

The Wireless World

4^D

AND
RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, January 8th, 1930.



RADIOGRAND
12/6

TENSEN
L.F. TRANSFORMERS

Radio's Choice

Have acquired a world-wide reputation for Quality and Value.

Built by Specialists in Transformer construction, they have set a Quality of Performance above reproach. Your Set will work better with a Telsen Transformer - - - Fit one now!

TENSEN ELECTRIC CO. LTD.,
Miller Street,
Birmingham.

750-WATTS!
THE BEST SWITCH YET.

LYONS "B.A.T." (Best-After-Test) "QMB" SWITCH comfortably breaks 3 Amps. at 250 Volts, yet it is extremely small and very robust and unconditionally guaranteed.

Cordially reviewed by "W.W."—specified in the 1930 EVERYMAN FOUR, etc. Essential in 2-volt sets where switch resistance is fatal. Used by many leading set-makers.

USES:—
H.T. Units, A.C. Sets, L.T. Switch, for Portables, Gram-Motor Control, M/C Speaker Field Switch, etc. Super-sedes noisy "push-pull" varieties and clearly indicates "ON" or "OFF."

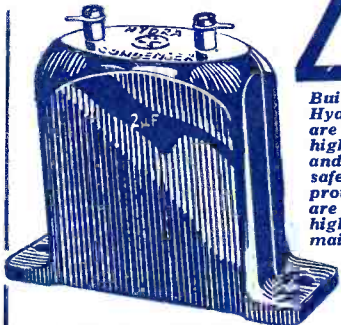
Nickel Finish.
Send for FREE 4-pp. Circular.



ONLY
2/6

CLAUDE LYONS Ltd.,
76, OLDHALL STREET, LIVERPOOL.

HYDRA
CONDENSERS
THE STRONG POINT
IN ANY MAINS UNIT!



—LOUIS HOLZMAN, 37 Newman Street, London, W.1.



Build an eliminator with Hydra Condensers and you are putting between the high voltage of your mains and your set the surest safeguard that science can provide. Hydra Condensers are built to stand up to higher pressures than your mains supply—and every one is tested before it leaves the factory—tested far beyond its stated working voltage. Fit HYDRA for safety.

BurTON
SELF-LOCATING
VALVE
HOLDER



1/- each

Pentode
-Valve-
Holders
1/6 each

Patent No.
316708

MANUFACTURED BY
C. F. & H. BurTON

PROGRESS WORKS
WALSALL, ENG.

A PERFORMANCE of HIGHEST MERIT

The greatest assurance of "success" possible for an artiste to receive is the public's demand for "more" and "more."

The McMICHAEL SUPER RANGE PORTABLE FOUR

is an assured success and the most popular Portable with discriminating people. Judged on its own merits in regard to quality of design and construction, or judged from a high standard of convenience, portability and performance, this receiver is without doubt supreme. Fitted in a beautifully finished furniture hide suitcase, with patent locking clips, with all accessories ready for immediate use, it possesses the following noteworthy features:—

1. Screened Grid Amplification.
2. Single dial tuning and volume control.
3. High selectivity.
4. Low upkeep cost.

Owing to the high degree of selectivity in this, and our other Screened Grid Portable Receivers, we are able to guarantee complete selectivity between all main B.B.C. Stations under the new scheme of wavelengths

Ask for a demonstration of this set at any high-class radio store, or call at our London Showrooms.

CASH PRICE

22 GNS.

(Including all Equipment and Royalties).

Or by our special "Deferred Payments on Hire Purchase Terms" system, £5 down and 10 monthly payments of £2 : 1 : 0

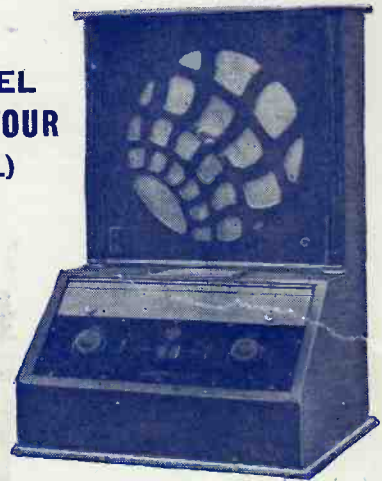


The McMICHAEL SUPER RANGE FOUR (TABLE MODEL)

A handsome Walnut table model mounted on a turntable and with a self-contained frame aerial and earth. The McMichael Super Range Four (Table Model) offers the same perfection in performance as

the Portable model and contains an exactly similar circuit. This model is designed for home use where an outdoor aerial and earth are not convenient or desirable. An additional aerial and earth may be used, however, to add to the normal and truly remarkable range.

CASH PRICE 26 GNS.
(Including all Equipment and Royalties).

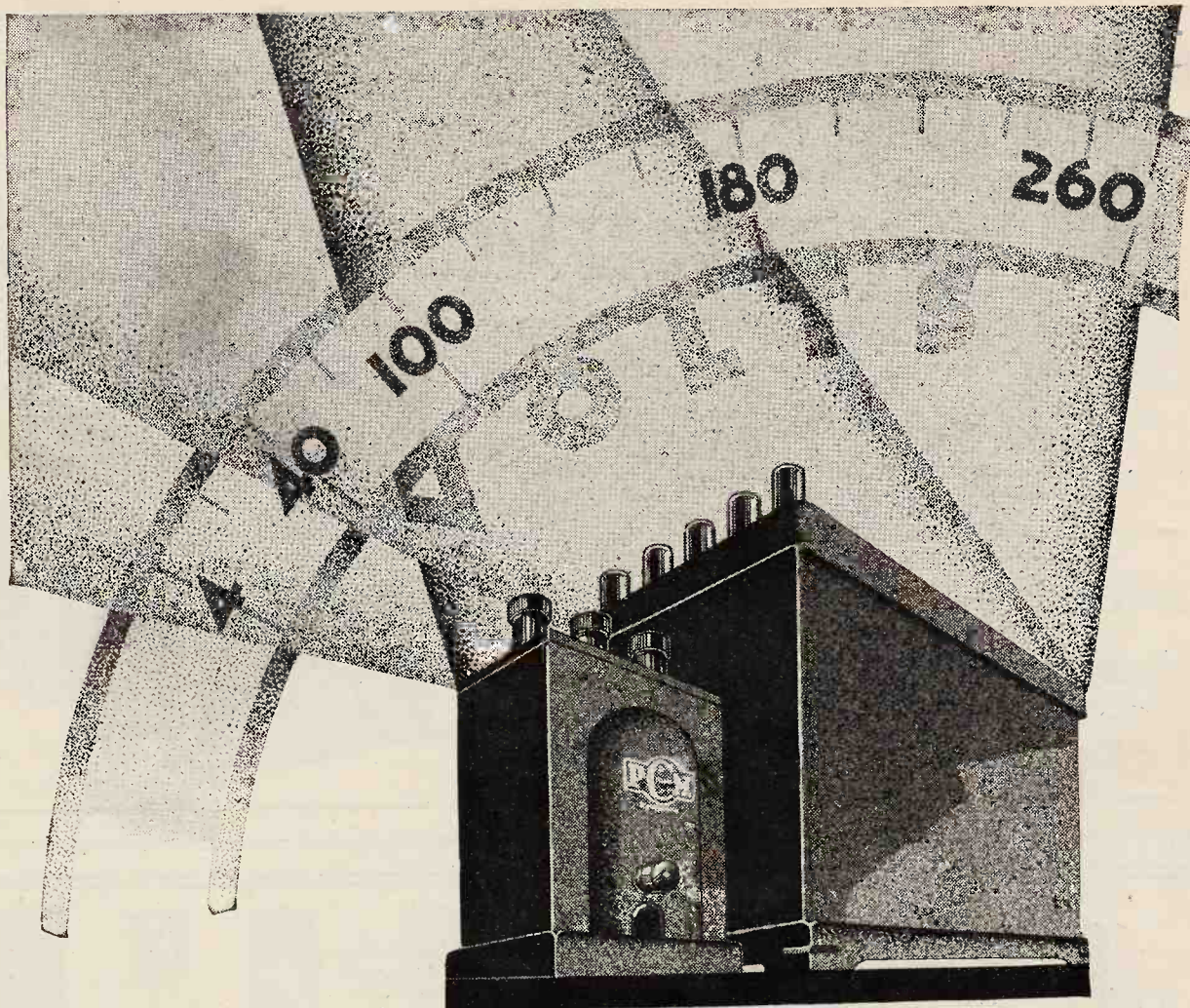


L. M. MICHAEL LTD

Manufacturers of Wireless and Scientific Apparatus
WEXHAM ROAD, SLOUGH, BUCKS.

Telephone: SLOUGH 441-442. Telegrams: RADIETHER, SLOUGH.
London Showrooms: 179, STRAND, W.C.2. (Telephone: Holborn 2466.)

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



RADIO ENERGY

USE them both—the A.C. Filament Transformer and the A.C. High Tension Unit. Mullard has made them for *your* radio, bringing you instant trouble-free entertainment with no hum. Too long have batteries held back radio from being effortless entertainment, but with the advent of these components you can fetter the steady energy of the mains to give you lasting service.

Mullard MASTER · RADIO

Advert. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2.

USEFUL INFORMATION.

A.C. Filament Heating Transformer. Output 4 v. 5 amp.

