed by Orchestral Concert: March, Wien bleibt Wien (Schrammel); Overture to Die Fledermaus (Joh. Strauss); Waltz from La belle polsane (Lehar); Songs and Serenade (Bert Silving); Song, Das war in einer Walzermacht (Ganglberger); Light Drinking Song (Max Rhode); Song, Drob'n am Hameau (Strecker); Song, Blondes Madel vom Rhein (Strecker); Wiener Hallel-Marsch (Recktenwald), followed by Photo-telegraphy Transmission.

VILNA (425 metres); 1.5 kW.—3.30, Announcements. 3.45, Talk for Men, by Mr. S. Czaplicki. 4.10, Poetry Recital (Mr. Z. Kleszczynski). 4.35, Talk from Warsaw. 5.0, Divine Service from the Ostra Brama Chapel. 5.45 Art Talk by Prof. Julius Klos. 6.10 News. 6.30, Programme from Warsaw.

WARSAW (1,111 metres); 10 kW.—4.10, Talk. 4.35, Talk by Prof. H. Mosecicki. 5.0, Programme relayed from Vilna. 6.0, Miscellaneous Items. 6.30, "Radio-Chronique," by Prof. Stepowski. 6.55, Time Signal. 7.0, Agricultural Report. 7.5, Mr. B. Winawer, Talk: The Latest Scientific and Technical Discoveries. 7.30, Concert of Operetta Music. 9.0, Aviation Notes, Weather Report, News, Police Announcements and Sports Notes. 9.30, Dance Music from the Oaza Restaurant. 10.30 (approx.), Close Down.

ZÜRICH (588 metres); 1 kW.—7.0, "Requiem" for Tenor Solo, Choir and Orchestra (Berlioz), from Basle Münster. 9.0, Weather Report and News. 9.10 (approx.), Close Down.

Programmes from Abroad.—

BARCELONA (Radio-Barcelona), Call EAJ1 (244.8 metres); 1.5 kW.—11.0 a.m., Relay of Cathedral Chimes. 11.5 a.m., Weather Report from the Provincial Meteorological Service. 1.30, Concert by the Iberia Trio with Gramophone Records at Intervals. 2.45 to 5.30, No Transmission. 5.30, Relay of an Opera from the Gran Teatro del Liceo. In the Interval, Local Market Prices. 8.0 to 8.23, Talk, arranged by the Catalonian Institute of Agriculture at San Isidro. 8.30, Orchestral Selections. 8.40, Sports News. 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—Programme relayed from Bern. 7.0, Advent Festival relayed from the Kreuzkirche, Zürich, First Performance of the Christmas Oratorio by Felix Pürstinger, Words by Emil A. Grob. 8.45, Sports News. Late News Bulletin, and Weather Report. 9.15 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—9.30 a.m., Relay of Divine Service. 11.30 a.m., Weather Report and Forecast and General News Bulletin. 7.0, Orchestral Concert. 7.20, Concert. 7.50, Talk on a Current Topic. 8.20, Recitation by Doris Johannesen and Mrs. Jenny Jøhansen; "Syndens Sold," by H. Meidell. 9.0, Weather Report and Forecast, Late News Bulletin and Time Signal. 9.15, Dance Music. 11.0 (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—7.55 a.m., Garrison Church Chimes, relayed from Potsdam. 8.0 a.m., Concert and Address, relayed from Voxhaus, followed by Berlin Cathedral Chimes. 10.30 a.m. (approx.), Concert, relayed from Voxhaus. 3.30, Musical Programme, relayed from Voxhaus. 5.0 to 7.0, Talks, arranged by the "Deutsche Welle," followed by relay of another German Programme. 9.15, Late News Bulletin and Sports News. 9.30, Light Musical Selections. 11.30 (approx.), Close Down.

BERLIN (Voxhaus) (494 metres); 4 kW.—7.55 a.m., Chimes, relayed from the Potsdam Garrison Church. 8.0 a.m., Concert with Choral and Instrumental Items and Address in the Interval, followed by Berlin Cathedral Chimes. 10.30 a.m. (approx.), Concert. 3.0, Talk. 3.30, Concert. 4.0, Musical or Literary Programme. 6.0, Talk. 7.0, Concert. 9.15, Weather Report and Forecast, Time Signal, Sports News and Late News Bulletin. 9.30, Dance Music. 11.30 (approx.), Close Down.

BERN (411 metres); 1.5 kW.—9.30 a.m. to 10.30 a.m., Religious Address. 12.0 Noon, Time Signal and Weather Report and Forecast. 12.5, Orchestral Concert. 8.15, Violin Recital by Vasco Gaudini. 6.20, Time Signal and Weather Report. 6.30, Reading or Talk. 7.0, Concert. 8.45, Sports News, Late News Bulletin and Weather Report. 9.0, Concert. 9.35 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—Programme relayed by Gleiwitz (329.7 metres).—8.15 a.m., Chimes relayed from Christ Church. 10.0 a.m. (approx.), Recital of Music and Address. 1.0, Guessing Competition. 1.10, Talk or Literary Programme. 1.35, Talk for Chess Players. 2.0, Stories for Children by Friedrich Reinicke. 2.30, Agricultural Talk. 7.15, "Im weissen Rüssel." 9.0, Late News Bulletin. 9.30, Dance Music. 11.0 (approx.), Close Down.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Selections by the Orchestra at the Palace Hotel. 6.0, Programme for Children. 6.30, Concert by the Station Trio. 7.30, "Le Journal Parlé de Radio-Belgique." 8.15, Orchestral Concert with Soloists. 10.10, News from the Evening Papers. 11.0 (approx.), Close Down.

BUDAPEST (556.6 metres); 20 kW.—8.0 a.m., General News Bulletin and Beauty Hints. 9.0 a.m., Relay of Morning Service and Sermon. 11.30 a.m. (approx.), Concert. 2.30, Agricultural Talk. 3.15, Concert. 6.30, (approx.), Concert or Relay of an Opera. 9.45, Concert of Light Music. 10.30 (approx.), Close Down.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (408.8 metres), and Münster (250 metres).—6.45 a.m., Boxing Lesson. 7.5 a.m., Esperanto Talk on the Weekly Programmes. 7.15 a.m., Lesson in Music by Olly Wirtz-Koort. 7.35 a.m., Lesson in Esperanto by Alfred Dormanns. 8.0 a.m., Church Chimes. 8.5 a.m., Evangelical Recital and Address. 12.0 Noon, Musical Selections. 3.30, Orchestral Music. 6.45, Sports News. 7.0, "The Cousin from Nowhere," an Operetta in Three Acts by Eduard Künneke, Text and Lyrics by Hermann Haller and Rideamus, Musical Director, Buschkötter, followed by Late News Bulletin, Sports News and Light Music. 11.0 (approx.), Close Down.

CORK, Call C6K (400 metres); 1.5 kW.—8.30, Concert with Vocalists, Baritone Songs by Douglas Pemberton. 11.0, National Anthem and Weather Report and Forecast. 11.15 (approx.), Close Down.

SUNDAY, DECEMBER 2nd.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

CRACOW (566 metres); 1.5 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 10.56 a.m., Relay of the Fanfare from the Church of Notre Dame, followed by Time Signal and Weather Report. 11.10 a.m., Programme relayed from Warsaw. 1.0 and 1.20, Two Talks for Farmers. 1.40, "La Chronique Agricole," by Dr. St. Wasniewski. 2.15, Concert relayed from Warsaw. 4.20, Talk. 5.0, Relay from Warsaw. 7.30, Literary Programme: "Zagloba at the Wedding," Selections from the Novel, "By Fire and Sword," by H. Sienkiewicz, dramatised for wireless performance, and rendered by the Circle of Polish Wireless Amateurs. 9.0, Programme relayed from Warsaw. 9.30, Relay of Concert from a Restaurant. 10.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—8.30 to 11.15 (approx.), Programme relayed from Cork. 8.30, Vocal and Instrumental Concert Selections by the No. 2 Army Band. 11.0, National Anthem and Weather Report. 11.15 (approx.), Close Down.

FRANKFURT (428.6 metres); 4 kW.—Programme relayed by Cassel (252.1 metres).—7.30 a.m. to 8.30 a.m. (approx.), Morning Recital and Address. 12.0 Noon, Programme under the auspices of the Wiesbaden Agricultural Institute. 7.30, Musical or Literary Programme. 9.30 (approx.), Dance Music. 11.0 (approx.), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres), and Kiel (254.2 metres).—7.25 a.m., Time Signal. 7.30 a.m., Meteorological Report, General News and Announcements. 7.50 a.m., Talk on Topical Economic Problems. 8.15 a.m., Morning Recital of Instrumental and Vocal Music. 9.55 a.m. (for Kiel only), Divine Service with Address relayed from the University Church, Kiel. 10.0 a.m. (for Hamburg and Hanover), Talk: Rambles through the Hamburg Museums. 10.0 a.m. (for Bremen), Talk: Famous Landmarks in the Bremen District. 1.0, Funkheinzelnachrichte Programme for Children. 6.30, Sports Talk arranged by the Hamburg School of Physical Culture. 6.40, Sports News. 6.55, Meteorological Report. 7.0, "Das Jungste Gericht"—First Performance, by Dietrich Buxtehude, relayed from the Marienkirche, Lübeck. 9.30, Weather Report and Late News and Announcements followed by Popular Concert. 10.50 (for Hamburg, Bremen, and Kiel), North Sea and Baltic Weather Report. 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40, Concert of Trio Music. 2.10, Orchestral Concert relayed from the Amsterdam Concert Hall. 3.40, Musical Programme. 7.40, Weather Forecast, News and Announcements. 7.55, Concert from the Works of Mozart by the Augmented Wireless Orchestra conducted by Nico Treep, including "The Impresario," arranged by Louis Schmidt. 10.40 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits from 3.40 to 1,852 metres.—8.5 a.m. to 9.0 a.m., Relay of Morning Service and Address. 10.0 a.m., Sacred Service. 12.10, Concert. 1.10, Talk. 1.40, Talk. 2.10, Concert. 4.10, Programme for Hospitals. 5.40, Relay of Evening Service from Amsterdam. Sermon by the Minister, the Rev. P. Steenge Azn. on the text from St. Luke VII.-19. Choral Renderings by the Christian Song Union. 7.40, Orchestral Concert. 10.25, Choral Epilogue conducted by Mr. Jos. H. Pickkers. 10.40 (approx.), Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres).—9.0 a.m., Morning Service relayed from Copenhagen. 10.30 a.m. to 10.40 a.m. (Kalundborg only), Weather Report and Forecast from the Meteorological Institute. 12.0 Noon to 12.25, German Language Lesson arranged by "Radiolytteren." 5.50 (Kalundborg only), Bulletin and Weather Forecast from the Meteorological Institute. 6.0, Press News and Announcements. 6.15, Correct Time. 6.16 (approx.), Talk. 7.0, Town Hall Chimes from Copenhagen. 7.5, "Das Jungste Gericht" (Dietrich Buxtehude), the first performance relayed from the Marienkirche at Lübeck through the Hamburg Station, followed by Dance Music relayed from the Palace Hotel, Copenhagen. In the Interval at 11.0, Town Hall Chimes relayed from Copenhagen. 11.30 (approx.), Close Down.

KATTOWITZ (422 metres); 10 kW.—9.15 a.m., Relay of Sacred Service. 10.56 a.m., Time Signal. 11.0 a.m., Weather Report and Forecast. 11.10 a.m., Musical Selections by the Station Quartet. 1.0, Religious Talk. 1.20 and 1.40, Talks for Farmers. 2.0, Weather Report and Forecast. 2.15, Concert

relayed from the Warsaw Philharmonic. 5.0, Instrumental Concert. 6.0, Announcements. 6.20, Humorous Selections by Professor St. Ligon. 6.56, Time Signal. 7.0, Talk. 7.30, Orchestral Concert. 9.0, Weather Report and Forecast, News from Press and Sports Notes. 9.30, Concert of Light Music. 10.30 (approx.), Close Down.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—8.0 a.m., Morning Service with Choral and Instrumental Items and Sermon. 10.0 a.m. (Königsberg only), Meteorological Report. 11.55 a.m., Relay of the Time Signal from Nauen, followed by Meteorological Report. 5.0, Scientific Talk by Doctor Willy Schultz, "Physiological Researches into the Mental Capacity of Bees—Bees and a Sense of Colour." 9.15, Late News and Announcements and Sports Notes, followed by Silent Night for reception of Foreign Stations.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsinki (375 metres). 8.0 a.m., Relay of Morning Service. 9.50 a.m., Press News. 10.5 a.m., Concert. 10.50 a.m., Weather Report and Time Signal. 11.0 a.m., Relay of Morning Service in Swedish. 3.0, Orchestral Concert, under the direction of Erkki Linko. 4.0, Relay of the Festival of Advent Services from St. John's Church. 5.40, Musical Programme. 6.0, Talk. 6.40, Concert by the Finnish Orchestra. 7.45, Late News Bulletin given in Finnish and Swedish. 9.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres) and Münster (250 metres).—6.45 a.m., Physical Instruction by Dr. Ludwig Bach. 7.5 a.m., Alfred Doumanns: Programme Review in Esperanto. 7.15 a.m., Lute and Guitar Lesson. 7.55 a.m. to 7.55 a.m., Esperanto Lesson. 8.0 a.m., Church Chimes. 8.5 a.m., Evangelical Festival of Music and Address. 10.55 a.m. to 11.35 a.m., Music Talk: Schubert and his Songs. 12.0 Noon, Concert. 3.30, Orchestral Concert. 6.45, Sports News. 7.0, Concert or Play, followed by Late News Bulletin, Sports News and Musical Selections. 11.0 (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—Programme relayed by Dresden (275.2 metres). 7.30 a.m., Organ Recital, relayed from the Church of St. Nicholas. 8.0 a.m., Vocal and Instrumental Recital. 2.0, Musical Programme. 5.30, Talk. 8.30, Lawrence Sterne (Born in Southern Ireland, 1713; died in London, 1768): Readings from "Tristram Shandy," with Introductory Address by Dr. Felix Zimmermann, of Dresden. 9.0, Sports Notes. 9.30, Dance Music, relayed from Berlin. 11.30 (approx.), Close Down.

LYONS (Radio Lyon) (291 metres); 1.5 kW.—7.45, "Le Journal Parlé" and General News Bulletin. 8.0, Instrumental Concert: Violin Solos by M. Canand, of the Lyons Conservatoire, and Cello Solos by M. Testanière; Incidental Music to Shakespeare's Hamlet (Ambrose Thomas). 9.0 (approx.), Close Down.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—Programme, relayed by Salamanca, EAJ22 (405 metres).—11.30 a.m., Programme by the Municipal Band, under the Direction of Señor Villa, relayed from El Retiro. 2.0, Chimes and Time Signal. 2.5, Light Music by the Wireless Orchestra and Selection by Luis Medina in the Interval. 3.30 to 7.0, No Transmission. 7.0, Chimes. 7.5, Concert by the Station Sextet. 8.0, Dance Music by the Palermo Orchestra at the Alkazar. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Concert by the Band of the Saboya Regiment, under the Direction of Don Tomas Romo. 12.0 Midnight, Chimes, followed by Dance Music by the Palermo Orchestra, relayed from the Alkazar. 12.30 (approx.) (Monday), Close Down.

MILAN, 1M1 (549 metres); 7 kW.—9.0 a.m., Opening Signal and English Lesson. 9.30 a.m. to 10.0 a.m., Vocal and Instrumental Concert of Sacred Music. 11.30 a.m., Time Signal and Concert by the Milan Wireless Quartet. 12.30 to 3.0, No Transmission. 3.0, Opening Signal. 3.5, Concert by the Station Quintet. 4.15, Programme, relayed from the Fiaschetta Toscana; Selections by the Tzigane Orchestra. 5.0 to 6.55, No Transmission. 6.55, Opening Signal and Topical News. 7.30, Time Signal. 7.35, "La Grazia," Opera by V. Michetti, preceded by Introductory Talk on the Opera. 10.30 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (280.9 metres), Östersund (730 metres) and Sundsvall (545.0 metres).—10.0 a.m., Relay of Divine Service from a Stockholm Church. 4.55, Carillon from Stockholm Town Hall. 5.0, "The Blue Bird," Play by Maeterlinck. 8.15, Late News Bulletin and Meteorological Report. 10.30 (approx.), Close Down.

MJICEZ (535.7 metres); 4 kW.—Programme relayed by Augsburg (566 metres), Kaiserslautern (277.8 metres) and Nuremberg (241.9 metres).—10.15 a.m., "Der Stehengebliebene Wachtposten," Musical Play by Franz Schubert, a new arrangement by Dr. Eru,

Programmes from Abroad.—

Leopold Stahl and Dr. Franz Hallasch, relayed from the Residenz Theatre, Munich. 12.5, Time Signal, Weather Forecast and Programme Announcements. 2.0, Musical or Literary Programme. 9.0 (approx.), Late News Bulletin. 10.30 (approx.), Close Down.

NAPLES, Call INA (333.3 metres); 1.5 kW.—9.0 a.m., Sacred Recital of Music. 3.45, Children's Corner. 4.0, Variety Programme with Vocal Items. 4.30, Time Signal. 7.30, Current Topics. 7.50, Transmission by the Harbour Authorities of Naples. 8.0, Time Signal. 8.2, Concert by the Station Orchestra, with Soloists: Signor Raff, Aulicino, Baritone Solo with Orchestral Accompaniment, Son Pereda, son ricco d'onore, from La forza del destino (Verdi). 9.0, Sports Results. 9.50, Calendar and Notes on to-morrow's Programmes. 10.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by **Fredrikstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—9.20 a.m., Carillon. 9.30 a.m., Service relayed from St. Saviour's Church. 6.15, Weather Report and Forecast and Press News, followed by Literary or Musical Programme. 8.30, Weather Report and News from the Press. 8.45, Talk by a well-known journalist on a Topical Subject. 9.0 (approx.), Relay of Dance Music from the Hotel Bristol. 11.30 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—Programme relayed at intervals by the following stations: **Bordeaux PTT** (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille** (204 metres), **Limoges** (285 metres), **Lyons PTT** (480 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse PTT** (280 metres).—8.0 a.m., General News Bulletin and Time Signal. 8.25 a.m., International Time Signal and Weather Report and Forecast. 12.0 Noon, Concert. 1.0, Industrial Notes. 1.30, Orchestral Concert. 4.0, Padeloup Concert of Symphony Music. 6.30, "Le Radio Journal de France." 8.0, Talk: Compulsory Insurance against Tuberculosis by Dr. Cavaillon. 8.30, Concert, followed by Late News Bulletin, Time Signal and Weather Report. 10.30 (approx.), Dance Music relayed from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—7.56 a.m., Time Signal on 32.5 metres. 9.25 a.m., Time Signal on 2,650 metres.—6.0, Relay of Padeloup Concert. 7.10 to 7.20, Weather Report and Forecast. 7.30, "Le Journal Parlé par T.S.F.," with Talks by Dr. Pierre Vachet and Detective Ashelbe. M. René Casalis: Talk on the Day's Sport, with News from the papers. "Paris Sport." 7.56, Time Signal on 32.5 metres. 8.0 to 9.0, Vocal and Instrumental Concert. Orchestral Selection: Clairière enchantée (Ed. Mignan). 10.26, Time Signal on 2,650 metres. 11.15 (approx.), Close Down.

PARIS (Petit Parisien) (430.9 metres); 0.5 kW.—8.45, Gramophone Concert. 8.50, Talk. 8.55, News from the Press. 9.0, Vocal and Instrumental Programme by Artists from the Paris Opera and the Opéra-Comique. Selections from Cavalleria Rusticana by Mascagni. 9.25, General News Bulletin. 9.30, The Half Hour of Symphony Music conducted by Professor Estyle of the Paris Conservatoire. 10.0, Late News Bulletin. 10.15, Concert of Orchestral Music. 11.0 (approx.), Close Down.

PARIS (Radio LL) (370 and 60 metres); 1 kW.—12.30, Radio Liberté Programme, General News Bulletin, followed by Instrumental Concert by the Charles Seringes Trio. 1.0, Carillon de Fontenay. 3.0, Popular Dance Music. 9.0, Vocal and Instrumental Concert organised by "Le Journal des Débats." Quartet for Violin, Cello, Viola and Piano-forte (G. Faure). 10.0, Carillon de Fontenay. 10.15 (approx.), Close Down.

PARIS (Radio Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and Press Review. 8.30 a.m., Daily Physical Instruction, conducted by Dr. Difiere. 12.0 Noon, Religious address and Recital of Sacred Music arranged by "La Vie Catholique." Father de Tonquidec: "Ce qu'aurait été le monde sans Jésus-Christ: la pitié de Dieu sur le monde." 12.30, News from the Press. 12.45, Concert of Light Music by the Albert Lovatelli Orchestra, with selection by Bilboquet in the Interval. 4.30, Gramophone Concert arranged by "L'Industrie Musicale." In the Interval: News from the Press. 7.0, Agricultural Talk and News from the Press. 7.45, The Radio-Paris Circus. 8.15, Music Hall Concert; in the Intervals: News from the Evening Press and Late News Bulletin. 10.30 (approx.), Close Down.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.0, Sessions Clock Chimes, followed by Divine Service. 6.30, Programme arranged by the Whitehouse Coffee Company, relayed from New York. 7.0, "Roxy's Stroll," Programme from WJZ, New York. 9.0, Organ Recital by Dr. Charles Heintzroth,

Sunday, December 2nd.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

Director of Music at the Carnegie Institute. 9.45, Evening Service relayed from the Shadyside Presbyterian Church and Sermon by the Pastor, the Rev. Hugh Thomson Kerr. 11.0, Music by Don Bestor's Orchestra at the William Penn Hotel, Pittsburgh. 11.30, Programme of Music by the Whittall Anglo-Persians. 12.0 Midnight, arranged Session Clock Chimes, followed by Service from the Calvary Episcopal Church, Pittsburgh. Sermon by the Pastor, Dr. E. J. Van Etten. 10.0 a.m. (Monday), National Broadcasting Company's Programme of Music from New York. 1.15 a.m., Collier's Radio Hour from New York. 2.15 a.m., The Utica Jubilee Singers from WJZ, New York. 2.45 a.m., El Tango Romantico relayed from New York. 3.15 a.m., Longine Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—9.15 a.m. to 10.45 a.m., Relay of Cathedral Service. 11.0 a.m., Time Signal. 11.5 a.m. and 11.30 a.m., Two Agricultural Talks. 2.15, Symphony Concert relayed from Warsaw. 4.50, Talk. 6.20, Talk relayed from Warsaw. 6.45, Talk. 7.30, Recital of Music. 8.0, Concert by the Band of the Fifty-Eighth Regiment, under the direction of Captain Chnielewicz. 9.0, Time Signal. 9.5, Fifteen Minutes Variety. 9.20, Weather Report and Sports News. 10.0, Light Music. 11.0 (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—8.0 a.m., Recital of Sacred Music. 10.0 a.m. (approx.), Concert. 12.5, Talk on Industrial Topics. 12.20, Social Notes. 3.30, Orchestral Concert. 4.30, Transmission for Workers. 5.0, Programme for German Listeners. 5.30, Sports News. 6.0, Concert or Play. 9.0, Time Signal and Late News Bulletin. 9.20, Dance Music. 10.15 (approx.), Close Down.

RABAT, Call PTT (416 metres); 2 kW.—12.30 to 1.30, Concert by the Orchestra Radio-Maroc, PTT. 4.0 to 5.0, Programme of Military Music. 8.15, "Le Journal Parlé" in Arabic. 8.20, News and Announcements. 8.30, Concert of Instrumental and Vocal Music by Soloists and the Wireless Orchestra. 10.30, Programme of Dance Music from the "Chaunière de Rabat." 11.0 (approx.), Close Down.

RIGA (628.3 metres); 4 kW.—8.0 a.m., Divine Service in German. 9.15 a.m., Divine Service in Latvian relayed from the Mara Church. 12.0 Noon, Programme of Story, Music and Song for Children. 3.0, Afternoon Concert of Orchestral Music conducted by Arved Parups. 4.0, Talks. 6.0, Evucing Concert with Soloists. 8.0, Meteorological Report and Late News Bulletin. 8.30, Programme of Light Music from the Café de l'Opéra. 10.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—8.30 a.m., Opening Signal followed by German Lesson. 9.0 a.m., Sacred Recital of Vocal and Instrumental Music. 9.45, a.m. to 12.0 Noon, No Transmission. 12.0 Noon, Opening Signal. 12.6 to 1.0, Concert by the Wireless Trio. 1.0 to 4.0, No Transmission. 4.0, Opening Signal. 4.5 to 5.30, Variety Programme. 5.30 to 6.40, No Transmission. 6.40, Opening Signal, followed by News Bulletin. 7.10, Agricultural Talk. 7.15, Sports Results and News from the Stefani Agency. 7.29, Time Signal. 7.31, Talk. 7.45, Concert by the Grand Symphony Orchestra; Symphony by Vincent d'Indy on a French Mountain theme for Piano-forte and Orchestra, Pianist: Rina Rossi. 9.50, Late News Bulletin. 10.0 (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—6.30 to 7.0, Programme arranged by the United Radio Corporation at New York. 8.30, Organ Recital relayed from the Union College Memorial Chapel at Schenectady. Organist: Elmer Tidmarsh. 9.0, Address to Men by Doctor S. Parkes Cadman, relayed from New York. 10.30, Violin Solos by Arcadie Birkenholtz, relayed from New York. 11.0, Stetson Parade Programme relayed from Boston, Mass. 11.30, Programme from New York. 12.0 Midnight, The Old Company's Programme, with Baritone Songs by Reinold Werrenrath, relayed from New York. 12.30 a.m. (Monday), Programme relayed from the Capitol Theatre, New York. 2.0 a.m., Talk on "Our Government," by David Lawrence, relayed from Washington, D.C. 2.15 a.m., Atwater Kent Hour from New York. 3.15 a.m., Correct Time. 3.17 a.m., Experimental Television Signals. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (434.8 metres); 1 kW.—2.0 to 3.0, Concert of Dance Music by the Station Orchestra and Gramophone Selections in the Intervals. 9.30, Orchestral Concert of the Works of

Spanish Composers. 11.0, Programme of Flamenco Music by the Station Orchestra. 11.30 (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—3.30, Musical Programme. 4.30, Exchange Quotations and Cereal Market Prices. 5.15, Programme of Turkish Music. 7.30, Weather Report and Forecast followed by Time Signal. 7.40, Talk on the History of Music. 7.55, Concert of Orchestral Music. 9.0, Late News and Announcements. 9.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—Programme relayed by Freiburg (577 metres).—10.15 a.m. (approx.), Morning Recital of Sacred Music. 11.0 a.m. (approx.), Concert of Orchestral Music, followed by Gramophone Selections. 1.0, Programme for Children by Funkheinzelnann. 6.45, Time Signal and Sports Notes. 7.15, (approx.), Musical or Dramatic Programme, followed by Late News Bulletin and Sports News. 10.0 (approx.), Close Down.

TALLINN (408 metres); 2.2 kW.—8.0 a.m. (approx.), Relay of Divine Service. 1.30 (approx.), Musical Selections by the Station Orchestra. 6.0, Programme of Orchestral Music. 9.0 (approx.), Close Down.

TOULOUSE (Radiophonie du Midi) (389.6 metres); 8 kW.—12.30, Meteorological Report and Local Market Prices. 12.45, Orchestral Concert. 1.0, Time Signal. 1.45, News from "Le Télégramme," "L'Express" and "Le Midi Socialiste." 8.0, Stock Exchange Quotations from Paris. 8.15, News from the Press. 8.30, Orchestral Concert. 9.0, Time Signal. 9.5, Concert, arranged by "L'Association des Commerçants Radio-Électriques du Midi"; Selections from Faust, by Gounod. 10.15, "Le journal sans papier," with North African News and Late News Bulletin. 10.30 (approx.), Close Down.

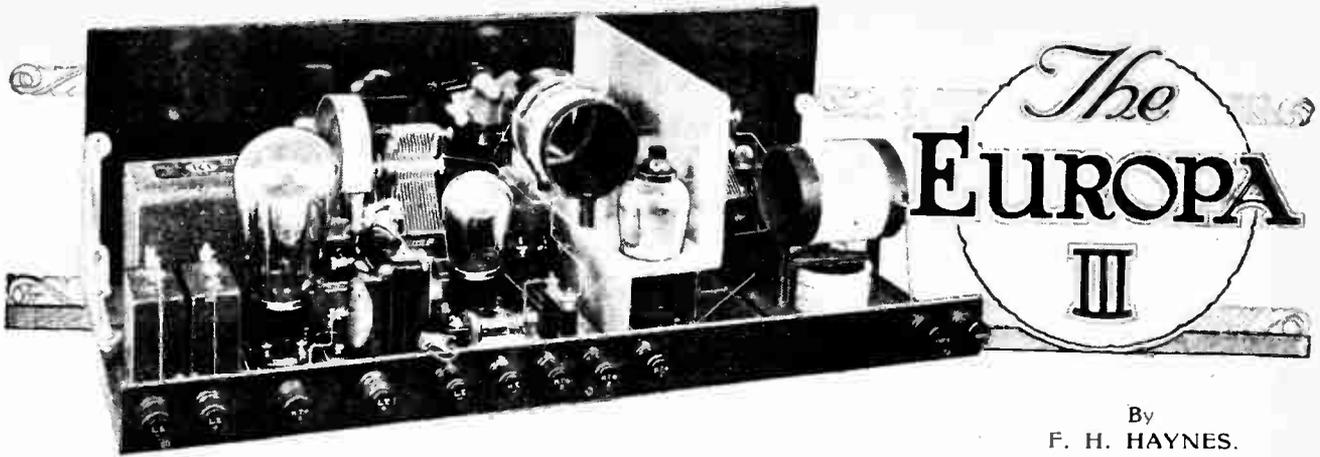
VIENNA (517.2 metres); 15 kW.—Programme relayed by **Gras** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres) and **Linz** (254.2 metres).—9.20 a.m., Morning Recital. 10.0 a.m., Concert by the Vienna Symphony Orchestra. 2.30, Experimental Picture Transmission. 3.0, Concert of Orchestral Music. 7.10, "Graf Toni," Operetta in Three Acts, by Rudolf Oesterreicher, Music by Edmund Eysler, under the Direction of Victor Flemming and Robert Kurmann; followed by Light Music and Experimental Transmission of Pictures. 10.15 (approx.), Close Down.

VILNA (435 metres); 1.5 kW.—9.10 a.m. to 10.45 a.m., Relay of Morning Cathedral Service. 10.56 a.m., Time Signal. 11.0 a.m., General News Bulletin, relayed from Warsaw. 1.0 to 6.0, Programme relayed from Warsaw. 1.0 to 2.0, Three Talks for Farmers. 2.0, Weather Report and Forecast. 2.15, Orchestral Concert. 4.20, Talk. 5.0, Concert. 6.0, Talk in Lithuanian. 6.20 to 10.30, Programme relayed from Warsaw. 6.20, Talk. 6.45, General News Bulletin and Time Signal. 7.0, Talk. 7.30, Evening Concert from the Works of Kossini, rendered by the Wireless Orchestra, under the Direction of J. Oziminski, with the Collaboration of Madame I. Zapolska (Vocalist) and Prof. Urstein (Pianist). 9.0, Aviation Route Report and Weather Forecast. 9.5, News Bulletin from the Polish Telegraphic Agency. 9.20, Sports News and Police Bulletin. 9.30, Dance Music, relayed from the "Oaza" Restaurant, Warsaw. 10.30 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—9.15 a.m. to 10.45 a.m., Relay of Divine Service. 10.56 a.m., Time Signal. 11.0 a.m., Aviation Bulletin and Meteorological Report. 11.10 a.m., Symphony Concert, arranged by the Educational Section of the Magistracy of Warsaw and the Symphony Concerts Directorate: Introduction and the Death of Iseult, from Tristan and Iseult (Wagner), rendered by the Orchestra of the Warsaw Philharmonic, conducted by J. Oziminski. 1.0 to 2.0, Agricultural Talks. 2.0, Meteorological Report and Forecast. 2.15, Concert of Symphony Music from the "Philharmonic de Varsovie." 4.45, Talk on Aviation, by J. Osinski. 5.0, Popular Concert. 6.20, Talk. 7.30, Concert. 9.0, Aviation Notes and Meteorological Report and Forecast. 9.5, Late News and Announcements. 9.20, Police and Sports Notes. 9.30, Programme of Dance Music from the "Oaza" Restaurant: Conductor, W. Roszkowski. 10.30 (approx.), Close Down.

ZAGREB (309.2 metres); 0.7 kW.—10.0 a.m., Concert of Orchestral Music. 4.0, Programme of Dance Music. 6.45, Radio Talk. 7.0, Opera, relayed from the Zagreb National Theatre; in the Intervals: Late News Bulletin and Sports News. 10.0 (approx.), Close Down.

ZÜRICH (588 metres); 1 kW.—10.0 a.m., Concert by the Orchestra at the Capitol Theatre. 11.0 a.m., Weather Report and Forecast. 11.30 a.m., Concert by the Station Orchestra. 8.0, Concert relayed from the Carlton Elite Hotel. 9.30, Time Signal and Weather Report. 6.32, Religious Address. 7.0, Programme relayed from the Kreuzkirche, Zürich: Advent Festival; First Performance of the Christmas Oratorio, by Felix Pürstinger, conducted by the Composer; Text arranged by Emil A. Grob. 9.0, Weather Report and News from the "Neue Züricher Zeitung." 9.30 (approx.), Close Down.



The EUROPA III

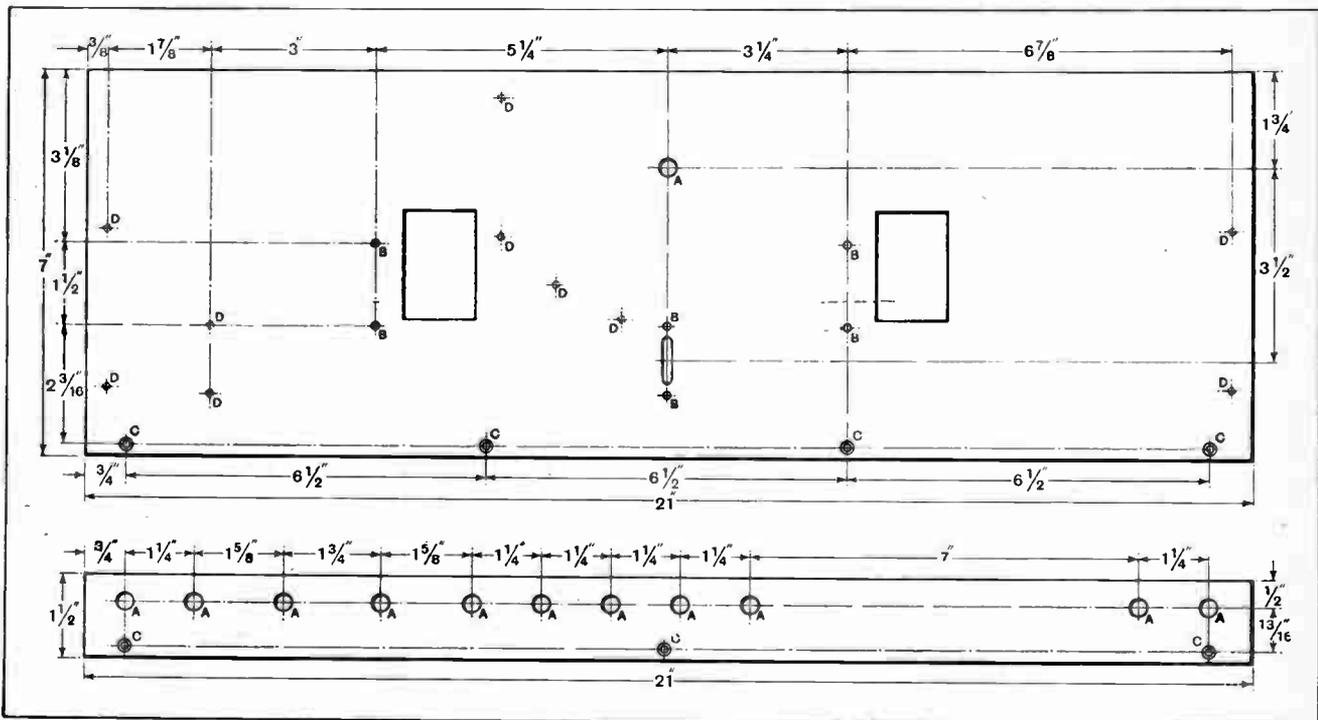
By
F. H. HAYNES.

(Concluded from page 697
of last week's issue.)

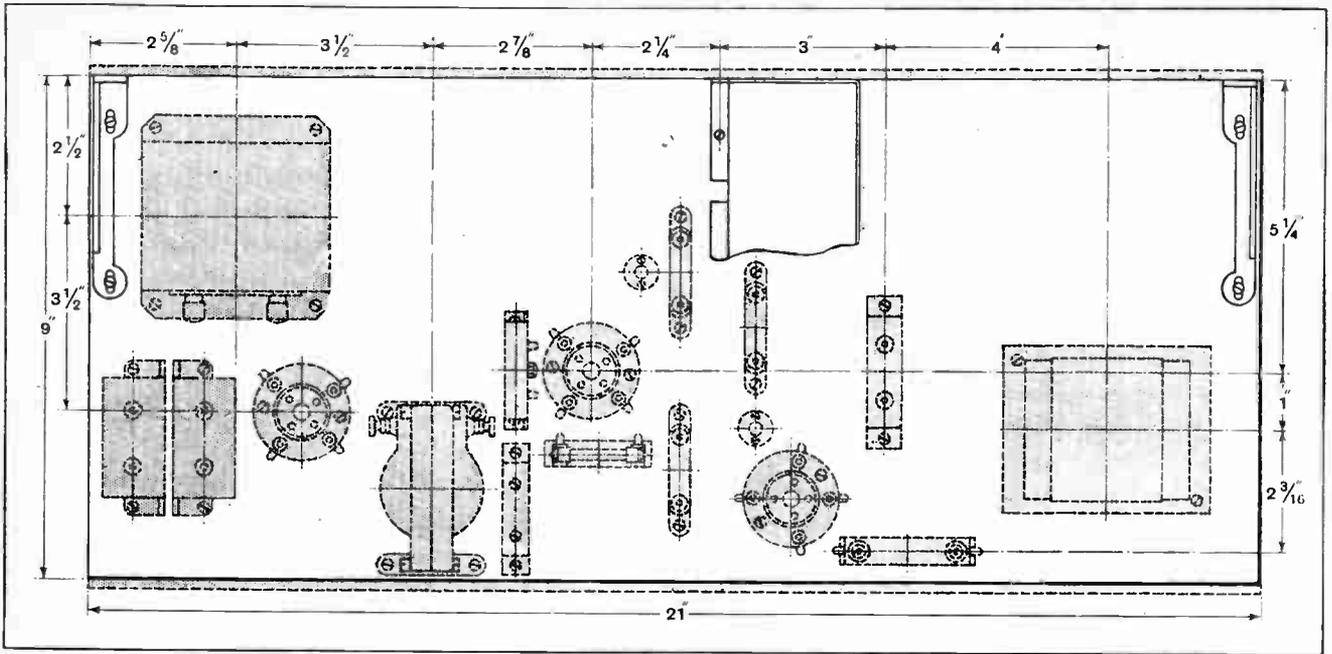
Constructional and Operation Notes.

THE practical working drawings give all constructional details, though a few additional hints, arising out of the actual building of this set, may be helpful. The front panel of $\frac{3}{16}$ in. highly polished bakelised board is supplied cut exactly to size. The apertures for the condensers are made by drilling and joining up rows of small holes. On the back of the panel filing may be necessary around the top and bottom edges to give clearance for the condenser scales. Take great care not to mark the panel, as a scratch once made cannot be removed. The irregularities around the condenser mountings will be hidden by the

cover plates. Very slightly "dish" the cover plates before tightening up the fixing screws so that they may bed hard up against the face of the panel. It should be noted that the condenser brackets are fitted with insulating bushes in order that the front plates shall not be "live." The baseboard is of $\frac{3}{8}$ in. five-ply wood, and its ends may be finished by filing. After fine glass-papering all over, the baseboard should be shellac varnished on both sides. Four screws, together with the end brackets, secure panel and baseboard. Actually, in the set shown, the brackets, screen and one of the switches were secured by screws passing from the back

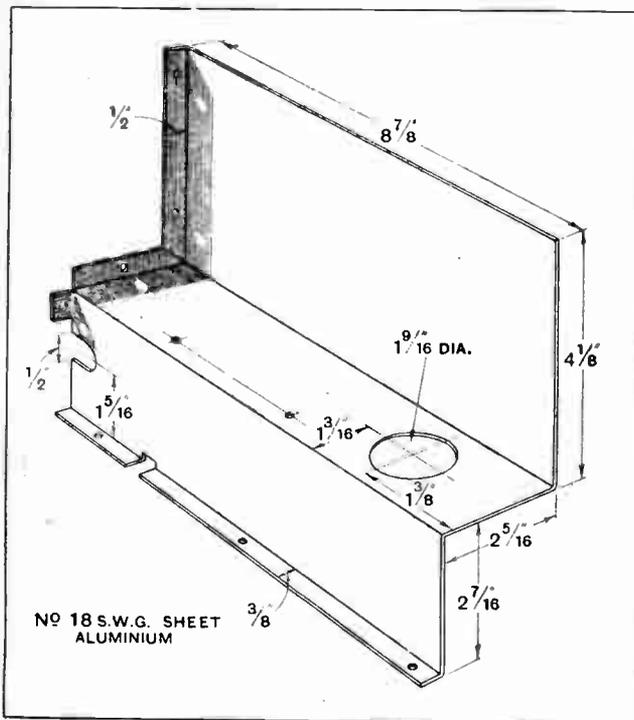


Details for drilling the front panel and terminal strip. Having located the front plates of the condensers, these are used as templates for the fixing holes and apertures. A, $\frac{5}{16}$ in.; B, $\frac{5}{32}$ in.; C, $\frac{1}{8}$ in., and countersunk for No. 4 wood screws. D, to accommodate 6 B.A. screws.

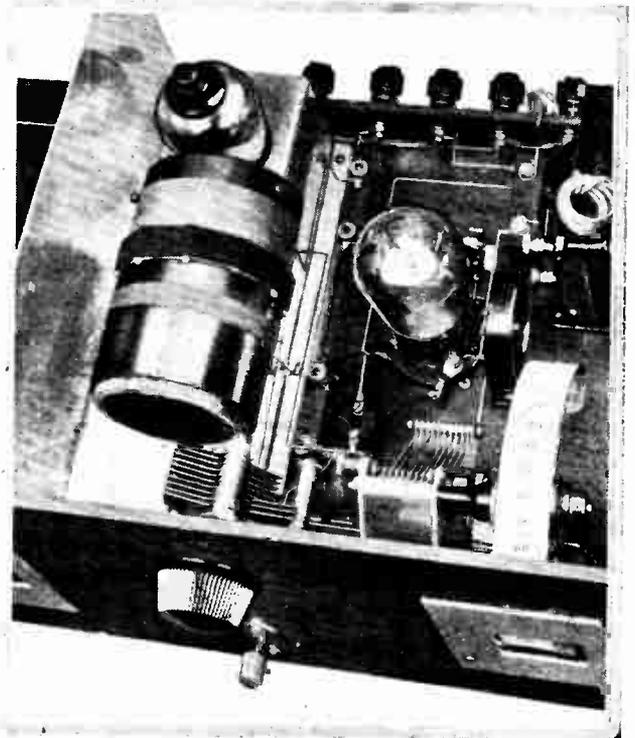


of the panel into blind holes. The beginner may prefer to drill the holes right through and use screws and nuts. Condensers and switches are, of course, fitted to the panel before it is mounted, taking great care that the switches move freely and make good contact. Beneath the screen is the valve-holder, anti-H.F. feed-back resis-

tance and condenser, and the filament resistance. These must be wired up early in the construction. Grid bias is provided for the H.F. valve by its filament resistance, which is space wound with 55ins. of No. 36 S.W.G. Eureka wire or other winding to a resistance of 24 ohms. The positive filament lead passes in a slot



Dimensional drawing of screen arranged to accommodate a screened-grid H.F. valve. The valve must, of course, be held in a rigid valve holder.