Type No.	103	111	210	222	240	253
A.C. Mains Voltage	100-106	107-114	200-214	215-228	229-245	246-260

Price 32/6.

Please give voltage and periodicity of A.C. Mains supply or type number when ordering.

H.T. Supply Unit.

Approximate output when used in conjunction with an average multivalve receiver.

Tapping	1—Detector Valves	40-60 v.
"	2—H.F. Valves	60-90 v.
"	3—L.F. Valves	90-130 v.
"	4—Last Valves	150 v.

Type No.	103	111	210	222	240	250
A.C. Mains Voltage	100-106	107-114	200-214	215-228	229-245	246-260

Price £5-5-0

Please give voltage and periodicity of A.C. Mains supply or type number when ordering.

Tudor

HIT UNITS FOR MODERN SETS

For modern sets, with power valves, pentodes and moving coil loudspeakers, the Tudor Monobloc High Tension Unit has no superior.

It is a 10-volt Unit sold in three capacities, each more than ample for ordinary requirements, yet not too heavy to make awkward handling—a unit that will stand for months between charges without a drop in voltage, because of its absolutely non-current-leaking construction. It is a unit which has sold in thousands since its introduction, not one single unit having been returned because of unsatisfactory performance. A unit made by a company with 35 years' battery experience—whose huge stationary batteries, weighing hundreds of tons each, are used by the majority of power stations in this country.



M.C.45.

ESTABLISHED IN PUBLIC SERVICE

10 VOLT HIGH TENSION UNITS.

COUPON.
Please send me full particulars of Tudor Wireless Batteries.
Name
Address

	Capacity.	Price.
5 H.T.1 ..	2,750 milliamps	6/9
5 H.T.2 ..	5,500 ..	10/-
5 H.T.4 ..	12,500 ..	17/6

Tudor Accumulator Co., Ltd., 2, Norfolk Street, Strand, London, W.C.2.

Advt. of Tudor Accumulator Co., Ltd., 2, Norfolk Street, Strand, London, W.C.2.

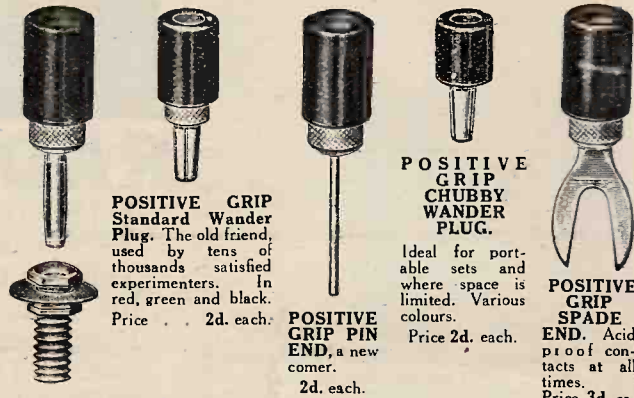
LISENIN

POSITIVE GRIP TERMINALS

(Patented)

Scientifically constructed, both electrically and mechanically, they hold the wire, but grip the flex covering. All stresses and strains are removed from the conductors, and once a connection is made it stays put, and without any unsightly frayed ends of leads, the bane of all fans.

Write for **FREE** copy of our latest descriptive leaflet "W.W." Post free, of course.



POSITIVE GRIP Standard Wander Plug. The old friend, used by tens of thousands satisfied experimenters. In red, green and black. Price .. 2d. each.

POSITIVE GRIP CHUBBY WANDER PLUG.

Ideal for portable sets and where space is limited. Various colours. Price 2d. each.

POSITIVE GRIP PIN END, a new comer. 2d. each.

POSITIVE GRIP SPADE END. Acid proof contacts at all times. Price 3d. ea.

POSITIVE GRIP Banana Type PLUG & SOCKET. A great advance on all other types of plug. A silky, dead smooth contact is NOW obtainable. Price 4d. complete.

LISENIN POSITIVE GRIP ALL MAINS PLUG AND SOCKET (Registered Design). The Lisenin Mains Plug and Socket is totally insulated and is equally as valuable on sets working off batteries as those from the electric supply. The leads may be dropped with impunity and there is no chance of a short circuit. Instantly assembled with the aid of a screwdriver. **NOTE THE PRICE, 6d. each, complete as illustrated.**

WRITE to-day for our new descriptive folder, mentioning this paper.

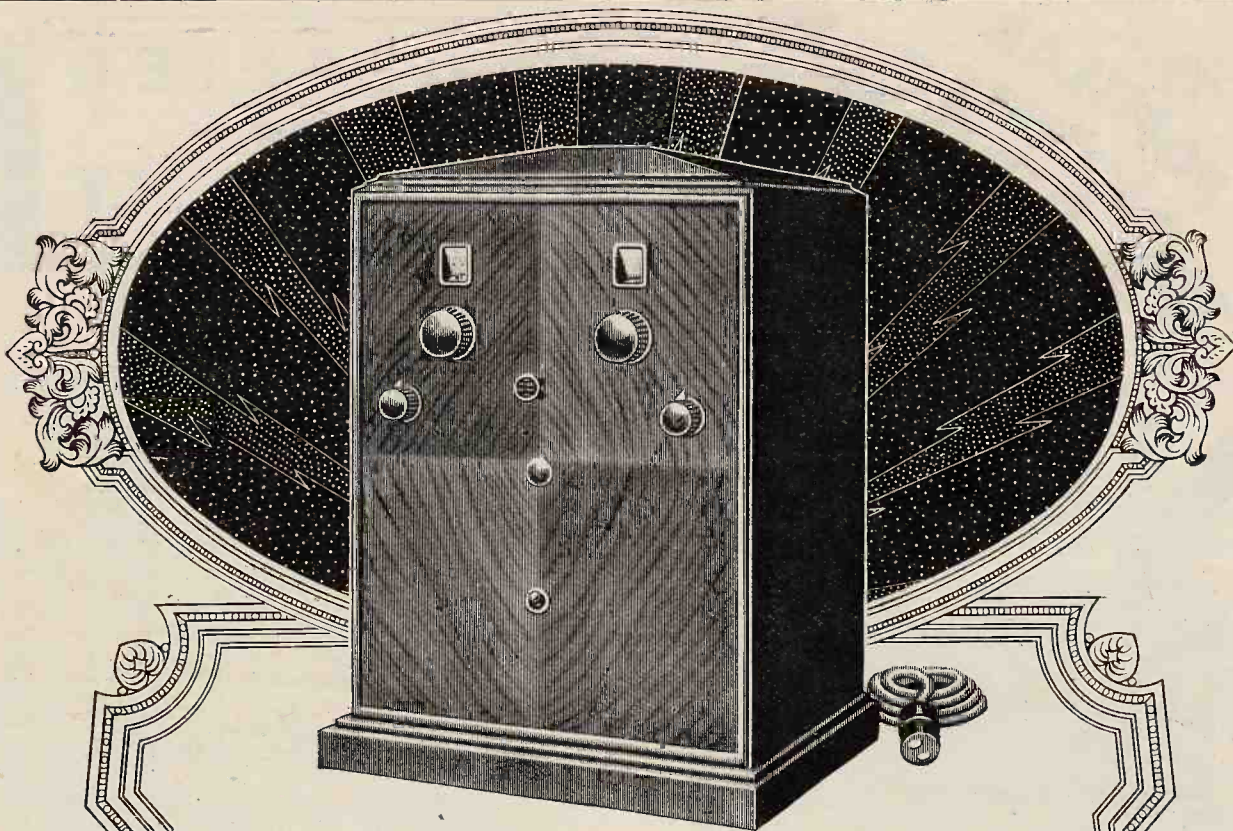
POSITIVE GRIP SAFETY PLUG AND SOCKET (Registered Design).



We have moved to larger premises. Note new address:—
THE LISENIN WIRELESS CO.,
5, Central Buildings, HIGH ST., SLOUGH, Bucks.
Phone: Slough 652. T. Address: POSGRIP, SLOUGH.

Look for the Lisenin Show Case on your Radio Dealer's Counter.

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



The outstanding feature of the FERRANTI A.C. Mains Receiver is the reproduction, which is very nearly true to life. The volume and richness of tone satisfy the critical listener.

This quality is attained by the use of the finest audio frequency components available and the close attention to detail which is expected from FERRANTI. Every component has been designed or chosen for the purpose it has to fulfil.

We have considered quality before price. Quality tells in the long run, and the first cost is the last cost when the best is bought.

The Set is handsome, too. You have the choice of three woods to tone with any scheme of furnishing.

Available for Alternating Current only, voltages 200 to 250; 50 cycles or over.

Any high-class dealer will demonstrate this Set to you and many will supply it on H.P. terms, if desired.

Price, including valves:

In Oak £25; In Mahogany £26; In Walnut £26

Royalty £1 extra.

FERRANTI

A.C. MAINS RECEIVER

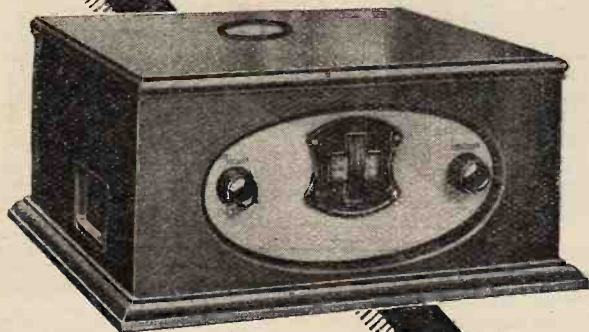
FERRANTI LTD.