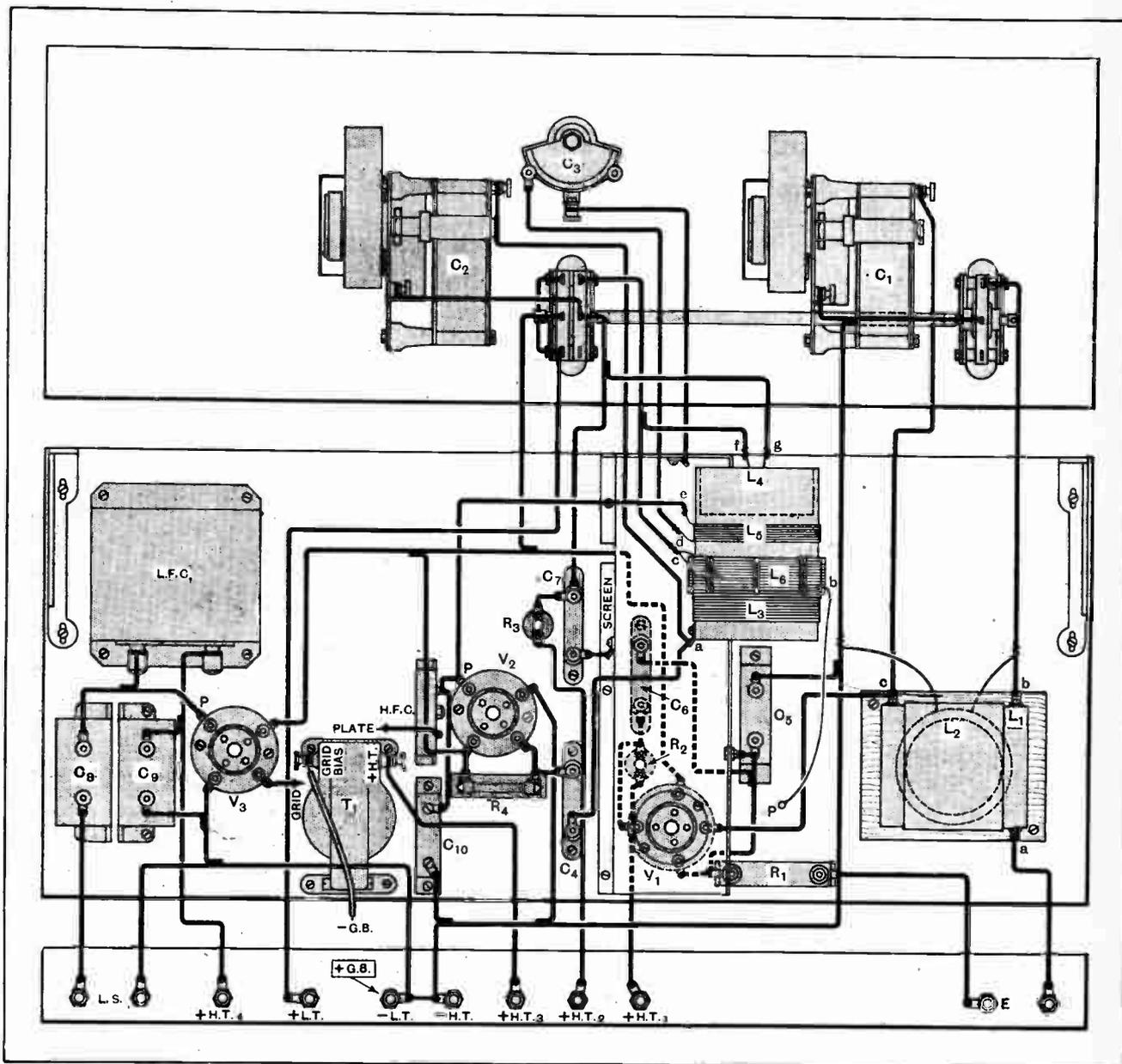
This view shows the method of assembling the H.F. intervalve transformer

The Europa III.—

under the screen, and should be covered with a small piece of empire cloth. Similarly the negative wire should be covered with sleeving where it takes a path between the back edge of the screen and the terminal strip. All filament wires lie on the baseboard and are held down by small clamps of wood or ebonite. The actual route taken by the wires may be copied without fear of dangerous couplings arising. No attempt has been made to substitute screw connections for soldered joints, for soldering is more reliable, and is not too difficult with an electrically or gas heated, well tinned iron. Plated tags should be filed bright and tinned

before use, while a small piece of blotting paper placed under joints before soldering will prevent spreading of the Fluxite.

Comment may be made as to the number of H.T. terminals, but these are necessary, as it is common practice in good battery eliminators - take precautions against undesirable couplings, and a reduction of the number of terminals on the set would demand the fitting of de-coupling resistances and condensers which would be duplicated in the eliminator. Incidentally, this set is particularly suited for battery or eliminator operation without the dangers of "motor-boating," firstly, by the avoidance of a tuned anode H.F. coupling



The actual routes taken by the connecting wires are shown. The components beneath the bend in the screen are located and wired up before proceeding with the remainder of the construction. Care must be taken in carefully identifying, with the aid of the drawing of the H.F. intervalve transformer, the various leads associated with the H.F. amplifier.

The Europa III.—

and, secondly, by the inclusion of a choke filter output feed. For battery working 150 volts should be applied to the plate of the P.M.14, 150 to 250 to the P.625 with up to 20 volts grid bias, 75 to the screen grid and the detector valve. It is worth experimenting with the exact setting of the screen and detector valve potentials.

In operation it will be found that the reaction knob will scarcely need to be touched while tuning, and the normal setting is roughly the same on both long and broadcast wavelengths. As the behaviour of the reaction control is in a large measure the merit of a set it may be used for bringing up signal strength as well as further improving selectivity. Its setting should not be critical, and actually a wide movement can be obtained between the position of no regeneration and the creation of the whistling sound, signal strength increasing all the time.

This set is, of course, less selective on the long wave adjustment, but on the long waveband one is involved in tuning-in four stations as compared with twenty or more on the broadcast band. It is doubtful if the London listener, not in need of 5XX, which gives the London programme, has use for long-wave tuning range, and he might decide to save the trouble and expense of fitting it, substituting the lever wave-change and filament switch by an "on" and "off" press button. No change of apparatus is required should the user desire to make use of a pentode valve in the output stage, as it will not be unduly overloaded following the limited input voltage handling capacity of a leaky grid detector.

This set is available for inspection by readers at the offices of "The Wireless World," 116-117, Fleet Street, London, E.C.4.

WIRELESS IN THE WILDERNESS.

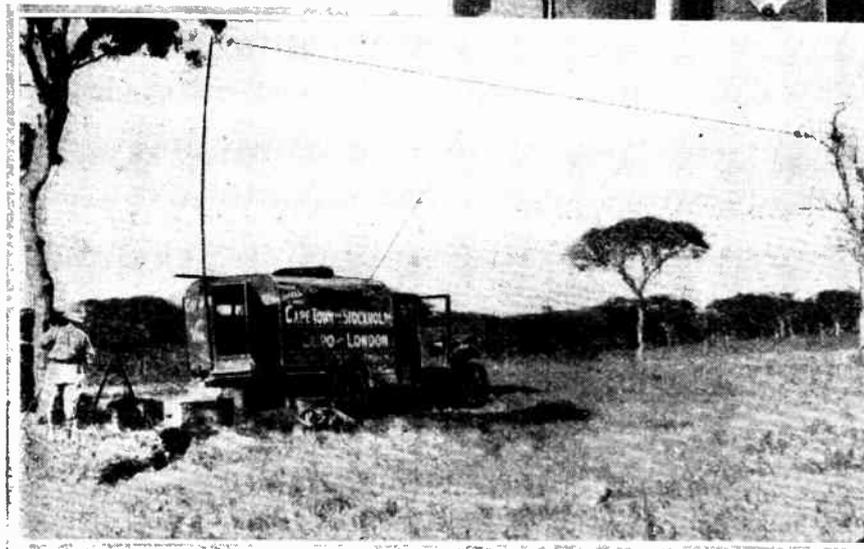
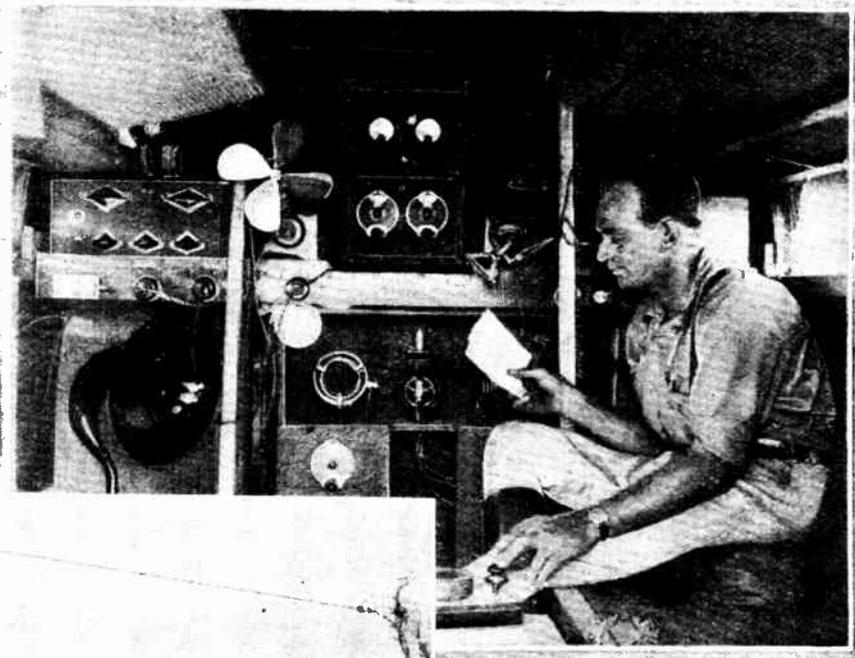
Across Africa with a "Transportable."

WIRELESS transmitting and receiving gear capable of withstanding the shocks of a seven months' car journey over some of the worst roads in the world was the requirement of General Motors of South Africa, Ltd., when they decided to send a Chevrolet car and 1-ton truck from Cape Town to London.

A well-known Port Elizabeth amateur, Mr. W. Wilson, was requested to help in the choice and collection of the apparatus. In two days it was complete, fitted with Mullard V.O.150 transmitting valves. Both transmitter and receiver were installed in the truck, the 2,000-volt generator being run off the engine.

The receiver, as will be seen in the photograph, was the well-known Grebe short-wave two.

After the party entered Rhodesia press messages and reports were transmitted



(Above) Mr. Wally Wilson, the amateur who accompanied the party, transmitting a message. (Left) A very temporary wireless station at Sreate Camp, Northern Rhodesia.

every night. The irregular nature of the country made the work extremely difficult. Sometimes the cars were in swamps, sometimes in forests, and, worst of all, in deserts, yet in spite of all handicaps the apparatus functioned perfectly, the travellers being able to listen to London dance music and Big Ben nearly every evening.

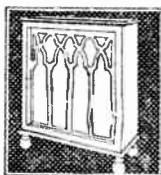
The trip took over seven months and it was never once necessary to replace a single valve.



"Wireless humour," say the critics, "never gets across." They put it down to lack of intimacy; the obtruding personality of the indifferent loud speaker. Now hear the next variety programme via the new Amplion. The vividness of the overture indicates at once that you are in the sixth row of the stalls. Isn't that fellow with the drums good? Next item—Tommy Handley. You've always chuckled; but now you roar. He's real . . . living . . . leaning over your piano and entertaining no mere million listeners but you . . . and just your friends. And so the show goes on. You hear the performance not as an eavesdropper but as a spectator. Rather wonderful—this new speaker! Wireless has given you many pleasures; this perhaps is the greatest. The new Amplion is all the more extraordinary because it provides naturally balanced reproduction of treble and bass without the aid of extra power. Even a two-valver can operate it. The new Amplion employs an entirely new principle possessed by no other speaker. But hear it—for eagerly you'll want it and gladly you'll buy it.

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With the small, neat B.T.H. Power Control Switch you can control the entire switching on and off of a mains operated receiver. A single movement of this switch puts your set into full operation. The reverse movement puts the set out of action and the accumulator on charge.

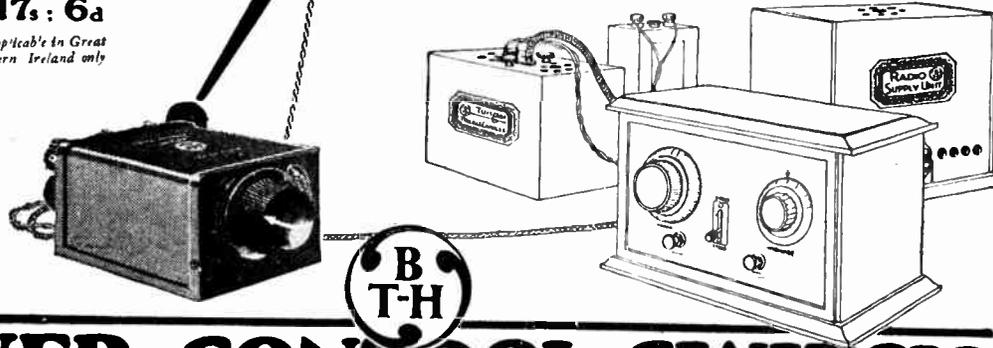
ON (Receiver Operation)
(1) Connects H.T. Eliminator to lighting circuit.
(2) Disconnects Trickle Charger from lighting circuit.
(3) Connects L.T. Battery to Set.
(4) Disconnects L.T. Battery from Trickle Charger.

OFF (Battery Charging)
(1) Disconnects H.T. Eliminator from lighting circuit.
(2) Connects Trickle Charger to lighting circuit.
(3) Disconnects L.T. Battery from Set.
(4) Connects L.T. Battery to Trickle Charger.

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The British Thomson-Houston Co., Ltd.

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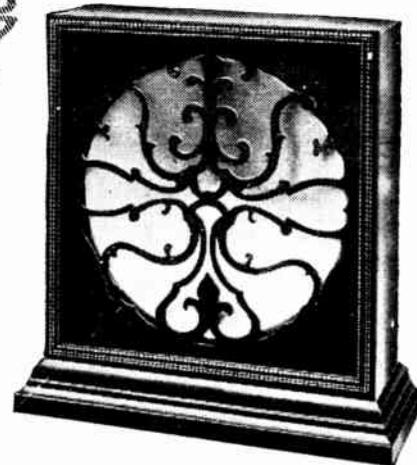
Its price 7 guineas.

* * * * *

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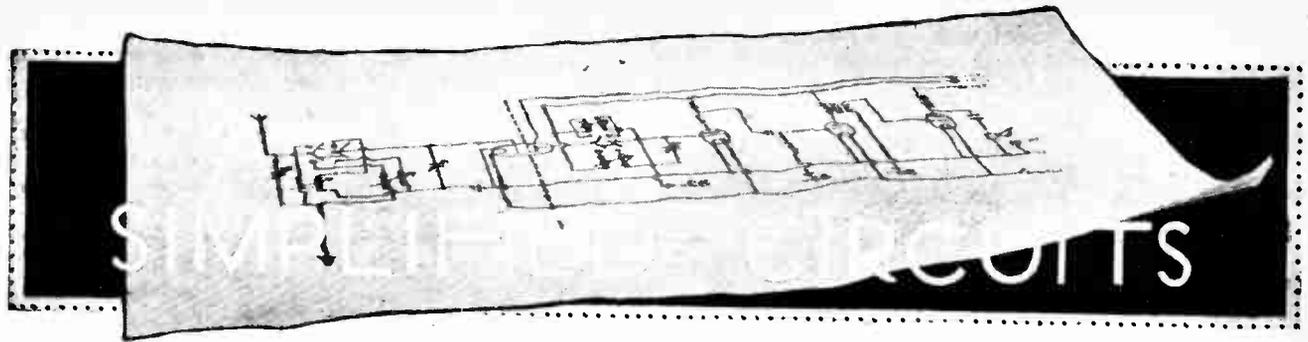


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Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

B40



How to Dissect a Theoretical Diagram. By "RADIOPHARE."

TO the majority of readers of this journal, wireless is nothing more than a hobby; it therefore follows that there is not the slightest reason why they should be at pains to acquire any more knowledge of the subject than they feel inclined; indeed, study carried beyond the point where it yields interest becomes a laborious task, instead of a recreation.

It would be an impertinence on the part of the writer to take to task those who have neglected the art of reading theoretical diagrams, but it is permissible to point out that a knowledge of the subject is vital to a proper understanding of a receiving set; further, it affords a short cut to some knowledge of basic principles.

Much has been done to smooth the path of the home constructor; practical wiring plans are prepared with references and cross-references and colour schemes for the various classes of connections, and receivers are designed with the object of eliminating all puzzling complications; although these expedients render almost impossible any chance of error, they are ultimately found to be lacking. This is partly because the builder, by the very simplicity of his task, is lulled into a false sense of security; unless he knows enough to trace out the different circuits which go to make up a complete set, he will seldom be able to locate a fault—which is bound to develop sooner or later—or even to make those slight additions and modifications which are almost inevitable in an art which as yet shows no signs of having reached a state of finality.

All this refers primarily to the set builder, but it

applies, although with less force, to the set buyer; there is no more certain way of reducing upkeep costs than by knowing something about one's receiver, and perhaps no easier way of getting this knowledge than by learning to read theoretical circuits. Put another way, it may be urged that knowledge can seldom be usefully applied to the solution of practical problems unless this art has been mastered.

Disentangling Individual Circuits.

Theoretical diagrams appear to be complicated only when they are considered as a whole, and many of the difficulties will disappear if one isolates the grid and plate circuits of each valve in turn, on the lines shown in Fig. 1, which represents the essentials of a three-valve set having an H.F. amplifier, anode bend detector, and a single transformer-coupled L.F. stage. It should be emphasised that the most complex multivalve receiver will yield to similar treatment.

A good deal of the diffidence with which the subject is generally approached may be attributed to the fact that it is customary to show a common high-tension voltage source for all valves; true, this is always used in practice, but it must be borne in mind that our anode circuits are not finished with when we come to the H.T. terminal; they must be carried through to the negative filament terminal of their associated valve. Starting from this common point, grid circuits should be traced out in the same way.

Still referring to Fig. 1, it will be as well to take each grid and plate circuit in turn, beginning with the H.F.

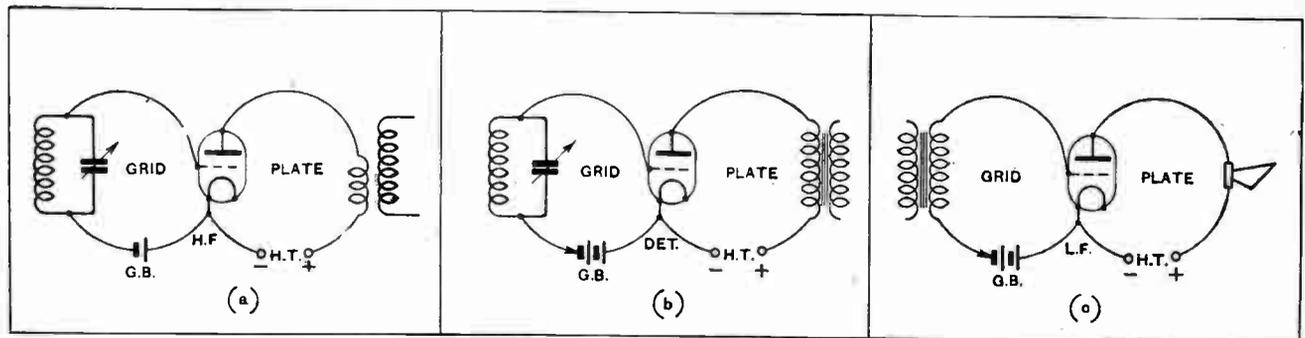


Fig. 1.—The basic grid and plate circuits of H.F., detector, and L.F. valves in a three-valve receiver.

Simplified Circuits—

amplifier (a). In series with grid and the common filament connection is a coil and condenser (which may conveniently be regarded as a self-contained unit), and also a grid bias cell. The plate circuit is completed through the primary winding of a coupling transformer and the H.T. battery.

The H.F. transformer secondary, in conjunction with

sents the separate single-valve circuits of Fig. 1 linked together. The connections of an aerial-earth system, whether in the manner indicated or otherwise, will not lead to confusion, but a neutralising system must, in the nature of things, introduce some complication, as it is bound to be common to both grid and plate circuits; however, if it is remembered that this will be so, and if the balancing winding and its condenser and con-

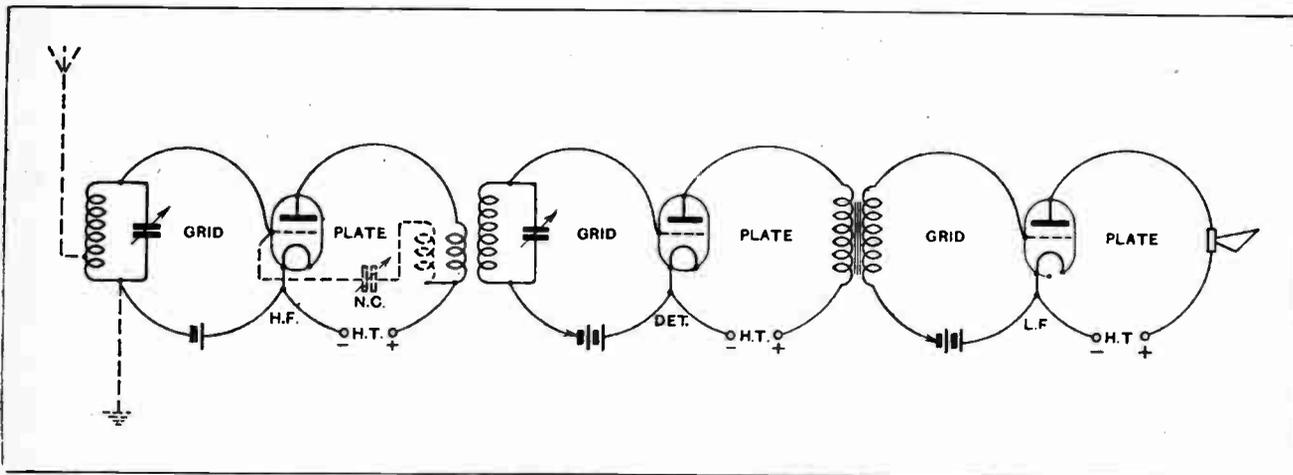


Fig. 2.—Diagram of a complete receiver, composed of the individual valve circuits given in the preceding figure.

its tuning condenser (omitted from diagram (a)), may properly be regarded as a part of the detector valve grid circuit, as shown in diagram (b). Similarly, the primary of the L.F. transformer is joined in series with the detector plate, but its secondary belongs to the L.F. amplifier grid circuit, so this winding must be transferred to the third diagram (c). The plate circuit of the output valve is completed through loud speaker and H.T. battery.