HOLLINWOOD

LANCASHIRE

FERRANTI

THE POPULAR LOTUS ALL ELECTRIC RECEIVER for £19-9 DOWN



Go home and listen
Radio Week 12th to 18th January

Easily operated by connecting to any A.C. Mains light socket—no batteries needed—this Lotus All Electric 3-valve S.G.P. Set is highly selective and covers a good range of British and Continental stations. Cash price £21 (Royalties paid, and including valves). The same circuit is used in the Lotus 3-valve S.G.P. Battery Model—Cash price £13:15:0.

For home construction get the Lotus 3-valve S.G.P. Battery Model Kit at £7:12:6. See and hear it at any wireless dealer's or write to-day for the Lotus Sets Catalogue and Hire Purchase terms.

LOTUS ALL ELECTRIC RECEIVER

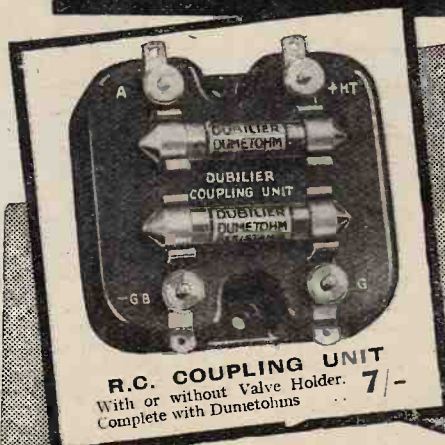
Gets the best reception.

Made by the makers of the famous Lotus components in one of the most modern radio factories in Great Britain.

**GARNETT WHITELEY & CO., LTD., Dept. W.W.4,
Lotus Works, Mill Lane, Liverpool.**

Co. 510n

DUBILIER FOR DURABILITY



R.C. COUPLING UNIT
With or without Valve Holder. 7/-
Complete with Dumetohms



DUCON AERIAL
Does away with outdoor aerial, as it has simply to be plugged into any standard electric lamp socket. Tested at 2,500 volts. Absolutely safe. 5/-



H.F. CHOKE
Four types to meet all uses. All types 4/6

Ask your dealer for the Dubilier Booklet—"A Bit about a Battery"—it's free.
If you have any difficulty in obtaining Dubilier products write direct giving the name and address of your dealer.

"Go Home and Listen."
Radio Week, Jan. 12-18.

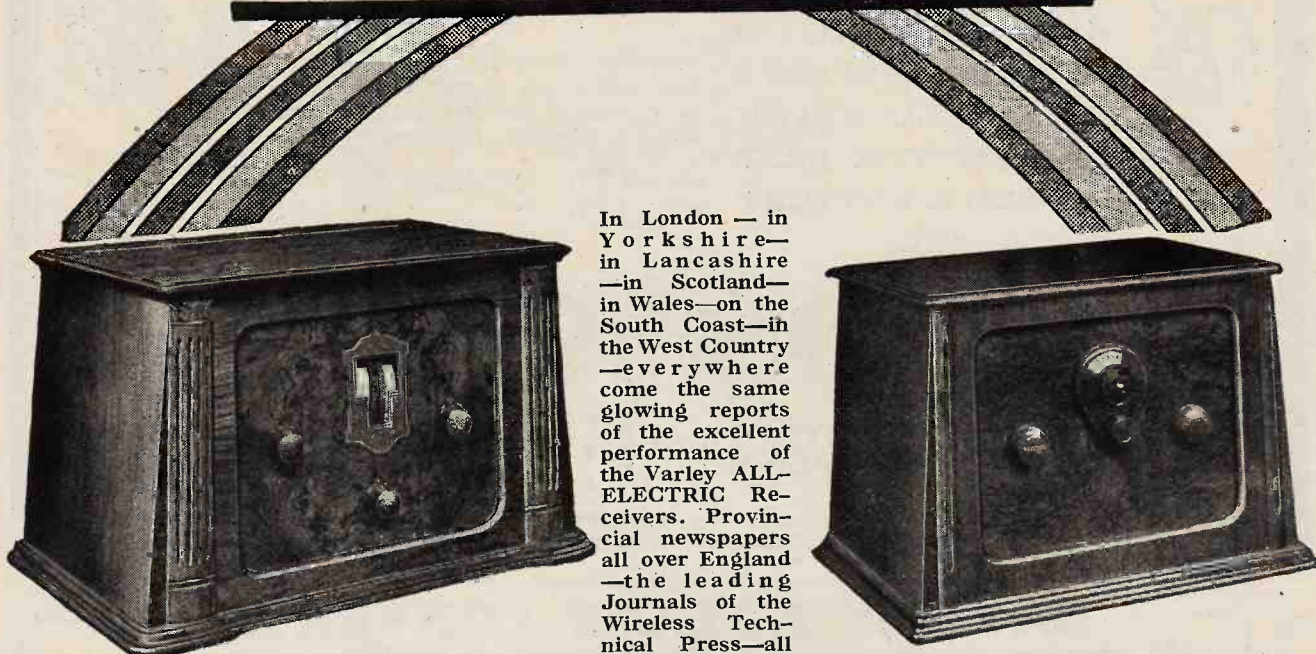
DUBILIER RADIO PRODUCTS

Dubilier Condenser Co. (1923) Ltd., Ducon Works, Victoria Road, North Acton, London, W.3

BC 250 C

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

For 1930 VARLEY ALL-ELECTRIC RECEIVERS



In London — in
Yorkshire —
in Lancashire
—in Scotland—
in Wales—on the
South Coast—in
the West Country
—everywhere
come the same
glowing reports
of the excellent
performance of
the Varley ALL-
ELECTRIC Re-
ceivers. Provin-
cial newspapers
all over England
—the leading
Journals of the
Wireless Tech-
nical Press—all

Varley All-Electric
3-Valve Receivers
List Nos. AP3
(A.C.) and AP4
(D.C.).

Marconi Royalty extra, each 20s.

recommend these Sets in the strongest terms.
Behind them is the name VARLEY—the name that stands
for everything up to date, for QUALITY, for all-round
excellent performance, and for perfect finish.

Varley All-Electric
2-Valve Receivers
List Nos. AP1
(A.C.) and AP2
(D.C.).

Marconi Royalty extra, each 15s

25 Gns.

and RADIO GRAMOPHONES

16 Gns.

Write to-day for Section A of our new Catalogue, which
gives full particulars of Varley All-Electric Receivers and
Radio Gramophones.



Radio Week, Jan. 12-18. A real pleasure
if your Set is a Varley All-Electric.

Advertisement of Oliver Pell Control Ltd., Kingsway House, 103, Kingsway, London, W.C.2.

Telephone: Hoiborn 5303.

R.I. Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.

Radio's Supreme Power



**ARE YOU PROUD
OF YOUR NEW SET?
DO IT JUSTICE
AND FIT THE BEST
POSSIBLE BATTERY**

Grosvenor Batteries give continuous and satisfactory service because they incorporate a new vitalising element which is unique to Grosvenor.

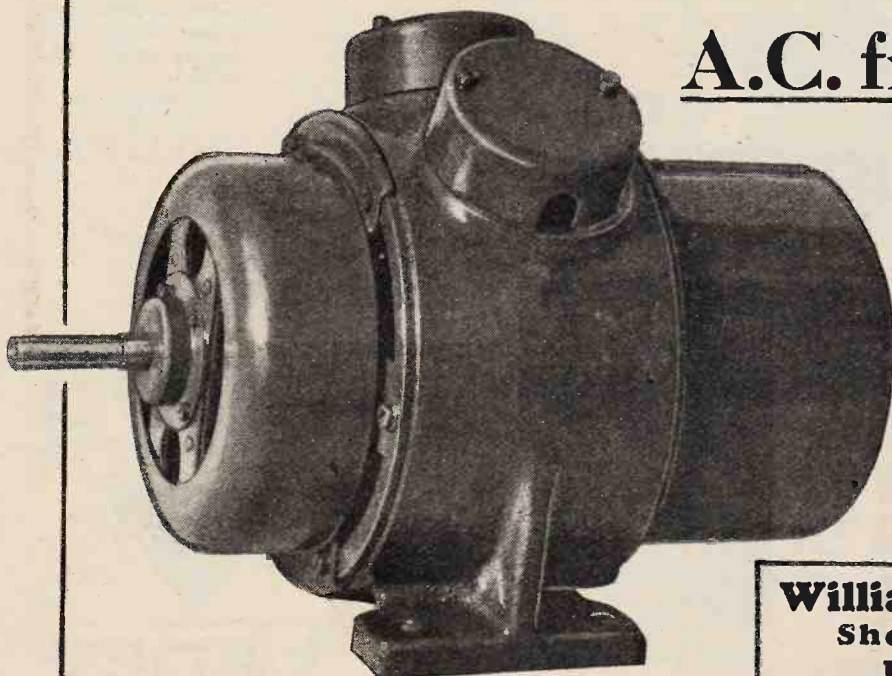
66 v. from 7/6	Super Capacity for Multi-Valve Sets	66 v. 20/-
99 v. „ 11/6		99 v. 32/6

The Grosvenor Battery

BRITISH MANUFACTURE

GROSVENOR BATTERY CO., LTD., 2-3, White St., MOORGATE, LONDON, E.C.2. Phone. Met. 6365

BAYLISS ROTARY CONVERTER



A.C. from D.C.