Unfortunately, we find in a practical receiver, even if it is of a comparatively simple kind, that a few complications must be introduced which tend to destroy the utter simplicity of the simple series circuits. Typical additions are shown in dotted lines in Fig. 2, which repre-

nections are looked upon as an addition to the simple basic circuits, no difficulty will arise.

Fig. 3 is a repetition of Fig. 2, but is drawn in the conventional manner. Those who are sufficiently interested will find it worth while to compare the two, and to trace out the various circuits of the more complex diagram with the help of the dissected version.

In the foregoing it has been assumed that the reader is familiar with the conventional symbols by means of which components are represented; this assumption is perhaps not altogether justified in the case of beginners, but it is considered unnecessary to repeat these symbols, as they are included in the majority of reference books dealing with wireless subjects.

Eliminating Another Complexity.

A type of circuit which may be responsible for some confusion is that in which valves are coupled by a condenser instead of a transformer; in this category are tuned anode H.F. stages and resistance- or choke-coupled L.F. amplifiers. The simplest way out of the difficulty is to regard the plate circuit as including whatever device may be in series with it, and to look on the grid circuit as being completed through its leak and bias battery, with the coupling condenser as a link between the two.

Unfortunately it is not possible to treat all the minor points of doubt which may arise when tracing out unusual arrangements; however, it will be a great help to remember that main plate circuits are always easy to follow, as they must include a through metallic path for D.C. current; any condensers, other than tuning capacities, can safely be regarded as shunts or as a part of parallel subsidiary circuits.

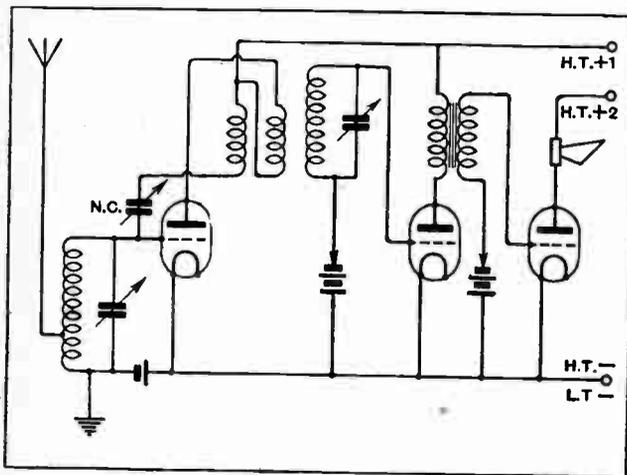
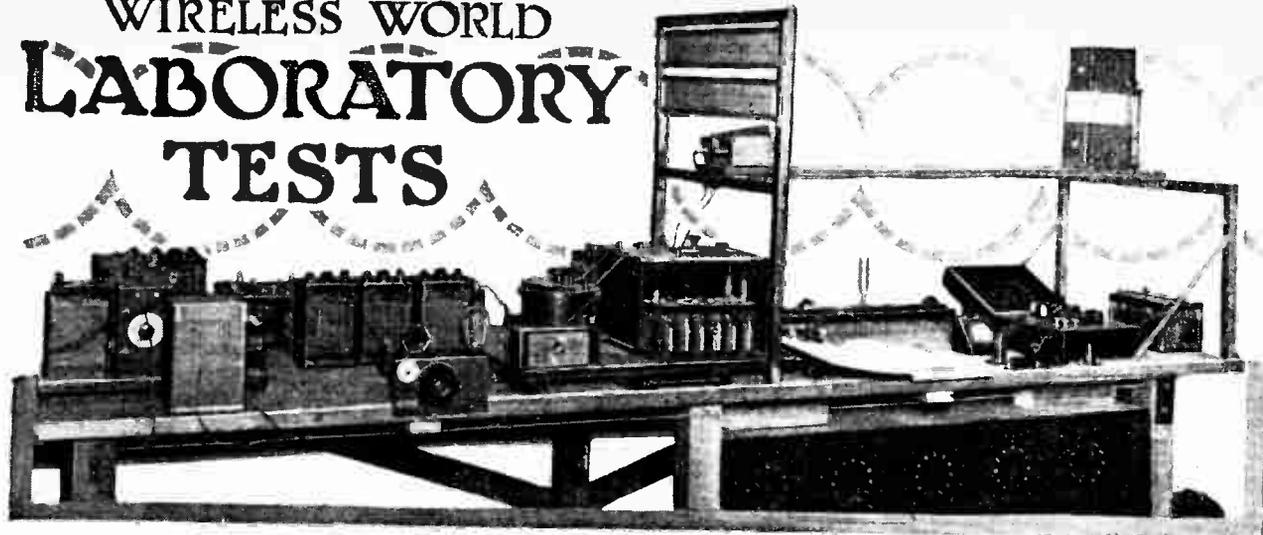


Fig. 3.—The circuit of Fig. 2, drawn in the conventional manner.

WIRELESS WORLD LABORATORY TESTS



A Review of Manufacturers' Recent Products.

TRIX H.F. CHOKE.

The base of the Trix choke is so arranged that it can be mounted either vertically or horizontally; all that is necessary is to interchange the positions of the terminal and the H.F. choke on the metal angle bracket fixed to the ebonite base.

The choke former is cylindrical and the wire is wound in 10 sections with a spacing equal to about twice the width of the slot. The maximum impedance occurs at 1,600 metres in a circuit which imposes an external capacity of 8 micro-mfd.; the choke is therefore suitable for wavelengths below this value. Self oscillation will not occur until 1,600 metres is passed and the choke can be used in a circuit designed for the reception of 5XX, though the factor of safety is small. Naturally, the impedance at 1,600 metres is above the average, and the choking effect on

Trix H.F. choke;
D.C. resistance, 390
ohms.

the medium broadcast band is also good as this band is nearer to the resonance of the choke than usual. The actual values of impedance are as follow:—

Wavelength (metres).	Impedance (ohms).
200	13,100
500	47,000
1,600	287,000

Each choke is supplied with a copy of

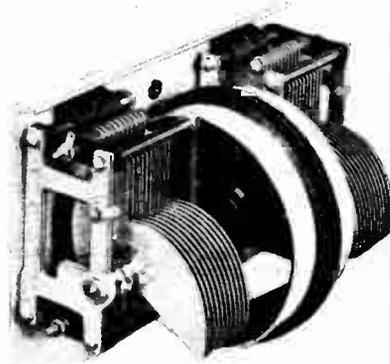
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the Faraday House report on inductance and self-capacity, and the price is 5s. 6d. The makers are Messrs. Eric J. Lever (Trix), Ltd., 8-9, Clerkenwell Green, London, E.C.1.

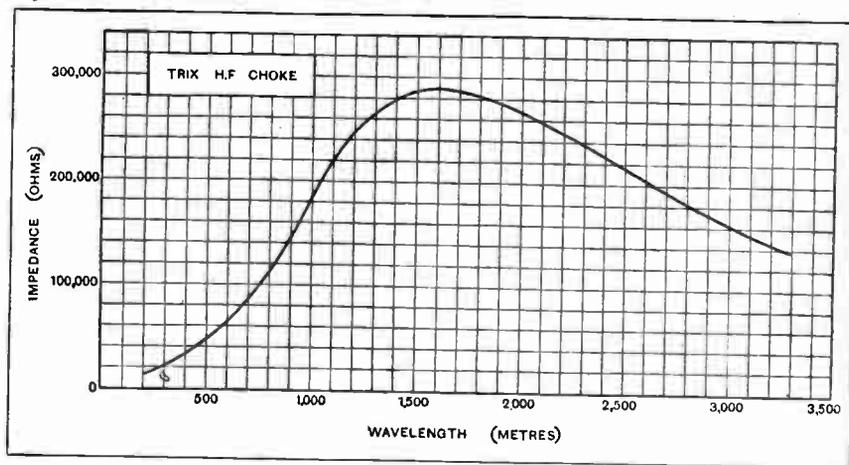
CYLDON SYNCHRATUNE TWIN CONDENSERS.

Many ingenious devices have been adopted for simplifying the operation of sets incorporating two, or more, tuned circuits, but the twin condenser assembly with control drums side by side is slowly but surely gaining popularity. The gang method of control, in which all condensers were connected to a common driving shaft, held sway for a period, but in very few cases was this entirely satisfactory. The wide use of drum control, as evidenced at the recent wireless exhibition, shows that designers have, for the forthcoming season, decided that this shall be the prevailing vogue, and many condenser manufacturers are now marketing their products with this attachment.

Messrs. Sidney S. Bird and Sons, Ltd., of Cyldon Works, Enfield, were among the first to put into production condensers



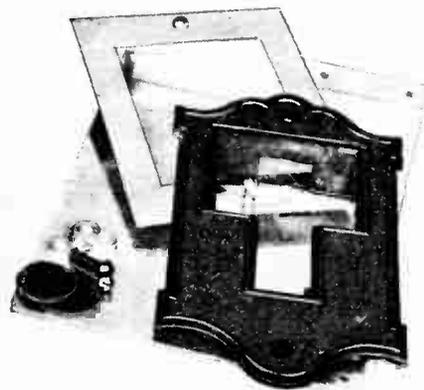
The new Cyldon "Synchratune" twin condensers.



Impedance curve of Trix H.F. choke: external capacity 8 micro-mfd.

designed specially for this method of operation, and long before the set manufacturers made drum control standard in many of their products. As is only to be expected, many improvements have been made since the first models were designed, and their latest "Synchratone" twin condensers embody a number of refinements which present-day practice demands as necessary with this method of tuning.

In the model illustrated, two log mid-line condensers, each with a maximum capacity of 0.0005 mfd., are mounted on an aluminum plate, the moving and fixed vanes both being well insulated, and the plate, therefore, forms an effective screen against hand capacity effects. Each condenser is fitted with a large diameter drum—4½ in. over the ivory scale—and these are mounted side by side with just sufficient clearance for a vertical screen to be fitted between them. The supporting plate is turned over at the top and bottom, and a narrow slot



The escutcheon plate, template and screen for the "Synchratone" condensers.

cut in each edge to facilitate accurate positioning of the screen. The object of this is to provide an electrostatic screen between the two condensers, as in many modern circuits the screening of each tuning condenser is as important as magnetic screening of the coils.

Two screws fix the unit to the front panel of the set, and these also hold in position an escutcheon plate moulded from bakelite. The unit is robustly made and exhibits the fine workmanship which characterises all this firm's products. The price complete is £2 7s.

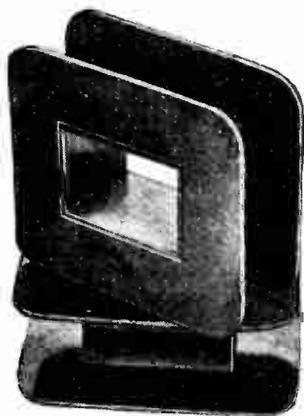
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TRANSFORMER MATERIALS.

Readers intending to make up the mains transformer described by Mr. H. B. Dent in the issue of October 24th will be interested to know that suitable core stampings having the same size and magnetic properties as those originally specified are obtainable from Messrs. W. B. Savage, 146, Bishopsgate, London, E.C. 2., the price being 8s. 3d. per gross pairs.

The construction of the transformer will also be simplified by the use of the bakelite bobbins supplied by this firm, which retail at the extremely reasonable

price of 1s. 6d. per pair. These bobbins are made to fit the "No. 4" stampings and provide for a core of 1½ square inches cross sectional area as specified in



Bakelite bobbins for building the transformer described on page 569 of the October 24th issue.

the article; between 86 and 90 pairs of stampings will be needed to complete the core. The use of bobbins for supporting the coils will somewhat reduce the winding space, but this will be compensated for to some extent by the fact that binding tape will not be required.

The type C30/2 smoothing choke made by this firm incorporates the bobbins and stampings mentioned above, and is a thoroughly sound and reliable job. The maximum current carrying capacity (D.C.) is rated at 125 mA. and the maximum inductance at 30 H. There are two sections in the choke, wound on separate bobbins, the terminals being arranged so that the two halves may be connected either in series or in parallel. With no D.C. flowing through the winding the series connection gave a measured inductance of 33.9 henrys and the parallel connection 9.5 henrys, the D.C. resistances being 172 ohms and 43 ohms respectively. The inductance would, of



Savage type C30.2 smoothing choke.

course, be reduced by the steady current flowing through the windings, but the generous dimensions of the core indicate that the reduction would not be as serious as in the average design. The price is 17s 6d.

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HARLIE WAVE SELECTOR.

This device consists of a tuned circuit with three alternative tappings for inclusion in the lead-in wire from the aerial. The function of the selector is to absorb the energy pick-up by the aerial from a local unwanted transmitter. The reception of distant stations which would otherwise be swamped by the local station is thus made possible.

The Model 9 illustrated is for the normal broadcast waveband, and costs 12s. 6d.; a similar model for long waves is in course of production.



Harlie Model 9 wave selector.

The workmanship is excellent, and special attention has been paid to the tuning condenser. This is of the moving vane type, with solid dielectric, and not the compression type often used in wave traps. A graduated dial on the top of the unit enables a record to be kept of the setting required to cut out the local station. The moulded case is of the usual high quality associated with Harlie products, and is finished in the popular crystalline black.

The makers' address is Messrs. Harlie Bros., Balham Road, Lower Edmonton, London, N.9.

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BROWN "L.F." TRANSFORMER.

In the review of this transformer on page 640 of the November 7th issue the amplification at 30 cycles with a D.E.L. 610 valve was given in error as 35. The true value at this frequency is 42.5 with the D.E.L.610, and the amplification of 35 refers to the curve for a P.M.3 valve.



By Our Special Correspondent.

**Engineers v. Musicians.—Royalty and the Microphone.—Yugo-Slavia's New Idea.—
Audition Horrors.—Discontent in Scotland.—Illustrating Broadcast Programmes.**

Another Trip to Eastbourne.

That "Eastbourne effect," referred to in these columns a fortnight ago, is more sought after at Savoy Hill than the public may have been led to believe. In a conversation last week, Capt. A. G. West, who heads the B.B.C. research department, confirmed the view that the lounge of the Grand Hotel at Eastbourne is the best "studio" that the B.B.C. have had at their disposal since broadcasting started.

This fact was recognised three years ago, when Capt. West made a personal visit to Eastbourne and took rough measurements.

New Acoustic Measuring Device.

Another excursion will probably be made shortly when the engineers will take with them a new acoustic measurement instrument now under construction at the Clapham laboratory. The device will also be taken to other buildings used for outside broadcasts.

The instrument will give the sound characteristics of any building, showing the natural resonances of the place and the extent to which echoes are prolonged at different frequencies.

Engineers v. Musicians.

No doubt the information gained will be of great interest to the academically-minded, but, from what I can gather, it can be put to little practical use at present, there being a strong musical faction at Savoy Hill which is resolutely opposed to the introduction of more echo in the transmissions.

Most of the engineers are in favour of introducing more of the "hall effect," arguing that it adds brilliancy to the performance of the average loud speaker. But the musical gods, who hear almost perfect reproduction on moving-coil loud speakers in the spacious apartments at Savoy Hill, are apt to overlook this fact.

Anyhow, there is conflict on the point, and we may hear more of it before very long.

How to Plumb Public Taste.

The citizens of Liverpool are now complaining that the centralisation of northern programmes at Manchester has deprived them of the local news which 6LV used to send out. This is rather hard on the B.B.C., because a number

And Quite Right, Too.

A cheerful genius, probably the one who made the same proposal last year, suggests that H.M. King should be prevailed upon to broadcast a message to the Empire just before the Christmas Dinner at Buckingham Palace.

"We should never think of making such a request," a B.B.C. official told me. With which sentiment most of us will agree. The Royal Family, like humbler families, is surely entitled to keep that one day to itself.

Prognostication.

Without consulting the stars or posing as Old Moore, I venture to suggest that listeners who are in a position to use their sets during the daytime should mark December 24th on their calendars as a date on which an important broadcast may take place. All will depend upon whether consent can be obtained from someone who ranks very high in the land.

An Arnold Bennett Play.

Arnold Bennett's one-act play, "The Stepmother," a farce which pokes fun at the popular woman novelist, and a Christmas sketch by F. Morton Howard entitled "Those Good Old Days," are in 5GB's programme on December 14th.

Great Problem Solved.

There is a hint of genius behind the decision to make the call of the cuckoo the signal for Yugo-Slavia's new 566-metre station at Laibach. The idea is original and full of the most wonderful possibilities. It solves all difficulties in station identification with one colossal sweep.

Station Identification Made Easy.

Why have we never thought before how simple and effective it would be to give every station an animal call? Animals know no language: the cry of the pussy cat is recognisable as such by people of all nationalities.

**FUTURE FEATURES.
London and Daventry.**

DECEMBER 2ND.—Twenty-fifth Annual Scottish Festival Service from St. Columba's, Pont Street, S.W.1. Address by the Rev. Archibald Fleming.

DECEMBER 4TH.—Two Plays by W. W. Jacobs: "The Grey Parrot," and "The Monkey's Paw."

DECEMBER 5TH.—"A Sea Change," by Sir George Henschel.

DECEMBER 6TH.—Hallé Concert from the Free Trade Hall, Manchester.

Daventry Experimental (5GB).

DECEMBER 3RD.—"Paddy Pools," a fantasy by Miles Malletson.

DECEMBER 4TH.—"Fireside Singing," an hour with old songs and choruses.

DECEMBER 7TH.—A Lecture on "How It Strikes Me," by G. Bernard Shaw, relayed from the Private Theatre of Royal Academy of Dramatic Art.

DECEMBER 8TH.—Chamber Music.—A Czechoslovakian Programme.

Cardiff.

DECEMBER 2ND.—Sunday in a Welsh Home.

DECEMBER 4TH.—"On Approval," a Yandeville Programme.

Manchester.

DECEMBER 6TH.—Hallé Concert from the Free Trade Hall.

DECEMBER 7TH.—Programme of Minnets and Gavottes.

Newcastle.

DECEMBER 2ND.—Service from St. Nicholas Cathedral.

DECEMBER 7TH.—"Dropped from Heaven," by Dion Titheradge.

Glasgow.

DECEMBER 3RD.—Programme of Spanish Music.

DECEMBER 7TH.—Glasgow Bach Society Chamber Concert.

Aberdeen.

DECEMBER 3RD.—"Ayont the Grampians," A Scottish Variety Programme.

Belfast.

DECEMBER 3RD.—"L'Enfant Prodigue," an opera by Claude Debussy.

of Liverpoolians used to find local news rather tedious, and said so!

It would appear that the best method of discovering whether an item is popular or not is to cut it out.

Appropriate Calls.

All that remains to be done is to allocate zoological calls to the various European stations, having regard to the types of animal most appropriate to particular transmitters

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Round the Zoo

Under the able guidance of Mr. Arthur Burrows, the members of the Union Internationale de Radiophonie might tour the nearest Zoo and listen attentively to the cries of all creatures, great and small, classifying them according to volume and frequency.

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Difficulties.

It is not for me to suggest on what basis the various calls should be assigned; no doubt every station would clamour for the honour of the lion's roar, and difficulties would undoubtedly arise in allotting such derogatory, if distinctive, sounds as the laugh of the hyena and the bray of the ass.

Anyway, Yugo-Slavia has given us the right idea. Geneva should now get busy on the new list of "stations, frequencies, and animal cries."

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A Spanish Classic.

The next production in the World's Great Plays series is Calderon's "Life's a Dream" It will be broadcast from 5GB on December 11th, and 2LO, 5XX, and other stations on December 12th. The play is representative of Spain's contribution to the world's drama.

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Audition Horrors.

I hear that there may be a decided diminution in the number of stage-struck

young ladies after the 20-minute broadcast on Friday next, November 30th, when we shall hear a theatrical audition from a room in the Palace Theatre. Aspirants for places in the chorus of No. 1 touring company of "Virginia" will be parading their talents before the judges—Herman Clayton, Jack Waller, William Mollison, and Ralph Reader—and the comments are to be outspoken in more than one sense. Strict anonymity will be observed, which is rather a good thing, considering how busy the courts are at present with libel actions.

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An Idea for the B.B.C.

But this audition idea might be developed by the B.B.C. themselves. We should like to hear some of the raw stuff which blows in at Savoy Hill on the off chance of securing a contract. If we had a whole evening given over to the people who think they can sing, or recite, or be funny, but have never been tried, it would do the B.B.C. programme department an enormous amount of good. We might then hear fewer complaints from "Fed-up," "Bored to Tears," and all those other persons who know what is wrong with the programmes but can never suggest how to set things right.

They would then have a faint glimmering of the refining processes which are at work before a real programme ever gets near the microphone.

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"Fed-up" Speaks.

One of the fraternity aired his views to me a few days ago. "There's nothing worth listening to," he stated. "The B.B.C. hasn't got the right 'touch' if you know what I mean. Somehow they don't seem to 'get there.'"

"And what," I asked, "did you object to in last night's Schubert concert?"

He looked annoyed.

"Oh, I haven't had a chance to listen since my aerial came down!"

I remember when that aerial came down. It was last August.

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Discontent in Scotland.

In view of the growing discontent among Scottish listeners regarding the new regional programme system in Scotland, the B.B.C. have thought it advisable to explain the situation in a letter to the Scottish Radio Traders.

It will be remembered that the Glasgow station is virtually the only main station in Scotland at the present time. Edinburgh, Dundee, and Aberdeen taking only the Glasgow transmissions. These may or may not originate in London.

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An International Cause.

In the course of the letter referred to, the B.B.C. admits that the conditions in Scotland leave much to be desired, but that the primary cause is the international situation.

After explaining the necessity of a common wavelength among the relays, the writer says:—

"At present in Scotland (and elsewhere to an equal degree) every relay transmitter is heterodyned and limited to almost negligible distance. Most main stations are practically useless beyond a radius of fifteen miles. . . ."

"It is essential that the same evening programme shall be radiated by Edinburgh as by all the other relays and Bournemouth, because it is impossible to radiate different programmes at the same frequency without risking mutual interference."

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Blessings of the Regional Scheme.