Load 400 Watts.

ANY Input.
ANY Output.

PRICE

£12 . 10 . 0

Delivery
from Stock.

William Bayliss Ltd.
Sheepcote Street
BIRMINGHAM

Telephone :
Mid 1409.

Telegrams :
"Drawbench, B'ham."

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

K
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K
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O

Tom Prendergast

PROFESSIONAL "PERRUQUIER" TO THE PRINCIPAL
LANCASHIRE AND YORKSHIRE AMATEUR OPERATIC
AND DRAMATIC SOCIETIES

24, UPPER BROOK ST.,
C.O.M.,
MANCHESTER

Dec. 11th. 1929.

The Sheffield Magnet Co.,
116/126, Broad Lane,
Sheffield.

Gents,

In answer to yours of the 9/12/29,
I beg to state that you are at liberty to
make any use of the P.C. posted to you on
Saturday last. Since writing you this,
I have carefully gone over the "Mullard
Master Three" set, and the 120 Volt H.
Tension "Exide" Batteries, and in con-
junction with your "KUKOO" Unit, I now
get results that are really surprising
and pleasing. I do get Moving Coil
results and far sweeter than most M. Coils
on the market. There is absolutely no
trouble in fixing your Unit to a 36" Baffle
Board as I use. With a Vellum (pure)
Cone-- surrounded with a Chamois leather
edging (Cone made shallow) I get wonderful
reception. I intend making 2 more
Loud Speakers.

Yours etc.,

Tom Prendergast

TOM PRENDERGAST
24, UPPER BROOK ST. C.O.M. MANCHESTER
PROFESSIONAL "PERRUQUIER" TO THE PRINCIPAL
LANCASHIRE AND YORKSHIRE AMATEUR OPERATIC AND DRAMATIC SOCIETIES

7/12/29

Gents. I have fixed the
"Kukoo" L.S. (Baffle Board 36")
& have obtained absolutely
Moving Coil results. Wonderful.
Thanks. Yours etc.
Prendergast

Postage 9d. extra



Weight 2 lb. 2 ozs.

The **SUPER
SPEAKER
UNIT**

Sole Patentees & Manufacturers:—
THE
SHEFFIELD MAGNET CO.
BROAD LANE, SHEFFIELD.

*Phone:—20866.

*Grams:—Magnet 20856 Sheffield.

FEATURES THAT MATTER

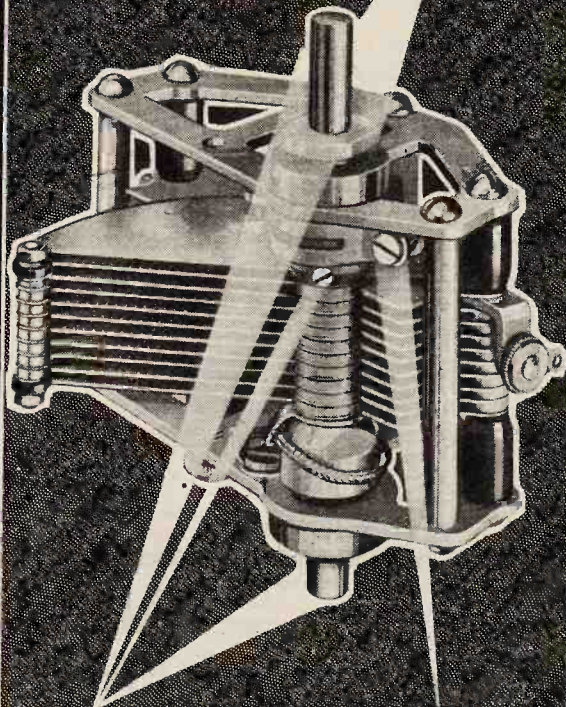
IT'S when you begin to look into J.B. Condensers that you appreciate the skill, the accuracy, the endless patience with which they are designed and made.

This is the Universal Log—one of the new models. It is the Condenser of the season, and has already featured in many of the Star Circuits. The frame construction is such that complete rigidity is assured.

PRICES:
 .0005 - 9/6 .0003 - 9/-
 .00025 - 8/9 .00015 - 8/9
Radio Week, Jan. 12-18
J.B. Precision Condensers will ensure sharp, easy, accurate tuning.



This bush is removable, enabling the Condenser to be fixed to Panel either end, left or right hand.



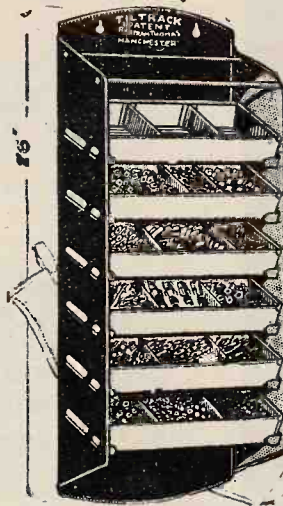
Steel Centre Spindle, adjustable for length and particularly useful for ganging and attaching to Thumb or Drum Control.

Showing the well-known J.B. adjustable tension to Centre Spindle.

Advertisement of Jackson Brothers, 72, St. Thomas' Street, London, S.E.1. Telephone: 110p 1837.



STORE YOUR WIRELESS GOODS WHERE YOU CAN FIND THEM



"TILTRACK" (Junior)

Price 30/- Post Free

Ideal for the Experimenter and the Household for storing Nuts, Bolts, Screws, Washers, Condensers and Small Components.



"TILTRACK" (Senior)
 The ideal stores for the Retailer and Factory—

Goods found in minimum time with minimum trouble. Patent adjustable partitions to trays. Maximum illumination. No danger of Fire. Great Storage Capacity.

THE "BENCHRACK." (Tiltrack Principle.)

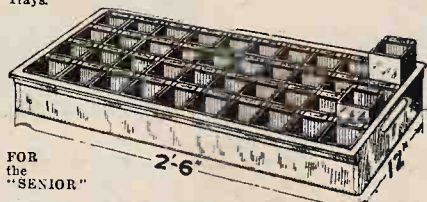
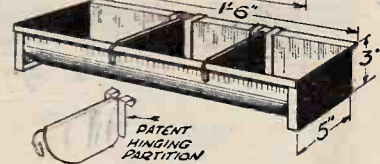
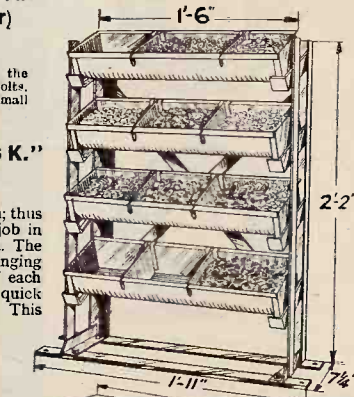
Made to stand on the work bench; thus all small parts needed for the job in progress are immediately to hand. The trays are provided with patent hinging partitions, and the front face of each tray is rounded to facilitate quick removal of the goods in the tray. This rack is a tremendous time saver.

Price 30/- Carriage Extra

"TILTACCESSORIES"

ACCESSORIES to "TILT RACK" TRAYS, for "JUNIOR" and "SENIOR."

These are square boxes for fitting into the "Junior" and "Senior" Trays. Extremely useful for small details as screws, washers, etc. The illustrations below show the boxes as fitted to the "Senior" Trays.



FOR the "SENIOR"



Particulars from Manufacturer & Patentee:— **Worsley Street, Hulme, MANCHESTER.**

London Office & Showroom:—28, Victoria Street, S.W.1.

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

WISE WIRELESS USERS PREFER BATTERIES

BECAUSE -



pure H.T. current comes only from a dry battery, for it contains steady, direct current and does not depend upon humming generators for its source of supply.

Batteries are handy, portable and safe, too; and cheaper in the long run—no expensive valves or windings to burn out.

Buy a battery and get the best in EVER READY, the battery that has stood the test for 25 years.

During Radio Week ensure perfect reception of the special programmes by fitting an EVER READY BATTERY to your set.

Use an EVER READY refill battery for your Electric Hand Lamp.

The Popular Batteries for Portable Sets.

PORTABLE 1. 63 volts, 6 x 5 x 3".	8/6
PORTABLE 2. 99 volts, 9 x 5 x 3".	13/6
PORTABLE 3. 108 volts, 10 x 5 x 3".	15/-



EVER READY

REGD TRADE MARK

BRITAIN'S BEST BATTERIES

The
Wireless
AND
RADIO REVIEW **World**
DIARY
for 1930

**Useful throughout
the 12 months ahead**

"The Wireless World Diary" contains 80 pages of useful facts and figures for wireless users, together with ample space for memoranda and personal notes on radio matters.

Get Your Copy!

PRINCIPAL CONTENTS :

Summary of Regulations Relating to Amateur Transmitter and Receiving Licences. Conversion Tables, English measures to metric and *vice versa*. Decimal and metrical equivalents of fractions of an inch. Broadcasting Stations of Europe with their Call-Signs and Wavelengths. Principal Short-Wave Broadcasting and Commercial Stations of the World. Nationality Prefixes used by Amateurs. Morse Code. Symbols used in Wireless Diagrams. Typical Wireless Receiver and Eliminators :—Fourteen Different Circuits with Diagrams. Valve Data, giving the characteristic features of standard valves.

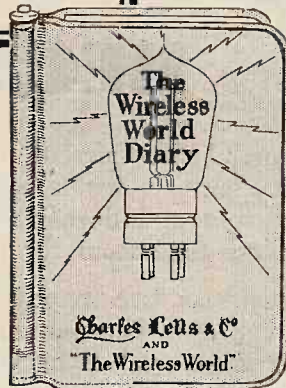
Published jointly by

"THE WIRELESS WORLD," LONDON, E.C.4,
and CHARLES LETTS & CO.

PRICES :

Cloth Bound 1/- net. By post 1/1.
In Leather Case, with pockets, pencil and season ticket window, 2/6 net. By post 2/7.

From all Booksellers and Stationers



PHOTOGRAMS OF THE YEAR

THE ANNUAL REVIEW FOR 1930 OF THE WORLD'S PICTORIAL PHOTOGRAPHIC WORK

Edited by F. J. MORTIMER, F.R.P.S.

Editor of "The Amateur Photographer and Cinematographer."

This year's edition of "PHOTOGRAMS OF THE YEAR" is now on sale, and lovers of pictures made by the camera will give it a warm welcome.

"PHOTOGRAMS" contains reproductions of the most striking and representative pictures from the principal photographic exhibitions of the year, selected from the work of the leading pictorial photographers of the world.

A literary section provides reports of photographic progress at home and overseas, and a useful Directory of British Photographic Societies is included.

For keen photographers the annual volume of "PHOTOGRAMS" is an inspiration; for those to whom camera pictures appeal it is a book which gives lasting pleasure.

From all leading booksellers or direct from the Publishers:

ILIFFE & SONS LTD., Dorset House, Tudor Street, London, E.C.4.

PRICES:
Paper Covers 5/-
Cloth Boards 7/6
Postage 6^d. extra.

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

£20 New Year's Gift Competition

Open to All
 Readers of "The Wireless World"
HIDDEN ADVERTISEMENTS

Below will be found six reproductions of fragments taken from the Advertisement pages of this issue of "The Wireless World." Each fragment is a clue. Can you from these clues identify the Advertisements? Eight prizes will be awarded to the first eight readers who send us correct solutions. No technical skill is required, merely observation. There are no restrictions or entry fees and the conditions are simple.

First Prize

An order entitling the winner to purchase goods as advertised in this number of "The Wireless World" to the value of

£7. 10s.

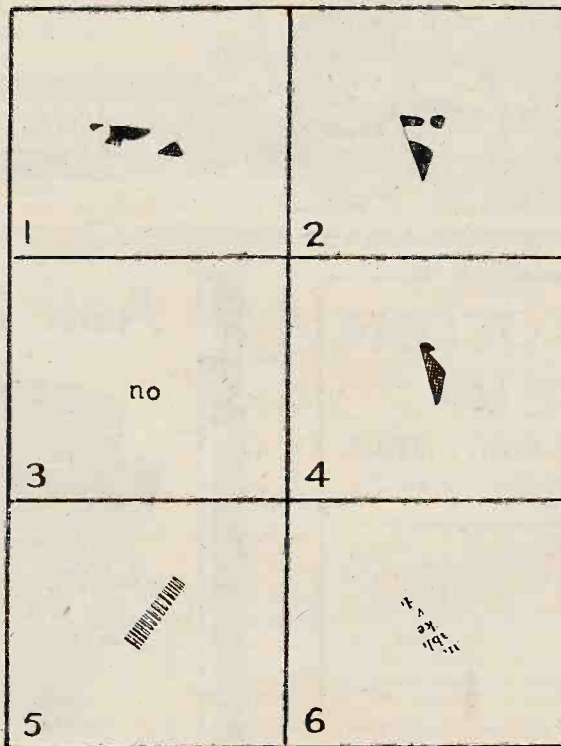
for the first correct solution opened.

Third Prize

An order entitling the winner to purchase goods to the value of

£2. 10s.

for the third correct solution opened.



Second Prize

An order entitling the winner to purchase goods to the value of

£5

for the second correct solution opened.

5 Consolation Prizes

of goods to the value of

£1 each

for the next five correct solutions opened.

CONDITIONS

1. All solutions must be written on the special coupon appearing on an advertisement page in this issue and addressed to *The Wireless World*, Dorset House, Tudor Street, London, E.C.4, and marked "Hidden Advt." in bottom left corner.

2. Clues will not, of necessity, appear in the same way as in the advertisement page, but may be inverted or placed in some other position.

3. In order that town and country readers may compete on equal terms, solutions will not be dealt with until 10 a.m. on Monday, January 13th. All solutions received before that date will be retained until Monday morning. Competitors may submit

any number of entries. Erasures or alterations on a coupon will disqualify the entry.

4. The first prize of £7. 10s. will be awarded for the first correct solution opened; the second prize of £5 for the next correct solution; the third prize of £2. 10s. for the third, and five consolation prizes of £1 each for the next five correct answers. In the event of no readers sending correct solutions the prizes will be awarded to the competitors whose solutions are most nearly correct.

5. The decision of the Advertisement Manager of *The Wireless World* is final, and no correspondence can be entered into. Competitors enter on this distinct understanding. No member of the staff of the paper is permitted to compete.



-and no crackle

Every sal-ammoniac battery begins to "crackle" far too soon. "Pertrix" simply cannot "crackle," for its electrolyte produces no corrosion. Nor can "Pertrix" lose power when not in use. These two points alone place "Pertrix" in a peerless position.

Use no battery but that with "pep."

PERTRIX
SUPER LIFE
H.T. BATTERIES

PERTRIX LIMITED, Britannia House,
Shaftesbury Avenue, London, W.C.2.
Factory: Britannia Works, Redditch, Worcs.

LONGER LIFE!

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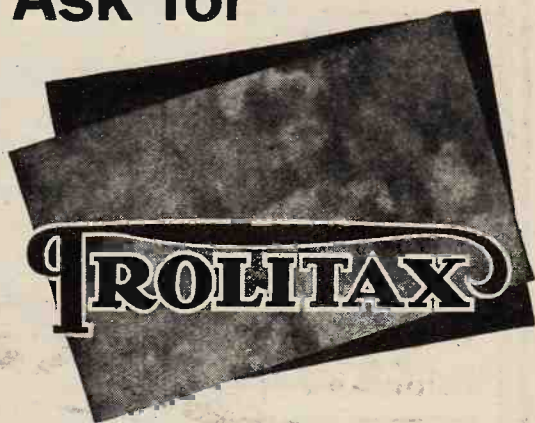
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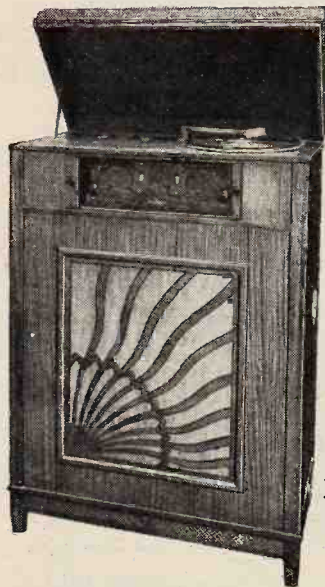
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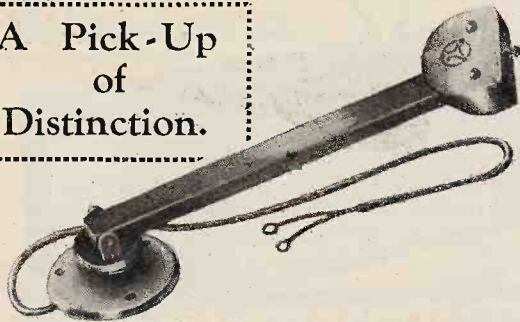
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


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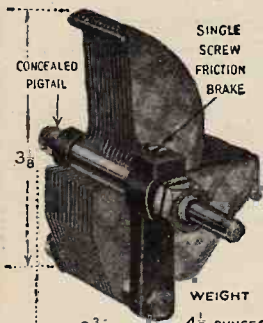
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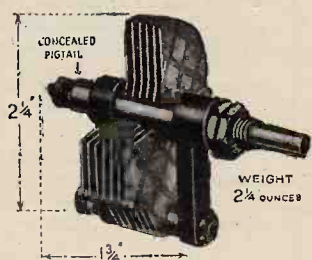
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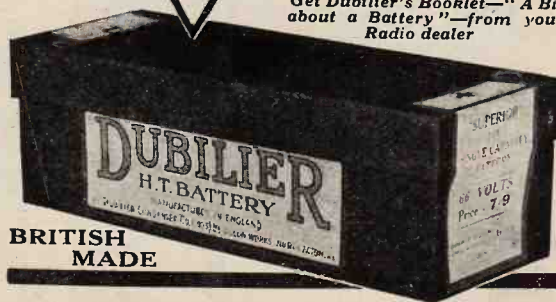
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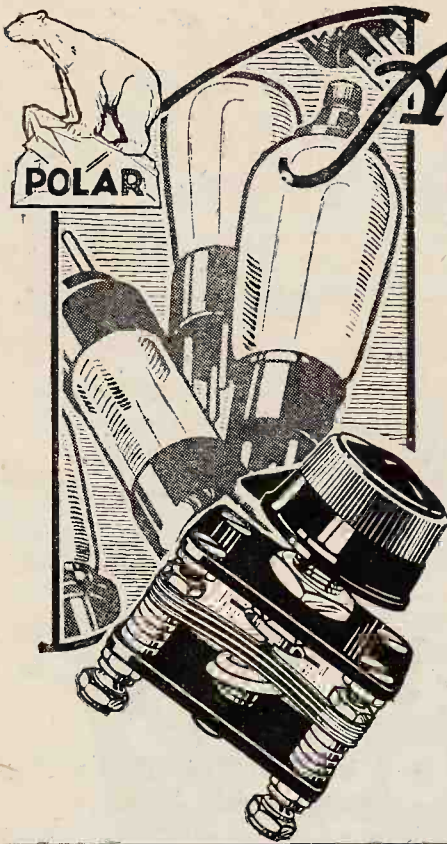


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The Wireless World

AND
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(17th Year of Publication)

No. 541.