The letter insists that the common wavelength plan is merely a temporary palliative pending the completion of the regional scheme. "If the regional scheme had been proceeded with three years ago we should be independent of the Continent, and there would be no cause for complaint in Scotland or elsewhere. But the P.M.G. did not see his way clear. . . ."

What a lot hangs upon the regional scheme!

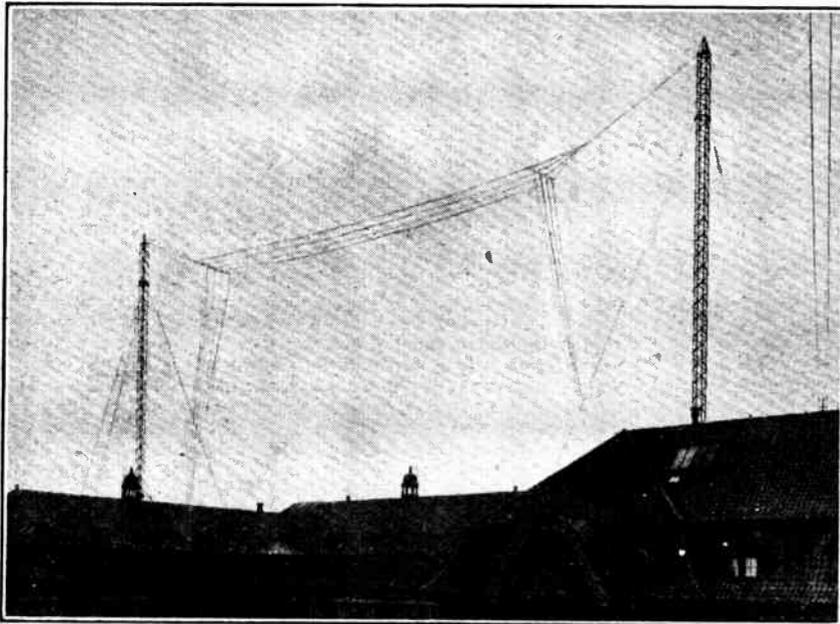
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Illustrating Broadcast Programmes.

The B.B.C. has just indicated the way in which the present series of picture transmission by the "Fultograph" system may ultimately develop. On Saturday, November 17th, one of the four pictures supplied by them for that day for broadcast purposes was a portrait of an artist who appeared on the Daventry programme only an hour later.

The portrait was that of Mable Constanduros, who was on the 5GB programme from Daventry at 3.30 p.m.

On the Thursday a photograph of the outside of the Savoy Hill headquarters was transmitted.



DENMARK'S CAPITAL. The aerial system of the Copenhagen station is unscreened by bricks and mortar. The station broadcasts nightly on 337 metres and is usually relayed by Kalundborg on 1,680 metres.

LETTERS TO THE EDITOR.

The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, 11, Fleet Street, E.C. 1, and must be accompanied by the writer's name and address.

LOUD SPEAKER "ATTACK."

Sir,—In the correspondence on "attack" and the reproduction of sudden "noises" (such as a shot), no one appears to have suggested that there may be a physiological difference between the mechanism by which we hear a "noise" and that by which we hear a musical note.

According to the generally accepted Helmholtz theory of hearing, the ear is provided with "resonators" each tuned to a particular audible frequency. If, say, middle C and its third harmonic (or fifteenth) are sounded together, resonators corresponding to frequencies of 512 and 1,536 are affected, and from the relative intensity with which they are affected we judge the relative intensity of the fundamental and harmonic. The ear, in fact, performs a harmonic analysis, but it is not affected by the phase relation between fundamental and harmonic.

It can easily be shown by drawing the curves that if the harmonic is in phase with the fundamental we have a "peaky" wave form, whereas if the harmonic is antiphase to the fundamental we have a "flat topped" wave, yet provided the relative amplitudes of the fundamental and harmonic are unaltered, we hear the same note precisely.¹

But is the same true of a sudden "noise"? I suggest that the effect produced by the "noise" of a shot, say, in shock excitation of all the resonators, and the precise "quality" of such a noise, depends to a very large extent on the steepness of the wave-front, i.e., by time rate of change of air pressure. Now if we suppose that the actual wave-form of the air pressure produced by such a "noise" is harmonically analysed over a sufficiently long period, and that the phases of the components are then altered at random, keeping the relative amplitudes unaltered, we shall obtain a curve having an entirely different steepness of wave-front, probably a very much less steep wave-front. If my suggestion, that the quality of the noise depends on steepness, is correct, the alteration of phase will give untrue reproduction of a sudden noise, although it may be of no effect when listening to the reproduction of a musical note or notes.

Now in practice, any loud-line must introduce phase change, which cannot be corrected subsequently as can amplitude distortion; also there is practically certain to be phase change in any transformer, whether in transmitter or receiver, hence the random change of phase suggested in the last paragraph is what actually does occur (and even if the transmission and amplifier could be freed from this, it will still be introduced by the loud speaker).

It would then appear that to reproduce a "noise" accurately is a problem of an infinitely more difficult nature than that of reproducing a musical sound, in our present state of knowledge it may even be insoluble, as it would require the elimination of phase-change. I hope some of your readers with a knowledge of physiology will comment on this suggestion.

Cambridge.

C. R. COSENS.

November 7th, 1928.

5SW AND EMPIRE BROADCASTING.

Sir,—There appears to be quite a lot of talk just now about 5SW and its expense, and suggestions are made that the Dominions should help pay for its maintenance.

We are told that 5SW costs £10,000 a year. I could find a use for £10,000 a year myself, but surely this is a very small sum to the B.B.C. I might as well say—"it costs me £10 a year in stamps and stationery to write to my friends and send little presents—what about asking my friends to subscribe towards this?" You reply "Yes, but your friends write to you and you get some return." Quite true, but imagine I am the "rich uncle," and send rather a lot of presents! Let the B.B.C. be

¹ For arguments in favour of the statement that phase-difference between notes does not affect the ear, see "A Vindication of the Resonance Theory of Audition," by H. Hartbridge and the writer, *British Journal of Psychology*, Vol. XII, p. 48, July, 1922.

the "rich uncle," and the Colonies the "poor nephews and nieces."

But to turn to another aspect: Why do the B.B.C. run 5SW? Why do they carry on conversation for an hour or so twice a week with 2XAD? Are the Colonies expected to pay for this, too? (Oh yes, I admit we listen to it.) Why do people in England use SW sets? To listen to 5SW? No! But do they contribute to SW stations in other parts of the world? No! Presumably 5SW is their way of paying for the pleasure of listening to 2XAF, PCJJ, 3LO, etc., etc.

And what about the B.B.C.'s latest activity, broadcasting pictures? Is this what the subscribers pay their licences for?

As a matter of fact I do not suppose any one of the Colonies would mind paying the B.B.C. a licence equal to:—

Present licence × cost of 5SW per annum.

Total expenditure of B.B.C.

The difficulty would be to find currency in which to pay it!

Let us hear a little less about the Colonies paying for 5SW; it is not a very generous or sporting suggestion. Many or rather most of us go to England for our holidays and spend our money freely: we might even pay for a year's licence while in England and only use it a few months.

One more aspect: here in India, what do you suppose the average listener, and the majority are Indians of course, cares about 5SW; not two pence. 5SW does not produce the kind of programme the Indian likes, and the I.B.C. would certainly not be justified, poor as they are, in paying one penny to the B.B.C.

No, let the B.B.C. and the English subscribers who grumble at the cost of 5SW be satisfied that they do get some return in a very small way, and if that does not satisfy them they might remember that a large number of subscribers have friends and relatives in the Colonies, and would like them to hear 5SW at their, the subscribers', expense.

Of course, if the Colonies should pay, I expect they would have a word or two to say about times of transmission and wavelengths.

BM/RBR.

Negapatam (South India).

October 22nd, 1928.

"MODERN NOISE."

Sir,—The peremptory manner in which Mr. Ernest Newman, the B.B.C. music critic, addressed us on Saturday, November 3rd, during his discourse on "Modern Noise," which he is pleased to call music, augurs a bad outlook for those people who are paying the piper, but who, apparently, have no voice in calling the tune. Can nothing be done to force an issue on this important matter, i.e., whether we are paying for noise or music? Apart from this pet idea of the B.B.C., I firmly believe we have the finest broadcasting organisation in the world. I listen to a good many distant stations, but I still maintain our stations will compare favourably with any other, but there is this "fly in the ointment" which needs immediate attention unless we are to become a nerve-racked lot of listeners. From letters which have already appeared in your valuable weekly and other papers it is quite apparent that the public prefer Beethoven to Bartok and other moderns. Then why should the B.B.C. persist in their policy? I should like to hear the views of your readers on this matter.

MUSICUS.

W. Eastleigh, Hants.

November 5th, 1928.

PICTURE BROADCASTING.

Sir,—It is hardly to be expected that people are going to the expense of installing kytograph or similar apparatus in their homes when the possibility of the B.B.C. discontinuing transmissions is present. It seems to me that the public are watching the B.B.C. and the B.B.C. is watching the public, and neither will make a move until they are sure of the other.

November 13th, 1928.

D. C. A. WALKER.

PICTURE BROADCASTING

Sir,—Mr. E. J. Crampton is not fair to the B.B.C. in his letter of October 20th, for they have no axe to grind by their recent ban on television, and are merely acting in the interests of the listener.

If the sample recently exhibited in Oxford Street is an example, then television is certainly not *at present* in a sufficiently advanced state to broadcast to the 10s. per annum brigade, who expect entertainment—which, however, they do not always get—for their outlay.

D. A. T.
Palace Gate, London, W.8.

November 15th, 1928.

Sir,—The value of the suggestion made by your correspondent, Mr. E. J. Crampton, in his letter regarding the relative merits of picture broadcasting, or television, depends on an assumption that wireless television is already practicable for broadcasting.

The B.B.C. and the foreign stations which have adopted picture broadcasting have decided that it is not, and are surely in a position to judge.

What is the good of asking the public if they want television when those who have actually seen it demonstrated are unanimous in considering that it has not yet reached the stage where it has entertainment value?

No doubt the public would like television of interesting events taking place outdoors in natural colours, but at present all that could conceivably be offered them is a blurred and very imperfect impression of the face of an individual or an object of approximately the same size.

As far as the suggestion is concerned that amateurs might be able to improve television reception if the B.B.C. started transmission, this again presupposes reasonably good transmissions. The imperfections exist, however, just as much in the transmitting system as in the system of reception, and until the former has been brought to a reasonable degree of efficiency it is not much use to experiment with reception.

Thornton Heath, Surrey.

W. McDOWELL.

November 17th, 1928.

TRANSMISSION QUALITY

Sir,—Your correspondent, Mr. A. K. Gordon, wishes to know whether other listeners in Sussex have any complaint of the quality of transmission from 5XX. My experience is the same as his. Sibilants, which are apparent in 2LO's transmission, are lacking in that from 5XX. There is considerable variation in the quality of 5XX's transmission in this neighbourhood, some of which is no doubt due to local interference. Mr. Gordon's letter has encouraged me very much. I was beginning to think that I should never succeed in building a set that gave a uniform response to the normal band of frequencies, and his letter indicates that the fault may not be mine.

Kingston-Gorse.

P. B. JOUBER.

Nr. Littlehampton.

November 18th, 1928.

Sir,—I should like to confirm every word of Mr. A. K. Gordon's letter (November 14th). The response frequency of 5XX gets steadily worse, and fully 90 per cent. of the transmission is deficient in the higher frequencies. In order to check my receiver I rigged up the simplest possible arrangement, using an old plug-in 150 coil, a P.M.5X valve, and a pair of well-tried headphones. The result was the same, music being dull, woolly, and consequently uninteresting, while speech was of the "hot potato" variety.

A very interesting item of news occurs in a letter from Amsterdam (in your same issue), where Mr. Wigan mentions that the Hilversum concerts are performed in a small concert hall. Most listeners must have noticed the immense superiority of Hilversum musical programmes over those of 5XX. And now we know the reason!

In the name of all common sense why cannot the B.B.C. condescend to learn something from their foreign rivals? The idiotic "control" is at last being scrapped (at least we hope so) after years of agonised protests by musicians, but the padded cell still remains. Is there nothing also to be learned from the Eastbourne transmission and other outside broadcasts? I

wonder if Mr. Eric Coates had any idea of how his little concert of last night sounded to 5XX listeners!

Perhaps I had better add that, owing to the Morse nuisance and the bad land-line distortion from 6BM, 5XX is really the only English station available to us south coast unfortunates.

H. BRAITHWAITE.

Southbourne, Bournemouth.

November 14th, 1928.

Sir,—I have read with interest the letter from A. K. Gordon in the November 14th issue of *The Wireless World* with reference to the great variation in quality of some of the B.B.C. transmissions.

I have been listening to-night to both 5GB and Cardiff, the former being really good, the "sibilants" especially being sharp and clear, while Cardiff, on the other hand, is "muffled" and altogether low pitched. This state of affairs seems to vary from night to night, and 5GB especially seems to be the worst offender, varying in quality from good to bad quite noticeably several times during an evening.

The receiver I am using is fairly flatly tuned, very little reaction used, and is capable of really good reproduction.

The difference in transmission is most marked when an "S.B." is being given from Cardiff and Bournemouth (both local stations). Speech appears hollow and "drummy" from one, while being practically perfect from the other.

I think that what Mr. Gordon has noticed coincides with what I am getting here, the transmissions and not the receiver being to blame.

R. L. A. BELL.

Yeovil, Somerset.

November 14th, 1928.

Sir,—I can fully confirm your correspondent's remarks in the November 14th issue of *The Wireless World* re the quality of 5XX transmissions, because I have, myself, proved conclusively that there is very considerable attenuation of the higher audio frequencies. One has only to listen to the announcer's voice during the news bulletin, first from 5XX and *via* 5GB to realise the truth of this.

I recently wrote to the B.B.C. complaining of the attenuation of the higher audio frequencies, both from 5NO and 5XX. The B.B.C. in their reply ignored my remarks *re* 5XX, but, referring to 5NO, stated:—

"You will appreciate that our modern transmitters, such as 5GB, are capable of giving more equal frequency response than was the case with older stations, such as Newcastle. At the same time we would point out that it is extremely unlikely that this difference in frequency response would be detected aurally, except by an extremely small percentage of receivers."

Where is the incentive to build a perfect receiver, so long as the majority of B.B.C. transmitters cannot do justice to it?

C. C. V. HODGSON.

Fenham, Newcastle-on-Tyne.

November 15th, 1928.

RANGE v. QUALITY.

Sir,—It must be evident to your correspondent Mr. Blouet that the qualifications which he postulates cannot readily be obtained either cheaply or with simplicity.

It is a matter of opinion as to whether any single set has yet been provided for us by your designers which will completely fulfil his requirements, but any regular reader of your journal will agree that by the intelligent employment of established *Wireless World* practice a radio receiver can be built to suit almost any individual requirement.

If your correspondent considers it worth ten minutes' walk I shall be delighted to introduce him to a set in which *Wireless World* practice is used throughout and which will give him even a little more than he demands.

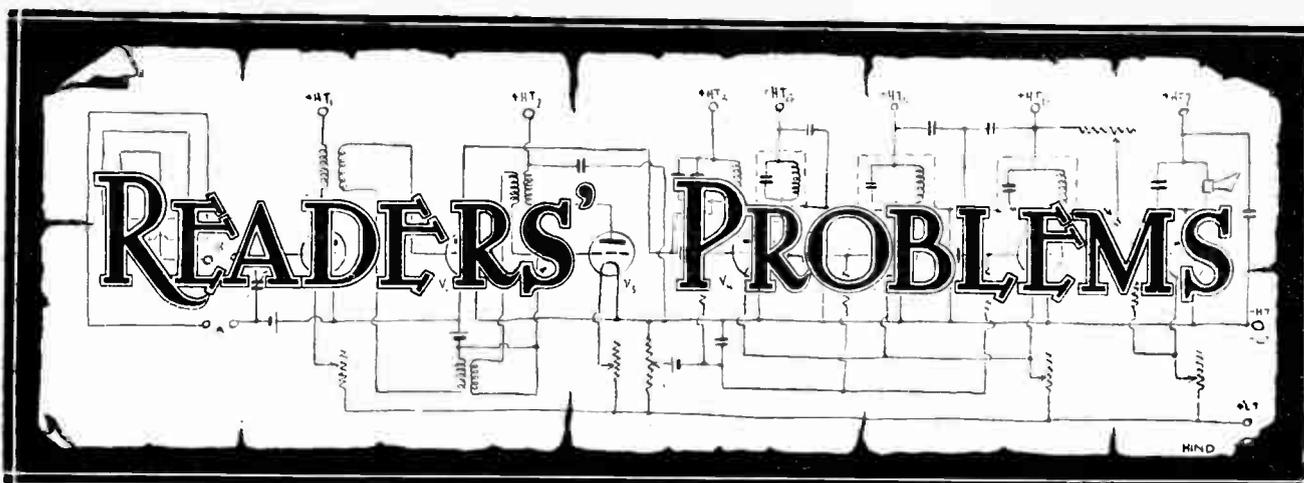
I might suggest that he makes it an early evening call, for the simple reason that no principles yet described, either in *The Wireless World* or elsewhere, will provide anything to outstride the local o-v-2 enthusiasts when they have got properly into their stride.

CHAS. BOWLES.

10, Audley Gardens.

Seven Kings, Essex.

November 16th, 1928.



"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Pentode Connections.

In the circuit diagram of the "Megavox Three" receiver, a decoupling resistance connected in series with the screened grid of the pentode is shown. I propose to adapt my two-valve set for use with a pentode, and would like to know if this refinement should be retained. S. D. W.

As your set presumably comprises a detector valve followed by an L.F. amplifier, for which you now propose to substitute a pentode, the use of this decoupling resistance would be generally unnecessary. It is specially required when L.F. impulses are capable of being passed back to the grid of the detector, as, for instance, in cases where it is preceded by an H.F. stage with tuned anode.

A Portable "Megavox."

Would the circuit of the "Megavox Three" receiver be suitable for a self-contained receiver with a frame aerial? I realise the need for modifications in the grid circuit of the H.F. valve, but should be glad to know if any other alterations would become necessary. F. S. S.

This circuit arrangement should lend itself very well for use in a three valve self-contained set, but if the frame aerial is included as a part of the receiver, we consider it would almost certainly be necessary totally to screen the H.F. stage in a metal box.

The Simplest H.F. Oscillator

Instead of depending on actual signals, I have decided to build an H.F. oscillator to help me in making some simple comparative measurements. Will you please give me a circuit diagram of the simplest arrangement? I believe it is possible to use a single tapped coil in conjunction with a valve. R. W. S.

The circuit you require is given in Fig.

1, and, as you will see, a single coil only is required. This should preferably have a number of tapings; it will be convenient finally to fix the lead connected to the positive terminal of the H.T. battery at a point which just produces self oscillation over the whole of the tuning scale. The grid leak should have a comparatively low value.

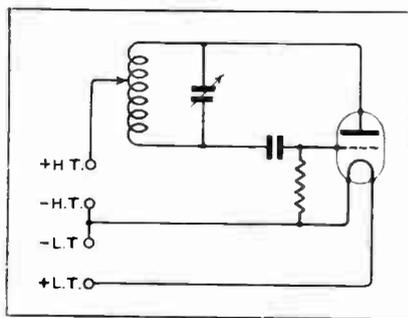


Fig. 1.—A single-coil Hartley oscillator.

RULES.

(1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."

(2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.

(3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.

(4.) Practical wiring plans cannot be supplied or considered.

(5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

(6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

Damped but Distortionless.

Several references have been made in recent issues of "The Wireless World" to diode rectifiers, but as this system does not seem to be widely used, I assume that it has disadvantages. It seems to be generally admitted that it is insensitive; are there any other serious drawbacks?

T. E. S.

An ordinary detector valve contributes something towards the total amplification obtainable from the receiver, but a 2-electrode rectifier does not. This applies equally to the original valve as to the more modern arrangement in which the grid is used to neutralise the space charge. Lack of sensitivity, however, is not so great a drawback as the damping imposed on the input circuit by the 2-electrode arrangement, which is of low impedance, and consequently draws a considerable amount of energy from the tuned circuit across which it is connected. It is thus somewhat unsuitable for use in ordinary circuits.

Motor-boating

Since fitting an eliminator to my four-valve receiver, I have been troubled with a low-pitched rattling sound in the loud speaker, which can only be prevented by reducing the H.T. voltage applied to the valves. The addition of extra by-pass condensers across the H.T. terminals does not improve matters to any extent, and I should be glad if you would suggest a simple cure. H. S.

Your trouble is almost certainly due to interstage coupling brought about by the resistances and impedances in the eliminator, and we think you would be well advised to try the simple arrangement which was described with full details in our issue of September 26th under the heading of "Back Coupling in Battery Eliminators."

A.C. Valves.

If you approve of the plan, I propose to modify my "Everyman Four" by fitting indirectly heated A.C. valves. Are there any special precautions to be observed.

M. V.

We fear that you will find it difficult to attain perfect stability if you use two high magnification L.F. stages with the new valves, although the modified set might work satisfactorily if you reduced the amplification of the first stage by fitting a low value of anode resistance. Probably, however, our best advice to you is that you should omit one of the L.F. valves, and follow the general circuit arrangement of the "A.C.3" described in *The Wireless World* for September 5th, 1928.

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Switched Hartley Circuits.

With reference to the throttle-controlled Hartley circuit used in the "Everyman Portable," would it not be possible to simplify matters by using an ordinary single-pole break switch for waveband changing instead of a double-pole component as specified? As far as I can see, all that this switch does is to short-circuit the long-wave loading coil. The set I propose to make is for use with an open aerial, and not with a frame.

F. L. C.

Your statement is right as far as it goes, and the purpose of the switch is to short-circuit the loading coil for reception on the medium band. You have, however, ignored the fact that for either wave-range it is necessary that the filament-connection should be taken from the

ductance of the loading coil when receiving medium waves, and the circuit arrangement would in effect be that of Fig. 2 (a), in which the unwanted inductance is shown at L.

The desired effect could be achieved by using a switch having two fixed contacts and a moving arm for short-circuiting them. The centre tap of the long wave loading coil and the filament connection would be joined to this arm in the manner shown in Fig. 2 (b). We doubt if such a switch is available commercially in a suitably compact form, but would add that an electric light switch may sometimes serve the purpose, particularly if it is of a type in which it is convenient to make an electrical connection to the moving blade.

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Discharge Rates.

Although it is generally considered safe to discharge L.T. accumulators at a rate equal to about one-tenth of their total ampere-hour capacity, I notice that this is not the case with regard to H.T. batteries; the makers in many instances recommend that they should not be discharged at more than about one-hundredth of their full capacity. I have always imagined that the two types of cells are essentially the same, differing only in size, and would like to know the explanation of this apparent discrepancy.

R. P. S.

The safe and economical discharge rate of an accumulator cell is governed mainly by the area of its plates, and as a rule those used for H.T. supply are small and comparatively massive. This accounts

where current demands are heavy, they have an important advantage in that they are not susceptible to damage from sulphating when the discharge is spread over a long period.

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A Two-station Receiver.

Will you please refer me to a published constructional description of a simple receiver which would be capable of giving good loud speaker signals from the two Daventry stations? I have an aerial which is well up to the average, and would prefer a set without home-made parts, as I have no workshop facilities.

T. N. R.

We see that you are situated at a distance of nearly sixty miles from Daventry, and, assuming that your conditions are even moderately good, we think that the "Pentodo Two" receiver, described in our issue for October 17th, should be quite suitable. As coils for this receiver may now be obtained commercially, you should not find any difficulty in its construction.

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L.F. Switching.

The provision of a switch for cutting-out an L.F. amplifying valve seems to have gone out of fashion, but in spite of this I am tempted to include it in my set. What is your advice?

M. L. W.

In this matter we are in full sympathy with present practice, and consider that the inclusion of a switch is only justified in exceptional circumstances. An L.F. amplifier is nowadays so designed that the output valve will be fully loaded up when the H.F. voltage applied to the detector is roughly that at which it works best, and the drastic expedient of cutting out a complete stage is likely to introduce serious complications, apart from the fact that the necessary complicated wiring may produce instability.

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Accumulator or Eliminator?

My D.C. mains supply is at 240 volts pressure. Will you advise me whether it would be preferable to buy an accumulator H.T. battery and to charge it from the mains through a resistance or to obtain an eliminator? My set has a total of four valves, and circumstances make it impossible for me to reproduce at very great volume; in fact, the output obtainable with 120 volts (at present supplied by dry batteries) is as much as I require.

D. R.

It is not altogether easy to give a definite expression of opinion as to which form of supply would be the most suitable for you. There is always the possibility that a D.C. supply will require elaborate and expensive smoothing devices, and other difficulties are sometimes encountered, particularly if the positive pole happens to be earthed. Accumulators, on the other hand, require a certain amount of attention; in the lack of it their life is not likely to be long. On balance, however, we are inclined to recommend accumulators to those having D.C. mains.

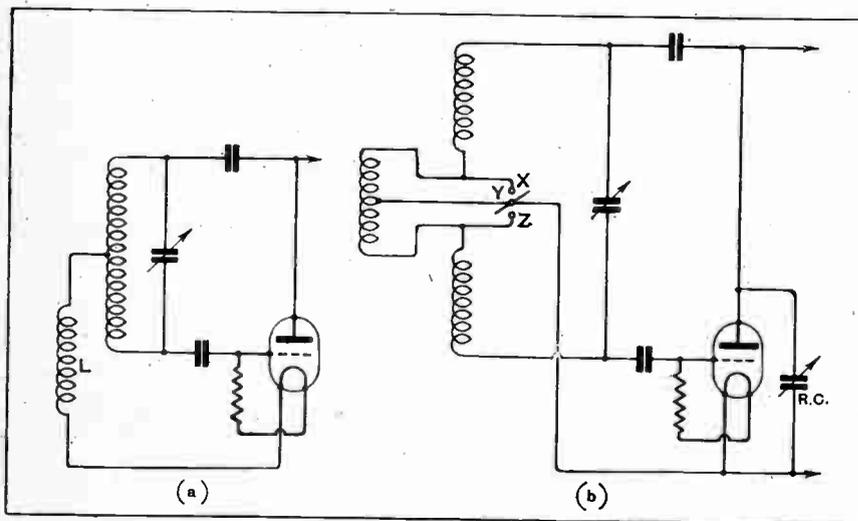


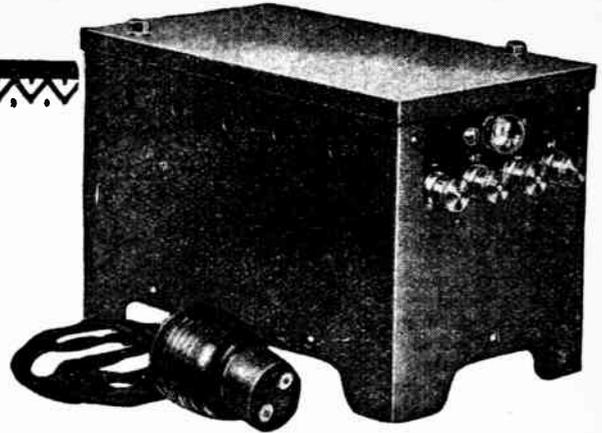
Fig. 2.—Diagram (a) shows why a single-pole break switch cannot be used in a throttle Hartley circuit. In diagram (b) are given the connections of a special switch having fixed contacts X, Z, which are bridged by a moving blade Y.

centre point of whatever inductance may be inserted, and this combined operation cannot properly be carried out by means of a single-pole break switch. If this is used, a careful consideration of the diagram will show you that the coil would be connected to filament through the in-

for the fact that a heavy current cannot be drawn from them effectively. A similar state of affairs exists with regard to the "mass" type of L.T. cell, which is used to supply comparatively small filament currents.

Although these plates are not suitable

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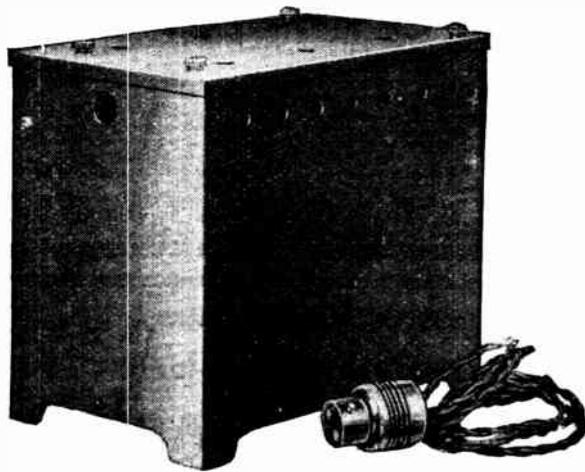
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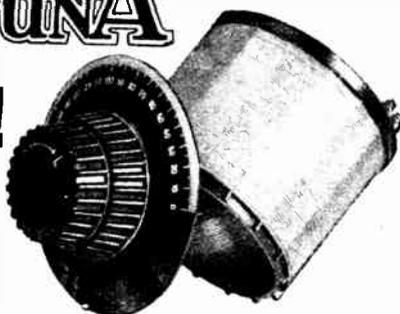
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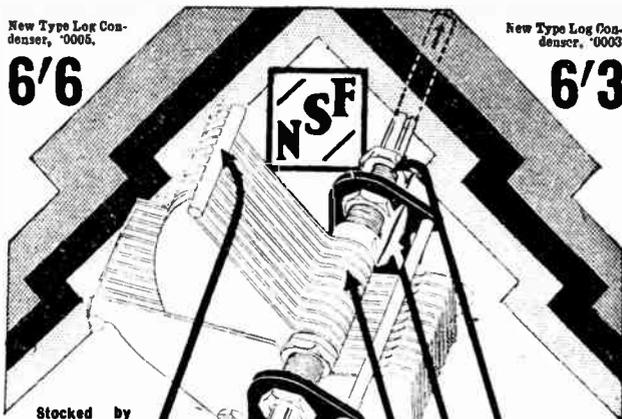
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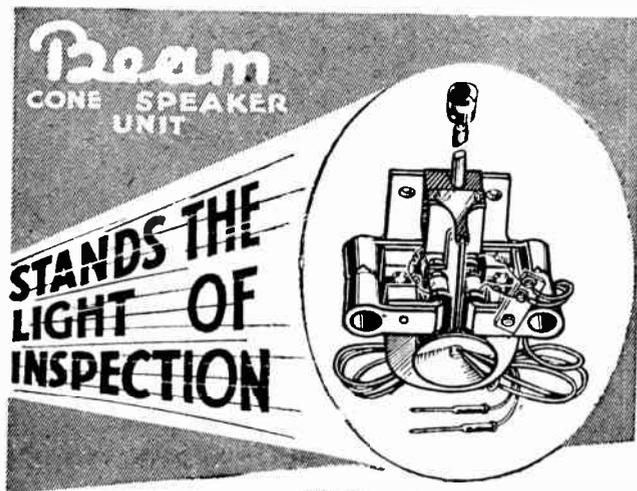
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Ask your dealer for "HARBROS" EASYFIX the patent CAPACITY REDUCING FLEX

For Loud Speaker Extensions

One dozen yards sample packet with fixing pins - - - 3/9

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HART Bros. ELECTRICAL MANUFACTURING CO., LTD.,
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B.B.C. Aerial Coil	-	-	15/-
5 X X " "	-	-	10/6
Bases	-	-	1/3
600 ohm. Resistance	-	-	1/6
ALUMINIUM Screen	-	-	9/-

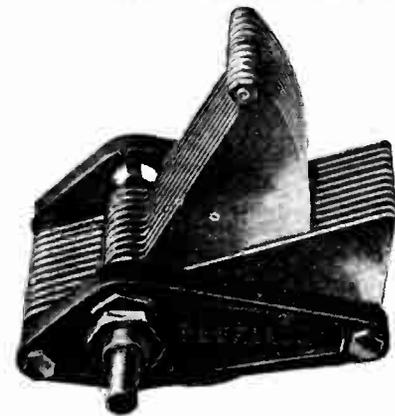
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COILS	-	-	10/- pair
" FORMER with BASE	-	-	2/3 each
" Tube Paxolin $3 \times 3\frac{1}{2}$	-	-	1/2
PANEL $14 \times 7 \times \frac{3}{16}$	-	-	6/-
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ON and OFF Switch with Terminals	-	-	1/-

HEAVY DUTY H.F. CHOKE for Battery Eliminator	-	10/6
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WRIGHT & WEAIRE, LTD.
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Phone TOTTENHAM 3847-3848.

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Are you a short-wave "fan"? If not, try building your own set and be sure you incorporate a "Peerless" Junior Condenser, S.L.F. type, which gives high maximum and low minimum capacity with true S.L.F. readings throughout the 180 degrees scale

.0002, .0003, .0005, 5/6 each.
4" plain dials, 2/- each.

SPECIALLY SUITED FOR SHORT-WAVE WORK

Send for New Illustrated Catalogue.

THE BEDFORD ELECTRICAL & RADIO CO. LTD.
22, CAMPBELL ROAD, BEDFORD.

Scottish Office: 113, St. Vincent Street, GLASGOW, C.2.



DX

You want a well-made Transformer at a reasonable price, that gives you really first-class performance. You want a D.X. Transformer.

It is laboratory designed, it is wound on our own special machinery and carefully and soundly finished.

Note: The secondary is in two parts, one on either side of the primary.

We invite you to inspect one and to listen to one. You will then agree that for value the D.X. Transformer is unequalled.

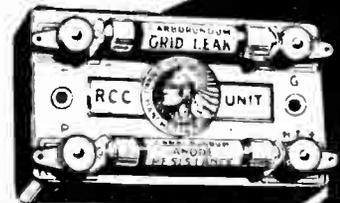
May we send you also particulars of the famous D.X. Standard and short wave coils and the famous D.X. circuit?

D.X. COILS LTD., LONDON, E. 8.

THE CARBORUNDUM R.C.C. UNIT

The Carborundum R.C.C. Unit gives remarkably pure reproduction when used in the recently developed popular circuits using R.C. Coupling. Send for full details of this wonderful R.C.C. Unit which is now recognised as the only perfect form of R.C. Coupling.

REDUCED
TO
7/6



THE CARBORUNDUM CO. LTD.
MANCHESTER.

FINEST QUALITY

BRITKAM-EBONITE

SPECIAL RUBBER SHEET
for Moving Coil Loud speaker Construction

12" x 12" - 1/8
14" x 14" - 2/2
per piece, post paid.

Panels cut any size and thickness. Matt or polished surface. Guaranteed against leakage.

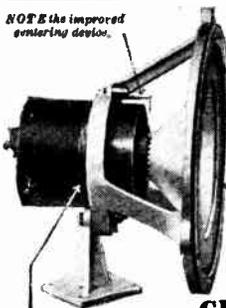
Sheets Rods & Tubes

Pliable and elastic yet not too thin. Unlike the thin grades which readily perish. Its roughened surface makes it strongly adhere to diaphragm and ring.

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Newgate St., London, E.C.1.

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NOTE the improved centering device.



IMPROVED COIL DRIVEN LOUD SPEAKER

Purchasers delighted at magnificent results! Astonishingly natural reproduction. A really well built speaker containing many improvements and refinements, e.g., the improved centering device and screw adjustment of pot magnet which makes assembly extremely simple.

Supplied with all parts ready to assemble, including moving coil, cone, and 2 ft. Baffle Board. Long or short stand as required.

Demonstrations daily after 4 p.m.
Full Particulars from the manufacturer:-

CUTTERS & TOOLS Ltd. Send for List
43/45, Fernside Place, LIVERPOOL. Post Free.

NOTE screw adjustment of pot in relation to moving coil.

Phone: Rows 2682, Grams: - Curool, Liverpool.

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HYDRA the CONDENSER for all Mains Units

HYDRA was the first commercial condenser to be sold under guarantee of a test at 500 volts. It is still the most popular condenser that manufacturers of Mains Units use exclusively in the smoothing circuit. To amateur constructors of Mains Units Hydra Condensers make all the difference between success and failure—ensuring trouble-free Mains supply for all time.

PRICES:
2 mfd. - 4/- 1 mfd. - 3/-
Tested at 500 volts A.C.
Work voltage 240 A.C. at 50 M.A.

Do not accept a silver grey condenser with out the Hydra label. Others are imitations and we are not responsible, in case of breakdown.

Of all radio dealers. In case of difficulty, write

LOUIS HOLZMAN
34 Kingsway, LONDON, W.C.2.

LOEWE RADIO

CONE LOUD-SPEAKERS

Loewe Radio Cone Loud-speakers will give you real music. All harsh resonance is lacking and for purity of reproduction and clarity of tone they are unexcelled. Mabogany finish. Silk front. Made in two types.



FOR THE HOME. Type EB 71. 13" x 13" x 5 1/2". Net weight 5 1/2 lbs. (As illustrated.) Price 9/6.
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Ask your dealer for further particulars or write

THE LOEWE RADIO COMPANY LIMITED,
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LOEWE RADIO

"The Wireless World"

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32-page BOOKLET. By W. JAMES

This booklet contains full constructional details for a remarkably efficient "Two-Control" Receiver, for long or short waves. The "Everyman Four" is very sensitive, and has a high degree of selectivity. The set is easily built and very simple in operation.

Price 1/2 post free.

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Dorset House, Tudor Street, London, E.C.4.

W.W.60

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By W. James.

Price **9/-**
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By Post 9/6.

A book that deals very thoroughly with the design and operation of small power apparatus.

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Dorset House, Tudor Street, London, E.C.4

W.W.9

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

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THE CHARGE FOR ADVERTISEMENTS in these columns is:

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Name and address must be counted.

SERIES DISCOUNTS are allowed to Trade Advertisers as follows on orders for consecutive insertions, provided a contract is placed in advance, and in the absence of fresh instructions the entire "copy" is repeated from the previous issue: 18 consecutive insertions 5%; 26 consecutive, 10%; 52 consecutive, 15%.

ADVERTISEMENTS for these columns are accepted up to **FIRST POST on THURSDAY MORNING** (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tudor Street, London, E.C.4, or on **WEDNESDAY MORNING** at the Branch Offices, 19, Herford Street, Coventry; Guildhall Buildings, Navigation Street, Birmingham; 280, Deansgate, Manchester.

Advertisements that arrive too late for a particular issue will automatically be inserted in the following issue unless accompanied by instructions to the contrary. All advertisements in this section must be strictly prepaid.

Postal Orders and Cheques sent in payment for advertisements should be made payable to **LIFFE & SONS Ltd.** and crossed **& Co. Treasury Notes** being untraceable if lost in transit, should not be sent as remittances.

All letters relating to advertisements should quote the number which is printed at the end of each advertisement, and the date of the issue in which it appeared.

The proprietors are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

NUMBERED ADDRESSES.

For the convenience of private advertisers, letters may be addressed to numbers at "The Wireless World" Office. When this is desired, the sum of 6d. to defray the cost of registration and to cover postage on replies must be added to the advertisement charge, which must include the words Box 000, c/o "The Wireless World." Only the number will appear in the advertisement. All replies should be addressed No. 000, c/o "The Wireless World," Dorset House, Tudor Street, London, E.C.4. Readers who reply to Box No. advertisements are warned against sending remittance through the post except in registered envelopes; in all such cases the use of the Deposit System is recommended, and the envelope should be clearly marked "Deposit Department."

DEPOSIT SYSTEM.

Readers who hesitate to send money to unknown persons may deal in perfect safety by availing themselves of our Deposit System. If the money be deposited with "The Wireless World," both parties are advised of its receipt.

The time allowed for decision is three days, during which time, if the buyer decides not to retain the goods, they must be returned to the sender. If a sale is effected we remit the amount to the seller, but, if not, we return the amount to the depositor. Carriage is paid by the buyer, but in the event of no sale, and subject to there being no client arrangement between buyer and seller, each pays carriage one way. The seller takes the risk of loss or damage in transit, for which we take no responsibility. For all transactions up to £10, a deposit fee of 1/- is charged; on transactions over £10 and under £50, the fee is 2/6; over £50, 5/-. All deposit matters are dealt with at Dorset House, Tudor Street, London, E.C.4, and cheques and money orders should be made payable to Liffe & Sons Limited.

THE SALE OF HOME-CONSTRUCTED UNLICENSED APPARATUS.

A Service to our Readers.

We have made an arrangement with the Patentees whereby readers who wish to dispose of a home-constructed receiver not licensed under the patents made use of, can license the set by means of the Deposit System referred to above.

The person desiring to sell, in sending us particulars for his advertisement, will in every case make use of a Box No., and should add to the price which he requires the amount of royalty customarily paid by manufacturers.

If the purchaser is satisfied with his purchase, the sum realised will be forwarded to the seller, less the amount due in respect of royalties, which amount will be paid by "The Wireless World" to the owners of the patents concerned, and a certificate will be handed on to the purchaser of the set.

SPECIAL NOTE.

Readers who reply to advertisements and receive no answer to their enquiries are requested to regard the silence as an indication that the goods advertised have already been disposed of. Advertisers often receive so many enquiries that it is quite impossible to reply to each one by post.

QUALITONE
PRODUCTS

ALL WIRELESS WORLD COILS.

MEGAVOX per set 28/-

PENTODE TW " " 7/-

NEW COSSOR B.B.C. 10/6

5XX 12/6

Write for latest lists.

B & J. Wireless Co.

2, Athelstane Mews, N.4. Mountview 1095.



HOW "CONSTANT POWER PRESSURE" MAKES AMAZING IMPROVEMENT IN RECEPTION

Ask any Standard Wet H.F. Battery user. He will tell you the purity of tone and complete absence of background noise is astonishing. Yet the explanation is simple. The flow of current from this highly efficient battery is absolutely steady, smooth and uniform. Hours of daily service for months on end does not show any violent variation in voltage. The secret is—it recharges itself overnight. All that is necessary to maintain the voltage is replenishment of the elements at long intervals, after which little or no attention is needed.

GET YOUR COPY OF THIS FREE BOOK

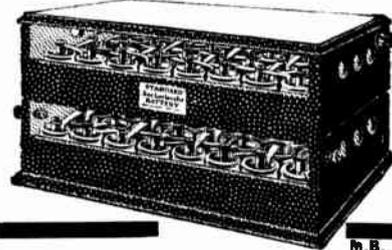
Take the first step by sending for FREE booklet describing every detail for installing and maintaining this super-efficient and money-saving battery.

8/1 96-volt "Unibloc" Cabinet completely assembled ready for despatch, as illustrated, 8/1 down and 5 DOWN monthly payments of 8/1. No refs. No deposit. Cash £2.6.5. Halford's Stores, Curry's Stores and all Radio dealers can supply on exactly the same cash or deferred terms as we do.

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SAC BÉLANCHÉ
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Head Offices, Showrooms and Warehouse:
184-188, Shaftesbury Avenue, London, W.C.2
(Nr. New Oxford St. End)



IMPORTANT NOTICE.

Owing to the Christmas Holidays, the issue of "THE WIRELESS WORLD" for December 10th must be closed for press earlier than usual.

The **MISCELLANEOUS ADVERTISEMENTS** for insertion in that issue can be accepted up to **FIRST POST, WEDNESDAY, DECEMBER 12th.**

RECEIVERS FOR SALE.

YOUR New Set or Your Repairs.—Consult F. D. Armitage, 12, St. Domingo Grove, Everton, Liverpool 1922

ALEXANDER BLACK, The Wireless Doctor, specialises in quiet reproduction. Details under Miscellaneous. [9748]

SECOND-HAND Receivers, 1-8 valves, perfect; cheap; state requirements.—Coutts, Engineers, Horley. [1424]

SCOTT SESSIONS for Megavox 3 and Latest Circuits; read advertisement under Miscellaneous column. [1726]

GLOPHONE Cabinet 3-valve Set, brand new; £17; can be heard evenings; offers.—42, Eastwood Rd., South Woodford. [1843]

SUPERIET, 10 valves, brings in all stations. British and foreign, coil drive loud speaker, mounted in baffle, run off accumulator 1/2 amp., complete new Ekide accumulators, H.T. and L.T. frame aerial, and numerous accessories, magnificent set; honestly worth £60, price £22/10; Manchester district.—Box 8899, c/o The Wireless World. [1933]

McMICHAEL, Super Screened 4-valve Portable Receiver, quite new, and in perfect condition; cost 35 guineas, will accept £30.—Write BM/BB6B, London, W.C.1. [2000]

MONOTUNE THREE, the 40 station receiver by Allinson, complete constructional envelope and price list of parts; 1/2; circular free; hundreds of dealers and users say the best three.—Below.