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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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we sincerely hope that it will never be proceeded with. Before the Broadcasting Corporation was formed broadcasting in this country, it may be remembered, was conducted by a company composed, or rather guaranteed, by the principal radio set manufacturers who also largely controlled the policy of the company. In those days a substantial contribution was made by manufacturers towards the cost of programmes, the contribution taking the form of a charge on sets sold, but fortunately this arrangement came to an end, and the revenue for programmes has since been derived from a proportion of the licence fees paid by the public through the Post Office. To reinstate the old arrangement would, in the first place, mean an increase in the cost of receivers to the public and would be equivalent to charging a higher rate for the annual licence. No scheme whereby the public is called upon to contribute a larger sum towards broadcasting is to be recommended so long as it is possible to avoid it. Further, it does not seem to be desirable that the responsibility for the programme matter and general policy of the B.B.C. should be divided, and we certainly do not think that the manufacturers themselves would desire to accept part responsibility, although we believe that they would welcome a rather closer co-operation than has existed in the past. This position is, however, improving and the B.B.C. is no longer inclined to make rash decisions with regard to rearrangement of stations, or changes in wavelength, without first discussing the position with the manufacturers in order to ascertain how far the public as users of receivers will be affected by the change.

SHOULD MANUFACTURERS CONTRIBUTE TOWARDS PROGRAMMES?

THE suggestion has recently been made that the B.B.C. does not keep closely in touch with the manufacturers of receiving sets who, since they are catering for the requirements of the public, really represent the listening public as far as the practical side of reception is concerned. It has been proposed that in order to remedy this state of affairs the manufacturer should contribute a royalty on the receiving sets which he sells, to go towards the cost of the programmes, in order that there shall be some link between the revenue of the B.B.C. available for broadcasting and the sale of receivers, and also to give the manufacturer a claim to a more positive influence on the programme policy than he has at present.

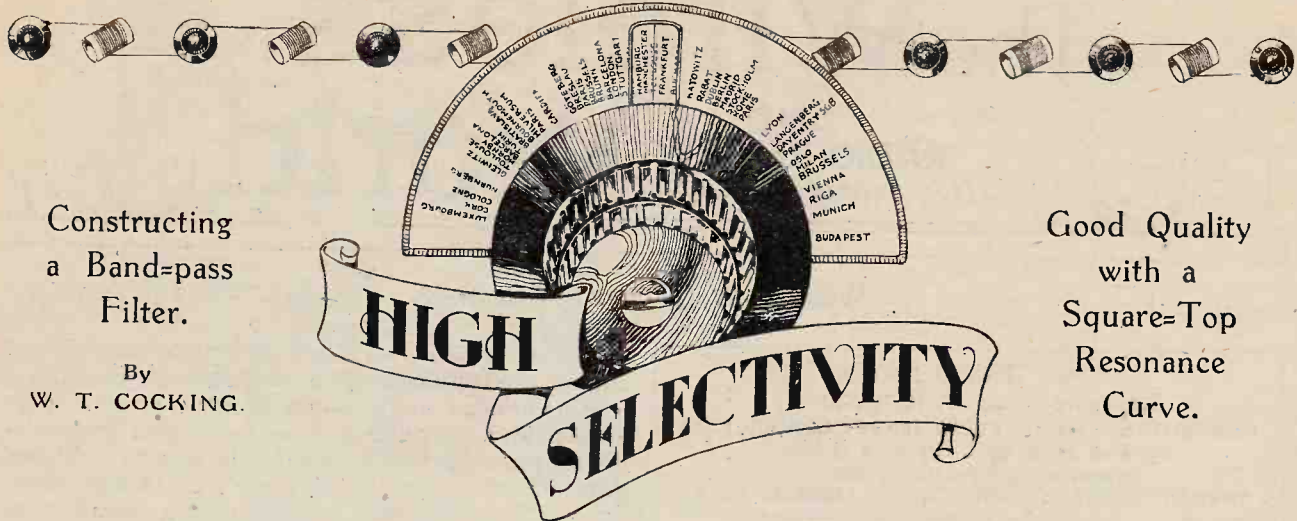
There are, of course, arguments which can be brought forward to support such a proposal but, on the other hand, there are so many objections to the scheme that

RADIO WEEK, JANUARY 12th—18th.

"GO Home and Listen" is the slogan for Radio Week 1930, which is arranged for the week beginning January 12th.

During Radio Week, as in previous years, the B.B.C. will put out programmes of special attraction, and the object of Radio Week is to widen the circle of listeners so as to bring us nearer to the position when every home will be linked together through the medium of the broadcasting service.

We hope that our readers will co-operate during Radio Week in recruiting new listeners from amongst their friends who have up to the present failed to interest themselves in broadcasting. The fact that special programmes have been planned will help to emphasise the advantages which are to be found in the ownership of a broadcast receiver.



Constructing a Band-pass Filter.

By
W. T. COCKING.

Good Quality
with a
Square-Top
Resonance
Curve.

At the present time with the regional scheme in force there is an ever-growing quest for high selectivity without distortion. There is a fund of information in the accompanying article on the design of filters which are a good compromise between selectivity, quality and magnification. It is shown that several stages can be ganged, thus considerably facilitating the control of a receiver.

THERE is little doubt that the band-pass filter offers the best solution to the problem of obtaining adequate selectivity and high quality at short distances from the Brookmans Park transmitter. While the circuit is simple to set up and operate, the results with it are principally dependent upon the degree of coupling between the primary and secondary circuits; for, if this is incorrect, poor signal strength and bad quality may be obtained.

In Fig. 1 is given the circuit diagram of a filter, coupled by mutual inductance between the coils, which is used as the sole means of tuning before a grid rectifier. Fig. 2 shows the effect on magnification (curve A), on the side-band variation (curve B), and on the selectivity (curve C) of varying the value of the mutual inductance. These curves are for a wavelength of 500 metres and for coils having an inductance of 240 microhenries and an H.F. resistance of 5 ohms. This last condition will not be true when a filter is used before a grid detector, owing to the heavy damping imposed by this method of rectification; but when reaction is used there will be a certain setting of the reaction condenser at which the curves are exactly true.

It will be seen that there is an optimum value of coupling for both magnification and side-band variation, and that the optimum is not the same for both. The selectivity, on the other hand, always increases with a decrease in the coupling. The greatest efficiency is

obtained when the mutual inductance is 1.5 microhenries, for then the magnification is 90, a figure which is exactly half that for one identical tuning coil used in the orthodox manner. The selectivity with this degree of coupling is quite high, being 240 at 40 kc. from resonance; the unfortunate part, however, is that the side-band variation is 75 per cent., which is altogether excessive. With a mutual inductance of 3 microhenries, the best value for quality, the side-band variation is only 5 per cent., but the selectivity has fallen to 85, and the magnification to 66. In practice, therefore, it is usually necessary to make a compromise between

the three conflicting requirements, selectivity, quality, and magnification.

Opinions differ as to which is the best compromise, but it is suggested that a maximum high note loss of 40 per cent. at a frequency of 5 kc. either side of the resonance frequency will usually meet the case. It is probable that a side-band variation of this order would be quite undetectable by the average person, as the ear is very insensitive to changes in strength; particularly is this so when the changes occur at different frequencies. Taking this figure, then, as the maximum allowable, the best value for the mutual inductance is 2.5 microhenries, with which the magnification is 75 and the selectivity is 120.

Fig. 3 gives the results with the same filter at a wavelength of 250 metres, at which the coil resistance is 10 ohms. It is interesting to note that, for mag-

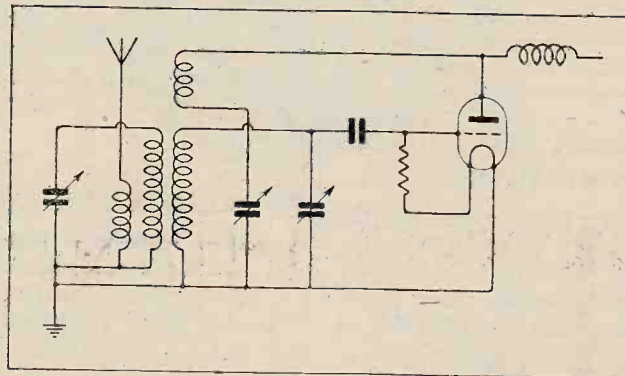


Fig. 1.—A filter circuit preceding a leaky-grid detector.

High Selectivity.—

nification, the best value for the mutual inductance is unchanged at this lower wavelength, but that the best value for quality is now 2 microhenries instead of 3 microhenries. Incidentally, the best value of mutual inductance for magnification can be found very easily for the case when each coil has the same H.F. resistance; it is only necessary to choose a value of mutual inductance such that its reactance is equal to the H.F. resistance of one coil at

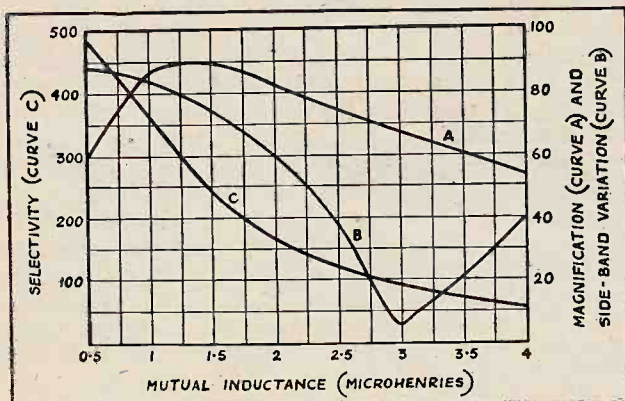


Fig. 2.—Curves for a mutual-inductance coupled filter in aerial circuit at 500 metres. A shows the effect on magnification, B the effect on side-band variation, and C the change in selectivity.

the same frequency. This may be expressed in the following simple manner:—

$$M = R/\omega \text{ where } M = \text{mutual inductance in henries.}$$

$$R = \text{H.F. resistance of one coil in ohms.}$$

The greatest difference between the curves for 250 metres and those for 500 metres is in the selectivity, which is much less at the lower wavelength. A value of mutual inductance (2.5 microhenries) which gives a 40 per cent. high note loss at 500 metres and a selectivity of 120 will give at 250 metres a side-band variation of 18 per cent. and a selectivity of 27; not only this, the side-band variation is no longer in the form of a high-note loss, but is what is perhaps best called a high-note accentuation. A selectivity of 27 at 250 metres, however, is still high in comparison with that of a single-tuned circuit at this wavelength. The falling-off in selectivity is normal and unavoidable with the usual method of tuning by variable condensers. It is due partly to the higher ratio of inductance to capacity, but principally to the increased coil resistance at the lower wavelengths.

Selectivity Under New Exacting Conditions.

For a receiver of the type of Fig. 1 these figures for selectivity are unusually high, and also the high-note loss is less than with a single-tuned circuit. In practice, the signal strength is less than that with normal tuning arrangements, the aerial winding in each case being chosen for maximum strength. When, however, the turns on the aerial winding are reduced for selectivity, as is commonly done, the filter with a full aerial winding is far superior as regards strength, quality, and selectivity. Brookmans Park, at a distance of nine miles, causes far less jamming with an

B 15

o-v-2 filter-tuned set than did the old 2LO on the same set and at the same distance, but with an ordinary single coil. Thus not only the Daventry Experimental station but Continental stations intermediate in wavelength can be received without a trace of Brookmans Park. It should be noted that the operation is not complicated, for the two tuning condensers are ganged.

Curves A and B of Fig. 4 and curve A of Fig. 5 show the selectivity, amplification, and side-band variation respectively with an H.F. amplifier consisting of a filter-tuned aerial circuit and a Mazda AC/SG valve coupled to the detector by another identical filter circuit—four tuned circuits in all. These curves show that for high quality the mutual inductance must be a little greater than when one filter only is used. This results in a somewhat higher loss of both amplification and selectivity. With a mutual inductance of 2.75 microhenries for each filter the side-band variation is 40 per cent., the amplification 6,400, and the selectivity 10,000! Lest it should be thought that selectivity of this order is unnecessary, it may be as well to quote figures for an amplifier satisfactory under the old broadcasting conditions and to show the increase in selectivity now essential if the apparent selectivity of the set is to remain the same.

Relative Signal Strengths of Old and New 2LO.

A set consisting of a tuned grid circuit with a tuned anode and a P.M.12 valve with a 5-ohm coil for the grid circuit and a 10-ohm coil for the anode has, at 500 metres, an amplification of 8,750, a selectivity of 213, and a side-band variation of 79 per cent. These figures are typical of well-designed H.F. stages of receivers of a year or so ago. Generally speaking, the amplification is quite sufficient for first-class reception of foreign stations on a good aerial. At distances of ten miles or more from the old London station the selectivity was great enough to allow the reception of stations working with about a 60 kc. separation from 2LO, but

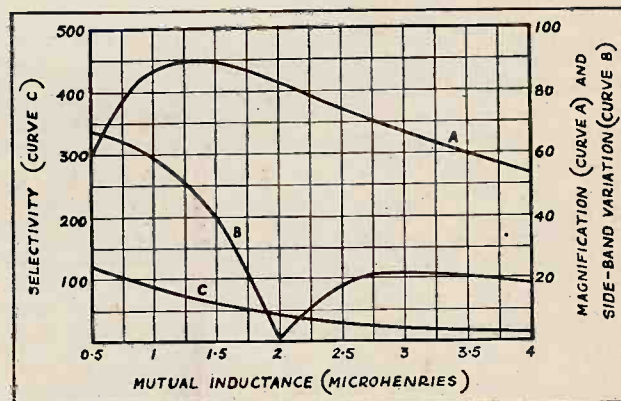


Fig. 3.—The same filter as in Fig. 2 but the curves are taken at 250 metres at which the coil resistance is 10 ohms.

the quality was usually poor due to side-band cutting. Now the power of the new station is about fifteen times that of the old, so that if the receiver is used at the same distance from it the selectivity must be increased fifteen times; that is, it must now be 3,195. If, in addi-

High Selectivity.—

tion, the new station is not so far away, a still further increase will be necessary. In the case when it is only one-third as far away, a further increase of three times is needed; that is, the total selectivity needed to get the same apparent selectivity as before is 9,585. It will be seen that a selectivity of 10,000 is not excessive for those living close to Brookmans Park.

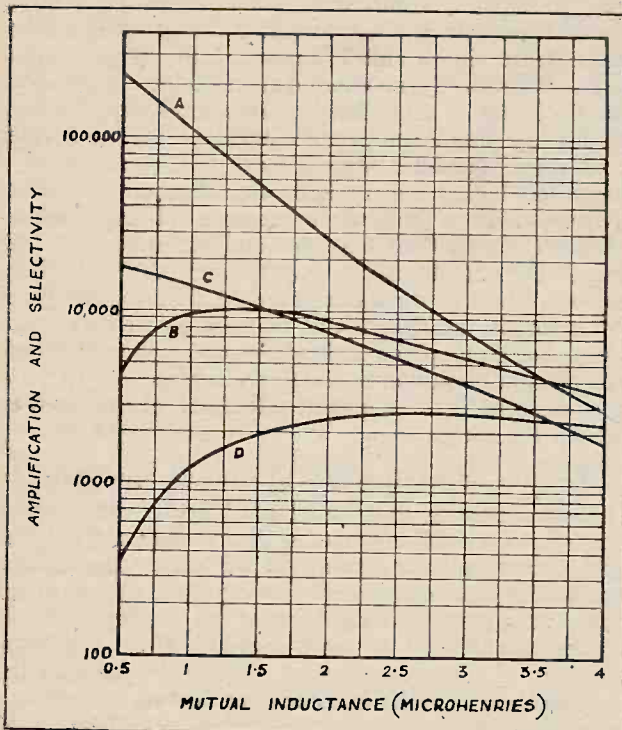


Fig. 4.—Showing the effect of mutual inductance on amplification and selectivity. Curves A and B show selectivity and amplification respectively for two filters with 5-ohm coils and an AC/SG valve at 500 metres. Curves C and D are for similar conditions but with 10-ohm coils.

If, therefore, an old set is rebuilt to include two band-pass filters the apparent selectivity on the new station will be about the same when it is one-third the distance away; the quality will be much better, but the amplification will suffer a slight decrease, for it will be about 25 per cent. less. This is, of course, provided that in both cases the optimum number of turns for the aerial winding is used.

When one comes to consider practical details, however, one finds that it is almost impossible to use coils having an H.F. resistance as low as 5 ohms when connected in circuit. The standard *Wireless World* type of Litz wound coil has this value of resistance when in circuit. But since the dimensions of this coil are about 3in. x 3½in., under ordinary circumstances it is obviously impossible to use four coils of this size. Not only is it difficult to find sufficient space for large coils, but it is not easy to obtain sufficiently loose coupling between the primary and secondary coils of the filter. It can be shown that the lower the coil resistance the looser is the coupling required, and this accentuates the difficulty. In addition, the use of large coils greatly in-

creases the risk of instability owing to their large external field. In practice, the only satisfactory way of using this type of coil in a filter circuit is to use either inductance or capacity coupling and to screen each coil completely.

While considering large coils, which have a low H.F. resistance and therefore give greater amplification, it is as well to point out that the amount of amplification affecting stability is greater than the stage amplification. The stage amplification is the overall amplification from the grid of the H.F. valve to the grid of the detector. The actual amplification affecting stability is the ratio of the voltage developed across the *primary* coil of the anode filter to the voltage on the grid of the H.F. valve. This may be nearly double the stage amplification, and with low resistance coils may cause trouble due to feedback through the grid-anode capacity. The coils to be described later in this article can be relied upon to give no trouble in this respect; they have a calculated H.F. resistance at 500 metres of 5 ohms, but when connected in circuit the figure will be higher. The exact figure is rather uncertain, but it is probably in the neighbourhood of 7 or 8 ohms; in any case, it is not greater than 10 ohms. The actual results with these coils, therefore, will be between those with 5-ohm coils and those with 10-ohm coils.