SCREEN Grid Stage for the Monotune, complete kit of parts, cabinet and panel, with plans and instructions; 67/6.—A. F. Oakley, 43, Carleton Rd., London, N.7. [1950]

EVERYMAN Four, built throughout with high class components, complete with valves and H.T. batteries, and contained in solid mahogany cabinet; £12; N. London district.—Box 8890, c/o The Wireless World. [1854]

READ and MORRIS, Ltd., for mains sets and components, the mains pioneers in 1924; 28 London hospitals are equipped with Read and Morris mains set, using no batteries; some of these sets have not even required their doors unlocking for over two years—just a switch on the wall used, nothing else touched. Single sets supply over 800 pairs phones and loud-speakers. Abroad one of our mains sets functions in a government hospital 600 miles from the nearest broadcasting station.

READ and MORRIS, Ltd.—2-valve set for D.C. mains from £10; A.C. sets from £15.

READ and MORRIS, Ltd.—H.T. eliminators for D.C. mains, £4; for A.C. mains, £6/10; eliminator transformers, from £15/-; full wave rectifying valves, 10/-. [1854]

READ and MORRIS, Ltd.—Why use accumulators if A.C. mains are available? The Longton L.T. unit is a complete substitute at negligible cost, always ready, valve rectifier, no batteries, gives 1.2 amps. at 2, 4, or 6 volts, and operates any set; new price, £6/15.

READ and MORRIS, Ltd., for electrolytic condensers; we use them, have used them for 3 years, liquid and dry; we test them all, but find Longton the best, capacity approximately 2,000 M.F., non-liquid; price 12/6, as used in the famous L.T. unit.

READ and MORRIS, Ltd., for moving coil loud speakers; delivery from stock; also mains-operated receivers and amplifiers for same. Demonstrations continually, service always.

READ and MORRIS, Ltd., undertake the design and construction of any type of radio apparatus. We make for the individual and guarantee results. It will pay you well to consult us before buying elsewhere.

READ and MORRIS, Ltd., have second-hand sets, best makes only, at junk prices; Elwell Aristophone, type 57, 3-valve, £8; Burndopt Ultra IV, with Mark IV tuner, £10, original price £54.

READ and MORRIS, Ltd., 31, Eastcastle St. facing back of Waring and Gillow's, Oxford St., [1973]

Receivers for Sale.—Contd.

THE RECEPTE Co. were the First Firm to Specialise in Designing and Building Receivers to suit customers' own particular requirements, and their policy has met with every success; write for quotation, low prices, and quick delivery; satisfaction guaranteed.

THE RECEPTE Co. also Make a Range of Standard Receivers, among which is the Receptite III, a 3-valve set, screen grid H.F., anode rectifier, resistance coupled to pentode; price £8/12/6; delivery from stock.

THE RECEPTE Co., 1, The Mall, Southgate, N.14. [1906]

YOUR Receiver will be all the better for fitting a Volume Control (Clarostat); 8/6, post free, at all dealers.—See: Claude Lyons, Ltd., displayed advertisement. [2009]

FOR Sale, S.T.100, in cabinet, sloping panel, 2 drawers underneath and Amplion speaker A.R.19, complete; £5.—Cole, 249, Seven Sisters Rd., N.4. [2014]

5-VALVE R.S.V.P. portable, with new H.T. batteries and super power valve, condition as new; £12/10.—Box 8954, c/o *The Wireless World*. [1985]

ALL-BRITISH Six, factory made, in perfect condition, wonderful tone and range, including H.T. batteries, L.T. accumulator, valves, long wave coils, and loud-speaker, cost over £50, price £30, or near offer; Emerald wavemeter and interrupter, 200, 600 meters, as new and guaranteed, £7; Townsend wavemeter, full range, and chart, just been reconditioned by makers, bargain, £4; Gambrell wavemeter, with coils and charts for 5 to 600 metres, as new, £2/5; Magnavox moving coil loud-speaker, new, 6-volt type, £6; rotary transformer, new, 240v., D.C., to 15v., 9 amp., £6, bargain.—121, Holland Rd., East Ham, E.6. [2075]

SOLODYNE, 5 valves, in finest quality mahogany cabinet, best components, Lewcos coils, both ranges; cost over £30, accept £16 for quick sale.—Bridge, Moor Lane, Bramhall, Cheshire. [2064]

BARGAIN—Halcyon portable, almost new; cost £34/13, sacrifice, £26/10; demonstrated anywhere.—G. Moss, 19, Anson Rd., N.W.2. [2055]

EVERYMAN Four, Cydon condensers, 3 D.E.5B's, 3 P.M.256 (2 brand new), cabinet by Broadwood, Amplion Radiolux, Ecco eliminator, 250 volts D.C., 1 6-volt 120 amp. Fuller's, 1 6-volt 80 amp. Fuller's; £15, or separate, oners.—Kenneth Simpson, Forres, Orley Farm Rd., Harrow. [2040]

EVERYMAN Four, complete with batteries, speaker, gramophone pick-up, plug-in coils, in figured oak cabinet, 3ft. long 3ft. high; can be heard any time; £22, bargain.—121, Lee Rd., Blackheath, London, S.E.3. [2034]

EVERYMAN Four, complete with long and short wave aerial grid and H.F. transformer coils, Ferranti A.F.5, choke filter output, potentiometer, grids, h.a. to detector valve, set of new 2-volt valves, and Ferranti loud-speaker, with 120-volt H.T. accumulator with A.C. trickle charger, small Exide 2-volt L.T. accumulator with A.C. trickle charger for 2-, 4-, or 6-volt accumulators; the lot complete for £24, or near offer, or would separate.—Box 8992, c/o *The Wireless World*. [2091]

5/- Down, balance to suit yourself.—Geophone, Mullard, Marconiophone, Cossor.—A.E.S. Co., 35, Friars Stile Rd., Richmond, London. [2023]

WIRELESS is a Fascinating Subject, but makes heavy demands upon the purses of its devotees. For one who is determined to keep abreast of the times, there are always new components to be bought, and sets and loud-speakers to be superseded.

AT the Same Time, the would-be buyer is often deterred from buying because he knows that there will be still one more piece of apparatus left on his hands, to add to those already in the junk box.

WE Have Opportunities of disposing of semi obsolete apparatus to those who are not fortunate enough to be able to afford the latest type, and will take such apparatus or components, providing they are in saleable condition, in part exchange for any new set, loud-speaker or component required.

ALL We Ask is that You should Send Along a List of Your Old Apparatus, together with your own requirements, or, better still, send the apparatus to us to inspect, when we will make you a fair offer.

IF You Approve of this You can Send Your Remittance for the balance, and we will forward the apparatus required; if you have sent your old apparatus and you do not approve of our offer, we will return carriage paid.

THE Principal of this Firm, who has been a professional wireless engineer since 1910, and has been manager for the Sterling Telephone Co., radio expert to the General Electric Co., and Chairman of the Technical Committee of the National Association of Radio Manufacturers, will willingly give advice to those who are desirous of purchasing apparatus; we are entirely unbiased, and will recommend the best apparatus for your particular purpose; you save money by having genuine expert advice.

DON'T Forget We Will Take Your Old Receiver or Components in Part Exchange.

WE Will Also Build Any Sets to Specification (Marconi Royalties payable), and instal anywhere in the British Isles; sets modernised; send for estimate.—Scientific Development Co., 51, Fishergate, Preston, Tel.: 1364. [2026]

HELLESEN DRY BATTERIES



A SECRET.

SAW a fellow the other day thrashing his Baby—seven up Newlands Corner in the teeth of a gale. Four up. Some people habitually overload everything, from their incomes to their H.T. Batteries.

No H.T. Battery, not even a Hellesen, will give long service when grossly overloaded.

The secret of obtaining a long life of perfect reception from a H.T. Battery is, firstly, to get a Hellesen Battery and, secondly, to see that you get a Hellesen of a capacity commensurate with the size and power of your set. If in doubt, get the larger size. It is a wrinkle that must have saved me pounds.



1928 Reduced Prices.

Standard Capacity.	
"Wiray" 9 volt Grid Bias Type	2/-
"Wirin" 60 volt H.T. Type	10/6
"Wirup" 99 volt H.T. Type	18/-
"Wisol" 108 volt H.T. Type	20/-
Treble Capacity.	
"Kolin" 60 volt H.T. Type	19/-
"Kolup" 99 volt H.T. Type	32/6

Your Dealer Stocks them.

SUPREME for 27 years.



A. H. HUNT LTD., CROYDON, SURREY.

Receivers for Sale.—Contd.

KILO-MAG Four—Screening boxes, 23/6; 6 coils, mounted, 30/-; decoupling resistances, 1/- each; complete set of parts, including valves, cabinet, etc., £15, as specified.—Below.

MEGAVOX—Aerial coils, set 22/6; complete set of parts, with valves, etc., £15.—Below.

EUROPA Three—Coils, full set 30/-; screens, 6/-; full set of parts, with valves, etc., £10/10.—Stott, 63, Syke Rd., Rochdale. [2078]

GECOPHONE 4-valve Set, as new, with valves, £11.

BURNDIPT 4-valve Set, with valves and coils, £10; another, last season's model, as new, £12; all in good order and carriage paid.—James Scott and Co., Radio Engineers, Dunfermline. [2027]

DEFERRED Terms; Marconiophone wireless apparatus supplied, £1 down, balance over 12 months; any model receiver, battery or mains drive, moving coil loud-speakers, H.T. mains units, etc., installed free within 30 miles of London; state your requirements.—Marconiophone Service Depot, 9, High St., Ealing, London, W.5. [1803]

MARCONIPHONE Wireless Receivers on Deferred terms, £1 down, balance over 12 months; installed free within 30 miles of London; state your requirements.—Marconiophone Service Depot, 9, High St., Ealing, London, W.5. [1802]

SIMMONDS BROS.—Receivers constructed to any published design or to your individual requirements, guaranteed, workmanship, repairs, reconstructions, overhauls, modernisations.—Shireland Rd., Smethwick. [9691]

BATTERIES.

WET H.T. Batteries—Parts per dozen: Jars, 2 1/2 x 1 1/2 square, 1/3; zincs, 1 1/2; sacs, 1/2 dozen; dozen cells (18 volts), complete with bands and electrolyte, 4.3, post 9d.; high efficiency, long life, self-charging, upkeep small! send 6d. for sample unit; illustrated booklet free; carriage free orders 10/-; write for free list wireless bargains; trade supplied.—W. Taylor, 57, Studley Rd., Stockwell, London. [2039]

C.D.E.S. Accumulator Charging Service—Collection and delivery in 5 mile radius of Croydon; send for particulars to Croydon and District Electric Service, Dept. W., 98, Cherry Orchard Rd., Croydon. [1009]

WET H.T. Replacements—Sacs (capped or uncapped), highest grade, No. 1, 10d per doz.; No. 2, 1/9 per doz.—See below

ZINCS—Best quality (wired), No. 1, 8d. per doz.; No. 2, 9d. per doz.; orders valued 5/- carriage paid, otherwise 6d. for postage.—British Battery Co., Clarendon Rd., Watford, Herts. [2028]

BATTERIES Direct, a saving of 40%—60-volt, 6/3; 108-volt, 10/11; postage 9d. and 1/- respectively; British throughout and fully guaranteed; super and treble capacity also stocked.—The Johnson Engineering Co., Dept. W.W., 88, Great Portland St., W.1. [1074]

STORAGE Batteries, storage batteries. Now's the time; just purchased, leading makers, brand new; 14 cell battery, 40-50 actual amp. hour capacity, half price to clear, £10; 27 cell battery, 40-50 amp. hour, £19; 54 cell battery, 40-50 amp. hour, £37; glass boxes with hydrometer and splash plates; all guaranteed.—T. W. Thompson and Co., Surplus Depot, 1, South St., Greenwich, S.E.10 (Tel.: Greenwich 1259), also 17, Strutton Ground, Westminster, S.W. (Tel.: Franklin 6355). [1855]

WHY Continue to use an H.T. Battery? If you are on D.C. or A.C., why not use them? Send for our pamphlet "Power", which will be sent free, together with other useful publications.—Claude Lyons, Ltd., 76, Old Hall St., Liverpool. [2010]

6 W.H. 10 Volt Units, charged; 18/-.—Silver, 33, Springhill, E.5. [2077]

BATTERIES—This week's special offer: Treble capacity H.T. 60-volt batteries, 1,000 hours' service, 12/6 each, carriage paid; also 36-volt grid bias batteries, 4/6 each; 66-volt double capacity, 7/6 each; 115-volt double capacity, 12/- each; all batteries are guaranteed British throughout and are obtainable only from Ford Battery Works, New Rd., Ponders' End, Enfield. [1951]

CHARGERS AND ELIMINATORS.

RUNBAKEN H.T. and L.T. Chargers for A.C. and D.C., you may try 14 days.—Ardwick, Manchester, and 39, Victoria St., London, S.W.1. [2022]

TANTALUM and Liumion for A.C. Rectifiers; make up your own inexpensive chargers; also prints for H.T. and L.T. Liumion electrodes fitted with terminals 2-3 amps. and 5-8 amps.—Blackwell's Metalurgical Works, Ltd., Liverpool. [9503]

ELIMINATOR Kit, comprising mains transformer, full wave output, 200 volts, 300 milliamps, 32 henry choke, 2 4 mid. condensers, 500 volts, test, variable potential divider, valve holder, 0/50 milli-ammeter and base board; price £3; other outputs at slight extra cost; state mains voltage when ordering.—H. Goodwin, Woodcock Hill, Elstree. [2027]

TRANSFORMERS and Chokes for H.T. and L.T. Battery Eliminators, transformers and chokes for all wireless purposes wound to any specification, transmitting transformers supplied; enquiries invited.—Chester Bros., 244, Dalston Lane, Hackney, London, E.8. [1952]

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Chargers and Eliminators.—Contd.

POTENTIAL Dividers, Always, absolutely guaranteed efficient, 5 tappings, all values from 1,000 ohms to 500,000 ohms; price 2/3.—Abingdon Wireless Supplies, 45, Stert St., Abingdon. [1929]

CHARGERS for L.T. Accumulators, foolproof; 10/- each complete; guaranteed output 1 to 4 amps, cost 1/- to 4/- per year from D.C. mains; send cash to-day, only few left.—Robin Hood Electrical Co., Primrose Lane, Birmingham. [1898]

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ELECTROLYTIC Condensers.—For these go to the specialists.—Read and Morris, Ltd., 31, Eastcheap St., London, W.1. [1974]

H.T. Eliminator, D.C., 230 volts mains, for 3 or 4 valves; advertiser now on A.C.; first remittance £1/10 secure.—Norris, Rose Dene, Rose Lane, Messer Hill, Liverpool. [1972]

ETHOPHONE H.T. Eliminator, for 200-250 volts; cost £12/12, accept best offer.—Dr. Roper Sanders, Warden, Western Av., W.12. [1968]

MARCONIPHONE A.C. Eliminator, new; £5.—Rose, 73, Woodgrange Rd., Forest Gate, E.7. [1963]

EXTREME Accumulator W.J.100, with case, cost £3/5, as good as new, owner buying eliminator; £2, or nearest offer.—D. J. Rushton, 1,561, Stratford Rd., Birmingham. [1961]

MARCONI All Power Unit, A.O.1, 200-250 volts, with U5 valve; what offers.—Payton, Silhillhall Rd., Solihull, War. [1959]

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BENJAMIN Majestic Eliminator, 200-250 volts, 50-60 cycles A.C. output 45ma. at 180 volts, nearly new; £5, or near offer.—Box 8985, c/o The Wireless World. [2069]

PHILLIPS H.T. Eliminator (220 volts 50 cycle, A.C. mains), gives 120 volts at 20 milliamperes, 2 variable tappings, perfect condition; cost £6/10, accept £5.—Galvin, 43, Queen's Rd., Wimbledon, S.W.19. [2057]

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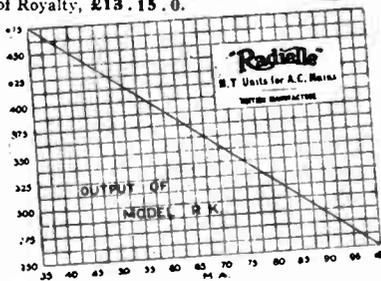
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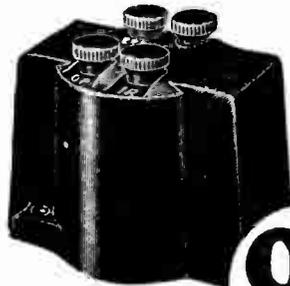
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Loud-speakers.—Contd.

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0233]

PENTODE.—Star Engineering, Didsbury, Manchester, are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1765. [1336]

EXCEPTIONAL Offer.—"Wireless World" moving coil loud speaker parts (Haynes model); owing to alterations in design all stocks of the above are being cleared out at bargain prices; write for list.—Pearson, 80a, Newland Av., Hull. [1776]

CELESTION C.12, mahogany: £5.—Clarke, 22, Priory Av., Hastings. [1863]

MAKE Your Own.—Cone or horn unit, 10/-; cone speakers, 25/-; cabinet type, 35/-; satisfaction guaranteed.—John Henry, 14, Church Rd., London, N.1. [1970]

CELESTION Speaker, C12, mahogany, perfect condition, as new, used 5 months only; £5/15.—Hughes, Fron Ddg, Mold, N. Wales. [2005]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0234]

SELHURST M.C. Speaker, 230v. D.C. mains, complete, working perfectly, 47/6.—D. R. White, 35, Elm Rd., N. Birkenhead. [1988]

TWO Amplion A.R.19 Loud-speakers; £2 each; perfect condition.—56, The Mall, Southampton, N.14. [1978]

WRITE for Appointment to Hear My New Loud-speaker, which is the only one in existence that reproduces naturally; no resonance whatever; one type only, one price only.—Colato, 33, Edgware Rd., W. [0261]

PERMANENT Magnet for M.C. Speaker, solid steel, high flux density, specially made for demonstrations, has 5/64 air gap; cost £6, take £4, no offers, genuine bargain, guaranteed.—G. D. Rouse, 37, Withens Av., Sheffield. [1960]

5/- Down, balance to suit yourself.—Celestion, Amplion loud-speakers.—A.E.S. Co., 35, Friars Stile Rd., Richmond, London. [2021]

DEFERRED Terms: Marconiphone moving coil loud-speakers, any model; £1 down, balance over 12 months.—Marconiphone Service Depot, 9, High St., Ealing, London, W.5. [1804]

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VORTEXION Moving Coil Speaker Parts, any voltage, pots supplied, wound or unwound, guaranteed.—Kirby (Wimbledon), Ltd., 72, Merton Rd., Wimbledon, S.W. Tel.: Wimbledon 2814. [8986]

YOUR Old Loud-speaker Taken in Part Payment for the Latest type, see our advert, under column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0227]

BAKER'S SELHURST RADIO Can Now Supply Moving Coils of 2,500 turns of 48-gauge Wire, to suit Pentode valves. [0236]

AMATEUR has for Disposal Tuning Moving-Coil Speaker (new), 230 volts, with spare coil, removing to house without electric light; also Blue Spot adjustable unit, brand new, 19/-.—BM/PH34, London, W.C.1. [2082]

MAGNAVOX, permanent magnet type, new, in oak cabinet; cost £5/5, accept £3/13/6.—White, 91, Mostyn Rd., S.W.19. [2058]

COLNE Parchment, used in best speakers, especially indicated for quality reproduction; 1/3. post free.—Colato, 33, Edgware Rd., W.2. [2047]

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QUARTZ Lenses; 8d., plus postage.—Apply Smith, Bryn Rodyn, Colwyn Bay. [2004]

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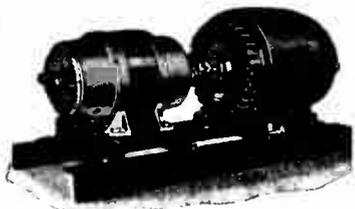
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ROTARY Transformer (Newton), input 200v., D.C. Zenith power choke, 30h.; both as new.—Details from F. Brockbank, 51, Pallatine Rd., Withington, Manchester. [2031]

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VALVES.

PENTODE.—Star Engineering, Didsbury, Manchester are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1337]

ANELOY (410) S. Grid, 10/-; H.F., 7/-; power, 8/6; practically new; Lewcos binocular coils (Reinartz and S.S.), 4/6 each; wanted, horn speaker.—201, Newport Rd., Cardiff. [2025]

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HENRY for Components.—Return service everything for radio; write for your needs; special offers: Briton variable condensers, latest type 5/-, 2 for 9/-; rheostats 1/6, 2 for 2/9, 3, 4/-; pocket voltmeters, 12 months' guarantee, 6/-; dial control condensers, single 15/-, dual 30/-, Hilde 45/-.—John Henry, 14, Church Rd., London N.1. [1971]

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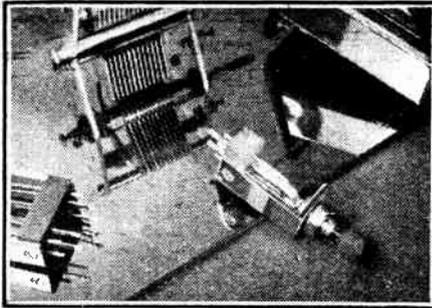
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COSSOR New Melody Coils, Radiax, the coil of incomparable excellence; B.B.C., 15/- pair; long wave, 17/6 pair; from stock.—A. E. Oakley, 43, Carleton Rd., London, N.7. [1997]

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FERRANTI A.F.3, 10/-; O.P.4C, 12/6; Marconi Ideal, 4/- to 1. 7/6; Goodman's moving coil speaker, 6v., 40/-; Sears, 627, Barking Rd., Plaistow, E.13. [2016]

HIGHLY Sensitive Microphones, watch shape, will pick up whispered words from a distance, for deaf aids, Dictaphones, dictaphones, experimental work; 5/- each, guaranteed new. Fredk. Adolph, 34, Fitzroy St., London, W.1.

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MEINDE 2-valve Crystal Reflex Receiver, with valves, £5; B.T.H. cone loud-speaker, 55/-; several condensers, transformers, tools, oddments, etc.; cash needed.—B.M./V.S.F. London, W.C.1. [2006]

EIGHT Lorentz Type Short Wave Coils, 10/6; G.F.C. .0002 condenser, 8/6; G.E.C. variometer, 3/6; Gambrell coils, A, B1, C, E, G, lot 15/6; neutrovernier, 3/6; 3 Lissen 6-pin bases, 4/-; wanted, A.F.5 Ferranti.—B.M./V.S.F. London, W.C.1. [2005]

SIFAM Moving Coil Milliammeter, 0-20, ditto ammeter, 0-3, 15/- each; valves, D.E.5, D.E.5B, D.E.5A, D.E.H.612, D.E.I.610, 4/6 each; 2 Burndept S.M. dials, 3/- each; 2 Igranitic Patent .00025 S.L.F., 4/- each; also coil, switches, resistance and other parts for Quality Three, all perfect.—Richards, 16, Tokio Rd., Ipswich. [2001]

PARTS for Marconi Two S625 Set, also Igranitic 6-valve superhet. kit, half price; Kelvin laboratory ammeter, 8 shunts, £6/10; Tinsley reflecting galvanometer, £4; Foster pyrometer, £7; short range Wheatstone bridge, £2; all perfect, half catalogue prices; new Amplion power valves, 6v. 0.25a., cost 22/6, 4/6 each; ditto 6v., 0.09a., resistance capacity, 4/-;—Barker, 57, Sedgley Rd. West, Tipton, Staffs. [1995]

SUPERHET Kit, consisting of 1 filter, 3 intermediate transformers, Geophone; £1.—Box 8961, c/o The Wireless World. [1991]

THREE Superhet. Transformers, with filter, laboratory matched and screened; American £2; 2 Colvern worm geared .0005 condensers for above, £1 pair; 5 D.E.5B, 10/6; S.T.61B, 4/-; D.E.8 H.F., 4/-; R.S., 2/-; D.E.5, 4/-; L.S.5A, 10/-; D.E.3, 3/-; or 34/- lot; Lissen pick-up, with adapter, 8/6; Weston Navy relay moving coil, ex Government, £1; Post Office polarised relay, 10/-; Post Office sander, 7/6; superhet. kit, condensers, and all valves above, £4/5 lot; no junk.—Kneale, 46, Waterloo Rd., Ramsey, Isle of Man. [1987]

SURPLUS, transformers, coils, accumulators, resistances, grid leaks, receivers, etc.; sale or exchanges.—Moorcroft, Hathersage, Derbyshire. [1979]

LOOSE Coupler, as new, tapped primary, secondary, suit experimenter; 15/-;—Laing, 35, Tredown Rd., Sydenham, S.E.26. [1976]

MATEUR'S Surplus, new.—Ferranti A.P.5, 20/-; P.M.254, 9/6; Pyo 32H choke, carries 80 milliamps, 10/6; practically new, guaranteed perfect; P.M.254, 5/6; P.M.4, 3/6; Pye push-pull transformers, 4:1 input, 1:1 output, 10/6 each; T.C.C. 4 mfd., 3/6; Mellovox, 15/-; Manhattan horn speaker, 10/-; Amplion gramophone attachment, 7/6.—Knott, 54, Ravenscroft Av., Golders Green. [1975]

P.M.252, 8/6; Cosmos S.P.18R.R., 7/-; S.P.16R., 5/6; Lewis M.M.3 coil, 250 550, 5/6; Colvern M.M.3 long wave, 3/-; 6-pin base, 1/-; Jackson .0003 geared condenser, 4/6; all nearly new, or lot £1/12/6.—J. Grubb, 3, Brookside, Junction Rd., Romford. [1967]

BLUE Spot Loud-speaker Units, cost 21/- and 25/-, guaranteed new, sacrifice for 17/6 and 20/-; various other components for sale; stamp for list.—Wilson, 44, Douglas Rd., Handsworth, Birmingham. [2018]

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Components Etc., for Sale.—Contd.

5/- Down, balance to suit yourself.—Any new wireless component over 41s.—A.E.S. Co., 35, Friars Stile Rd., Richmond, London. [2022]

MASTER THREEF.—Set of parts, less cabinet: 30/-; first class components.—Morley, 18, Graugemill Rd., Catford. [2030]

2RC Sale.—800v. 30w. D.C. generator, coupled to 200v. 50 cycle motor, bargain, £6; 12v. 100a. accumulator, 35/-; L.S.S. specially mounted, 12 6; 3 Troadyna superhet. transformers, 30/-, cost 105/-; T.M.C. headphones, 5/-; 20, Craignish Av., Norbury, London. Phone: Streatham 4428. [2036]

MULLARD 6v., 4-electrode, 3/-; P.M.4, 5/-; 2 P.M.252, 7/-; Marconi D.E.H.410, 4/-; Burndept 0005 log, unused, 11/-; Ormond brass 00035 log, 6/6; Ormond S.M. dials, ball bearing 4/-; friction 2 6; R.L. 100,000 ohms and Luller, 4/-; 1 T.C.C., 2 Dubilier 1 mfd., 1/6; Walmel auto-choke, 5/-; Leslie, 9, Lonsdale Rd., Fallowfield, Manchester. [2029]

ELECTRIC Motors, 1/2 to 1 1/2 h.p., 110 and 220v. silent running, carbon brushes, low amperage, 10/- each; these motors are in new condition and perfect running order, the ideal motor for television; state if large or small motor required.—Below.

2IN. Spark Coils, fitted high speed trembler, complete with contacts, ebonite panel, polished teak case; these coils are in perfect working order and ready to use, 12/6 each; 1in. spark coils as above, 5/9; Morse keys, mounted on ebonite, 5/-; new double pole Dewar switches, 1/-.—Below.

MILLAMP Meter, moving coil, 0-150, high class meter, by G.P.C., 20/-; voltmeter, new, 0-15, 4/-; G.P.C. magnetic galvanometer, 7/6; hand telephone, complete with earphone and microphone, 4/6; large earphones, 1/3.—Below.

H.T. Generators, hand driven, fitted 4 powerful magnets, 80v. 10ma., 6/-; good sensitive microphones, 2/-; microphone buttons, 1/-; microphone transformers, 2/-; 1,000 ohm chokes, wound with 42 gauge silk covered wire on ebonite bobbins, 1/- each; good high note buzzers, 1/-.—Below.

ELECTRIC Motors, 1/2 to 1 1/2 h.p., 110v., ball bearing, carbon brushes, continuous rating, condition as new, 25/- each; 80 to 110v. shunt regulators, 10/-.—Below.

All above goods guaranteed, 3 days' approval from date of delivery; cash with order or c.o.d.; all letters answered; further description if required. Galvin, Binfield Heath, near Henley on Thames. [2028]

180-volt H.T. Accumulator, recharged twice only, £2 10 10m. spark coil, £2 10; petrol engine, less magneto, £2; others considered.—C. Evans, Queens, Cambridge. [1966]

PAIR Wearite E.M.4 Coils, 17/6, perfect; B.T.H. transformer, 2 1, 8/-; Amplion A.R.1114 unit, 3/-; Success super choke, 4/6; W. and G. ma. meter, 0-100, 2/6; Ormond 0.00035 S.L.F., 3/6; 1 S.M. Ormond dial, 12-1, 2/6; Lissen transformer, 3/6; polar 2-coil holders, 1/6 each; Blue Spot multidyne coil, 6/-; Edison Bell 25, 35, 50, 75, 150, 250, 6/- set; Burndept rheostats (3), 1/- each; valves, 2 A.D. super power 4-volt 6 6 each, P.M.3 5/-, P.M.4 5/6.—B.M./Z.M.V., London, W.C.1. [1981]

GOLD for Aerials.—The absolutely non-corrosive aerial is the Gold Wave; always retains its extraordinary efficiency, unsurpassed for bringing in weak signals; see report in "Wireless World," November 14th.—From all dealers, or direct from Horace Soley and Co., Ltd., 3, Jewin St., E.C.1. [2083]

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ONE Aluminum Screen Lock-Atkinson Wireless, 6/6.

ONE Aerial Core Former, 3x2 1/2, 1/-; H.F. former, 3 1/2x2 1/2, 1/-.

TWO Utility Thumb Control, 0.0005, 26/-; 0.0001 Dubilier Midget, 5/6.

ONE R.L. Choke, 1 P., type Y.D.11, 21/-; 1 Burndept H.P. choke, 3/6.

ONE Ferranti A.F.4, 17/6; 3 W.B. valve holders, 3/-.

TWO T.C.C. 2 mids, 7/8; 2 ditto, 0.05, 3/6; 1 ditto, 1 mfd., 2/10; 1 ditto, 0.0005, 1/10; 1 ditto, 0.0001, 1/10.

ONE Loewe Grid Leak, 2 meg., 2/6; Bulgin holder, 6d.

TWO Irganic Loading Coils, 8/-; 1 Peerless variator, 1/3.

ONE Utility S.P.D.T. Switch, 4/6; 1 ditto D.P.D.T., 5/-.

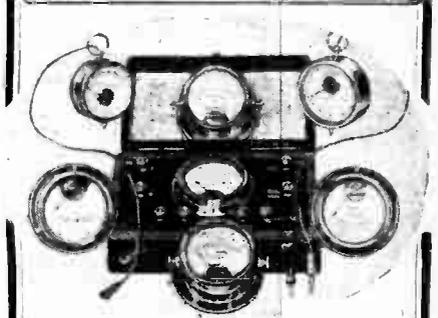
TWO Wearite 600 ohm resistances, 3/-; switch coupling rod, 1/6.

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OAK Cabinet, 21x7x9, 25/6; total £8/17/5; carriage paid.

RING or Write: Lock-Atkinson Wireless, 107, Bolsover St., W.1. Fitzroy 1223. [2087]

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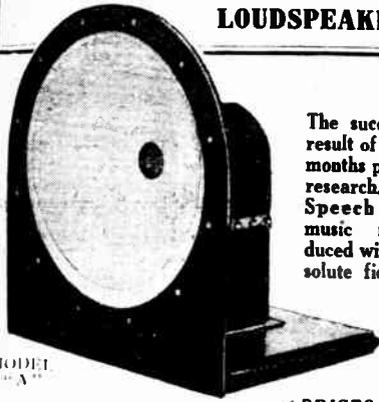
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Components, Etc., for Sale.—Contd.

COSSOR 4v. H.F. unused, 5/-; Sitam m.c. volt-meter, D.R., 0-6-120, 15/-; Marconi Ideal, 2-7-1, 12/6; Philips trickle charger, 42/6.—Box 8983, c/o *The Wireless World*. [2067]

IGRANIC K.L.1 Mains Transformer, 12/6; Marconi K.H.1 valve, 6/6; Mullard P.M.1, 3/6; all practically new and unused.—Box 8981, c/o *The Wireless World*. [2065]

VOLTMETER, hand calibrated, 0-7, 0-120, cost 9/6, 6/-; Bullphone cone speaker, bronze model, perfect, 32/6; microphone amplifier, cost 34/-, £1; S.P.18 R.C. valve, practically new, 5/-.—Dupére, Lea Rd., Harpenden. [2059]

RADIO HOUSE, HUDDERSFIELD, issues reliability wireless guide; copy sent post free.

RADIO HOUSE, HUDDERSFIELD.—Double scale voltmeter, 0/6, 0/120; 5/6.

RADIO HOUSE, HUDDERSFIELD.—For all advertised components of various makes; trade enquiries solicited.—J. H. Taylor and Co., 15, Radio House, Macaulay St., Huddersfield. [0028]

TWO Cydon Log Mid Line, 0.0005, 9/6 each; Igranic Lokvan, 0.0005, 6/6; Igranic N.C., 2/9; Igranic Patent 30 ohm, 1/6; single jack, 2/-; B.T.H. C2 speaker, 31/-; Baker's fixed magnet, £5/5 model, not assembled, £4/5; Marconi 4 to 1 transformer, 16/-; Lewcos coils, 60x 3/-, 200x 4/6; all as new.—G. A. Ryall, 182 Kennington Rd., London. [2063]

BRAND New Cossor Melody Maker Kit, carton unopened; for quick sale accept £6/18.—Armadale, Presburg Ltd., New Malden, Surrey. [2062]

COSSOR Melody Maker, assembled but unused, £7; Sterling Junior loud-speaker, 25/-.—Jas. Brown, Craigard, Cambuslang. [2042]

A GOOD Second-hand Component is **Helps Better** than a Shoddy New One; we have the following apparatus for disposal, in first class condition, and guaranteed as new, at prices ranging from half to two-thirds list prices.

MARCONI Ideal Transformers, any ratio, 15/-; Ferranti A.F.3, 16/-; Ferranti A.F.5C and O.P.3C O.P.1, 15/-; A.F.4, 12/-; R.I. multi ratio, 14/-; Brandes, 5/-; Lissen, 4/6; M.H. transformer, 8/6; Ferranti unshrouded type, 7/6; Cydon Log Mid Line condensers, 0.0005, 11/-; G.E.C. Ormrod, Igranic, etc., condensers, all 40% below list.

R.I. Varley Res. Cap. Units, 12/6; Mullard R.C.C. units, 11/6; B.T.H. Res. Cap. units and valve holder combined, 6/-; Cosmos, ditto, 5/6; Magnum, ditto, 5/6; Lissen R.C.C. unit, 3/-; Ediswan, ditto, 3/9; Carbonium, ditto, 5/-; R.I. Varley retractable tuner, 17/6; Formo double range tuner, 8/6; British General, ditto, 11/-; Watmel dual range, 9/-; Tomtina, 16/-; Etesca double range tuner, 8/-; Lewcos aerial Q coil, 10/-; Wearite, ditto, 10/-.

R.I. Varley H.F. Multi Cellular Choke, 6/-; Lissen H.F. choke, 3/6; Success, ditto, 5/-.

LISSEN L.F. Choke, 3/6; Mullard and R.I. wireless resistances, with base, 100,000 and 250,000 ohms, 3/- each; Wearite H.F. chokes, 4/9; plug in coils of all makes 40% off list prices.

LEWCOS and Colvern 6-pin Coils, split primary, split secondary, aerial, binocular, all 40% off list. 6-pin bases, 1/6; Dimic coils, 1A only, 2/9; bases, 1/6.

BRERMEY Tully Short Wave Outfit, 12 to 200 metres, 15/-; 2-way coil holders, all makes, half list price, or less.

FIXED Condensers, T.C.C. and Dubilier, almost any capacity, 40% off list; also mica condensers, 600 volt and 800 volt test for eliminators; Gambrell neutralising condensers, 3/-; Peto Scott baseboard mounting neutralising condensers, 3/-; M.H., ditto, 3/-.

LIBERTY Supersonic Kit, with 2 extra oscillators, 12 to 2,500 metres, £2/12/6; McMichael, ditto, with 2 extra Autodyno units, £3/15; switches of all types 40% off list.

ATLAS Eliminator, for 220-250 volt mains, output 150 volts, with 3 tappings, one variable for detector, also grid bias, complete with valves, operates moving coil well, cost £8/7/6, and as new, £5; Mullard eliminator, for 220 volt mains, 1928 model, with brand new D.U.2 valve, £5/5; Burndept all battery eliminator, cost £18 odd, as new, supplies H.T., L.T. and grid bias, perfect on moving coil speaker, £12; Brown gramophone pickup, 16/-; Burndept, ditto, 15/-; Igranic, ditto, 15/-; Ampilon, ditto, 20/-; Puritan (American), ditto, 10/-.

LISSEN Loud-speaker Units, 7/6; Ampilon A.R.19, as new, 50/-; Celestion £7/10 model loud-speaker, £5/5; Ampilon cone, 50/-; Brown disc speaker, oxidised silver, £4/10; Brown H.Q., just overhauled by maker, £3.

METVICK Elastic Aerial Unit, long wave; 9/-.

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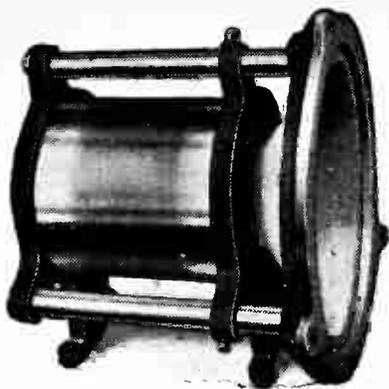
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Components, Etc. for Sale.—Contd.

YOUR Old Components Taken in Part Payment for Latest Type; see our advert. in column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [2028]

EVERY Tone of Component Supplied; post free; enormous stock.—G. Moss, 17, Kensington Park Rd., London, W.11 [2054]

L.S.5 (used 12 hours), 10/6; Brown's original A type carpiece, as new (4,000 ohm, 15/-)—Thompson, 40, St. Leonard St., Sunderland. [2043]

SILHURST Permanent Magnet Moving Coil Speaker, H.R. coil, like new, £3, or offer; Igranite regenerative short wave kit, 4 coils, 15-70 metres, £2, or offer.—4, Cobden St., Peterborough. [2056]

PHILLIPS Type 366 L.T. Heavy Duty Charger, £4; Adico H.T. charger, £2/10, both A.C., completely equipped; Exide C.X8 6v. 120 actual A.H. battery, £3; quantity American components, including valves, S.G. power and G.P. valve holders, 119A coils, 0.00035 variable condensers, Bodine loop, resistors, chokes, screens, etc., mostly Silver-Marshall, all little used, sacrifice, under half price.—4, Saville Rd., Twickenham. [2052]

BARGAINS; amateur's surplus.—Carborundum detector unit, 5/-; Sterling H.F. amplifier, including valve, 12/-; 2 D.F.A.7 valves, 10/- each; Exide 20v. H.T. accumulator (unused), 6/-; 12 0.5 megohms T.C.C. condensers, 20/- lot; Polar R.C.C. unit, 3/-; or £3 the lot; all practically new.—BM/VCK3, London, W.C.1. [2045]

MOVING Coil Baker 6-volt Pentode Coil and Spare H.R. Coil, 50/-; 1 D.F.5B, 1 Cosmos S.P.55B, 5/- each; 1 P.M.256, 7/6.—H. Auger, 105, Crystal Palace Rd., East Dulwich, S.E.22 [2041]

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EXPERIMENTER'S Surplus.—2 Climax heavy chokes, 15/- each; 2 Climax 400 ohm resistances, 1,000 ohm, 110v., 4/- each; Igranite 400 ohm potentiometer, 3/6; Polar 3-way vernier coil holder (unused), 4/6; Multicon 4 fixed condensers in one, 3/-; Weston moving coil relay, 15/-; 1sh.p. 220v. motor, perfect condition, £3 10.—Hargreaves, 19, Ennismore St., Burnley. [2086]

MEGAVOX Three for Sale; good tension; components exactly as specified, and wired up by well known firm; oak (Cameo) cabinet; deposit system if required.—Write Box 8989, in *The Wireless World*. [2088]

TWO 100,000 Wire Resistances, with bases, 4/- each; pick-up, 14/-; Amplion A.L.15 unit, 25/-; Vocoder counter, 20/-; lot of coils, wireless, etc., and accurate resistances and condensers.—Box 8991, in *The Wireless World*. [2090]

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ANY Kit, set of list of parts on deferred payment terms; send your list for prompt quotation.—A. E. Oakley, 43, Carleton Rd., London, N.7. [1998]

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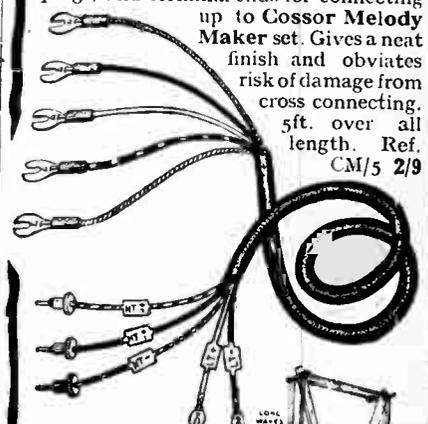
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Phone: MUSEUM 2492/3.

Miscellaneous.—Contd.

C.D.E.S. Accumulator Charging Service.—Collection and delivery in 5 mile radius of Croydon; send for particulars to Croydon and District Electric Service, Dept. X., 98, Cherry Orchard Rd., Croydon. [1010]

PENTODE.—Star Engineering, Didsbury, Manchester, are now manufacturing moving coils suitable for use with Pentode valves; send for particulars.—Phone: Didsbury 1785. [1338]

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2,000 Guaranteed 60 Dry Batteries; 5/9; guaranteed perfect.—A.E.S. Co., 35, Friars Stile Rd., Richmond, London. [2024]

LOG Labels.—Invaluable for recording stations and dial settings; 50 post free 1/2.—Craven, 14, Brook Av., Wembley. [2053]

BIRMINGHAM and District.—Charles White will cure faulty sets, modernise, install and maintain any type of set, pick-ups, eliminators, and loud speakers.—Write "Burleigh," Ulverley Green, Olton. [2027]

YOUR Old Apparatus taken in Part Payment for Latest Type; see our advert. in column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0229]

PATENTS.

THE Proprietor of British Patent No. 176128 is prepared to sell the patent or to licence British manufacturers to work thereunder; it comprises a wireless signalling system having inductively coupled 2 loop aerials.—Address Boulton, Wade and Tennant, 112, Hutton Garden, London, E.C.1. [1964]

PATENT AGENTS.

PATENTS and Trade Marks, British and foreign.—Gee and Co. (H. T. P. Gee, Member R.S.G.B. and A.M.I.R.E.), 51-52, Chancery Lane, London, W.C.2. Phone: Holborn 1525. [0001]

FREE.—Inventor's Guide on Patents.—Chatwin, 253 (W.), Gray's Inn Rd., London, W.C. [1158]

KING'S PATENT AGENCY, Ltd. (B. T. King, Registered Patent Agent, G.B., U.S., and Can.); free advice handbook and consultations; 40 years' references.—146a, Queen Victoria St., London, E.C.4. [0002]

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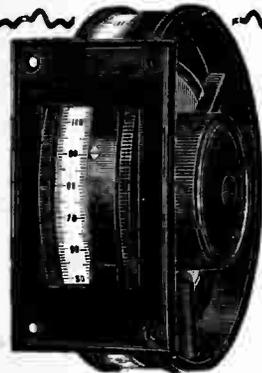
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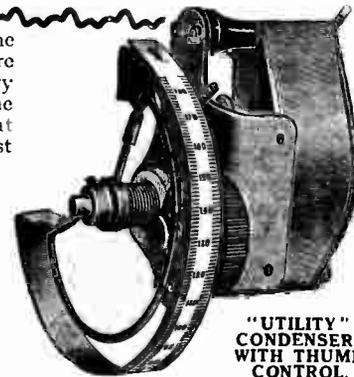


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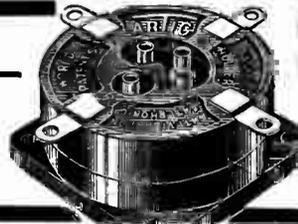
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