Using Four Tuned Circuits.

Curves C and D of Fig. 4 and curve B of Fig. 5 give the selectivity, amplification, and side-band variation respectively for a one H.F. set using two filter circuits with coils having an H.F. resistance of 10 ohms at 500 metres. An inspection of these curves reveals an interesting point; for a high-note loss of 40 per cent, a mutual inductance of 3 microhenries is required, and

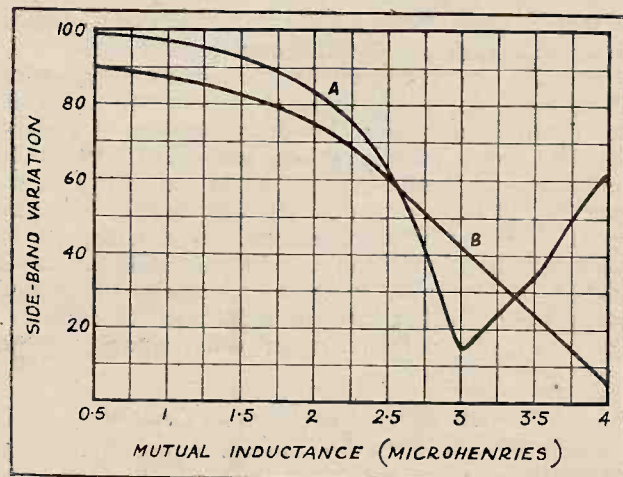


Fig. 5.—Side-band variation with change in mutual inductance. Curve A shows side-band variation with two filters, 5-ohm coils and an AC/SG valve at 500 metres. Curve B conditions are the same as those in curve A, but the coils are of 10 ohms resistance.

this is also the optimum value for amplification. With coils of 10 ohms resistance, therefore, the operation of adjusting the coupling is simple as it is only necessary to adjust for maximum strength. On the other hand, the best value of mutual inductance for quality is 4 microhenries, with which value the side-band variation

High Selectivity.—

is only 5 per cent., a truly remarkable figure for a set having four tuned circuits! Furthermore, the loss in amplification with this increase in coupling is only 14 per cent., an amount which is only just detectable by ear. The loss in selectivity with this tighter coupling, however, is rather more; it falls from 3,800 to 1,720, that is, a loss of 55 per cent. In some cases it may be a worth while loss, for the selectivity is still high in comparison with that of an ordinary set. It is not high enough, however, to give the best results near a high-power transmitter.

Earlier in this article it was said that a selectivity of

3,195 was necessary for good results at ten miles or more from Brookmans Park; if a 40 per cent. high-note loss is considered allowable, this degree of selectivity can easily be obtained by using two filter circuits with 10-ohm coils, each filter being coupled by a mutual inductance of 3 microhenries. The selectivity with this arrangement is slightly greater than is essential; and this is borne out in practice, for two filter circuits with the recommended coils give distinctly greater apparent selectivity with the new station than did two tuned circuits when the old 2LO was working.

(To be concluded.)

LOUD SPEAKER DEVELOPMENTS.

According to patent No. 312,756, a more even distribution of the energy applied to the diaphragm is ensured by using four moving coils instead of one. The coils A_1, A_2, A_3, A_4 are wound on cardboard rings spaced equally apart on the diaphragm D, as shown in Fig. 1. They co-operate with gaps formed in the pole-pieces of the four-pole magnet

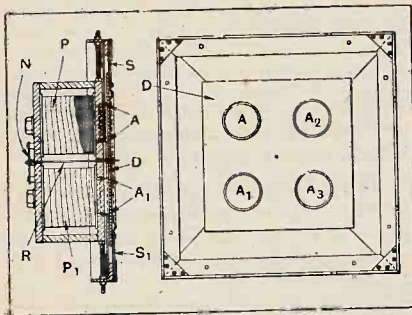


Fig. 1.—A speaker with four speech coils to ensure a more even distribution of energy. (No. 312,756.)

P, P_1 , etc. The windings may be connected in series or in parallel. The diaphragm D is supported around the edges by thin leather strips S, S_1 , and is centred by a rod R.

In the arrangement shown in Fig. 2

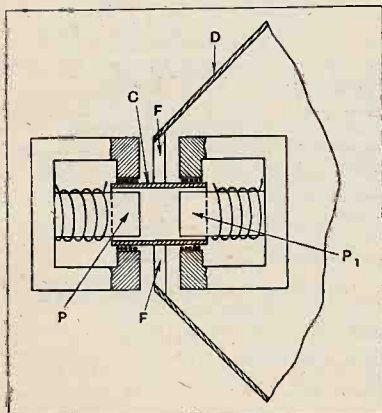


Fig. 2.—A moving coil with two pot magnets so arranged that the electrodynamic effects are additive. (No. 312,950.)

B 17

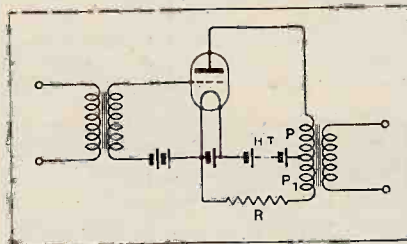
RECENT INVENTIONS OF WIRELESS INTEREST.

(patent No. 312,950) the moving coil C is mounted to co-operate with two adjacent pot-magnets P, P_1 , the windings of the coil being divided into two sections so that the electrodynamic effect is additive. The diaphragm D is connected to the moving coil by arms F extending radially outwards through the space between the adjacent magnets.

o o o o

L.F. TRANSFORMERS.

In the ordinary way the primary windings of the output transformer of a valve amplifier carries a direct-current component, as well as a fluctuating low-frequency current. The presence of the former may give rise to various undesir-



Output transformer with primary having two oppositely wound sections. (No. 313,229.)

able effects. For instance, if there is any residual "ripple" in the H.T. supply from an eliminator unit, the ripple will be transferred to the secondary winding and so pass on to the loud speaker. Again, the steady-current component may cause the transformer to operate on an unfavourable point of its magnetisation curve.

The arrangement shown in the figure (patent 313,229) is designed to prevent these drawbacks. The output primary consists of two oppositely wound halves P, P_1 . The portion P_1 is connected in series with a high resistance R across

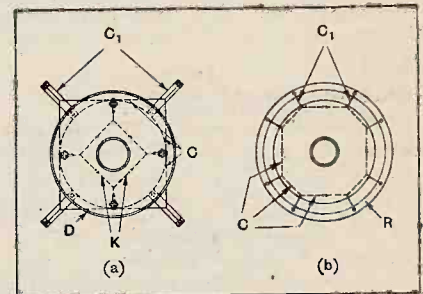
the terminals of the H.T. supply, R being of such a value that the current flowing through the lower half of the windings exactly neutralises the effect of that flowing in the upper half. If any "ripple" is present in the H.T. source, this will also be balanced out so far as its effect on the secondary is concerned.

o o o o

SUSPENSION SYSTEM FOR LOUD SPEAKER DIAPHRAGMS.

An interesting method of suspending a loud speaker diaphragm is described in patent No. 313,646. The suspension is designed to allow the diaphragm to move freely to and fro in the direction of the applied forces, i.e., in the so-called plunger fashion, whilst at the same time the diaphragm can "flex" or vibrate internally under the action of the stresses and strains set up in the material of which it is composed. The diaphragm is prevented, however, from moving as a whole in a plane at right-angles to the direction of the applied driving-forces.

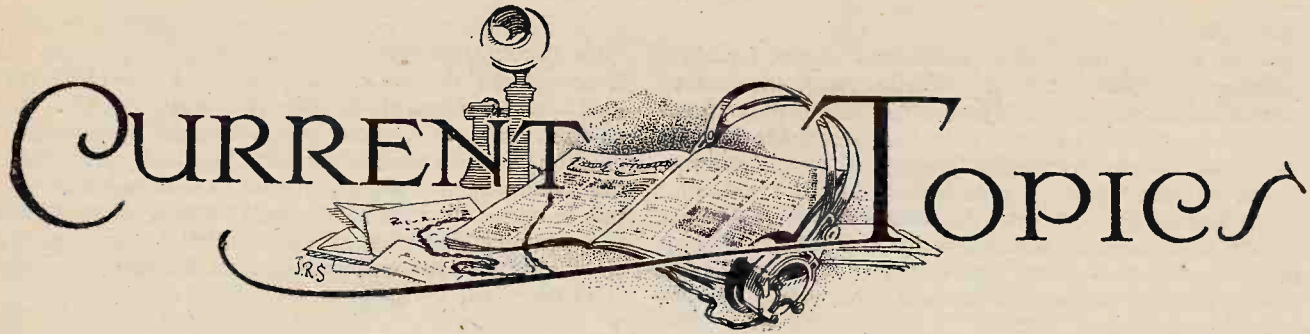
In one arrangement, Fig (a), tangential cords C are attached to the outer end of the cone, and form a square suspension, the corners of which are secured to a fixed support by auxiliary strings C_1 . A second similar string support K may be provided near the narrow end of the cone. In another arrangement, Fig.



Two methods of suspending a loud speaker diaphragm to give "plunger" action. (No. 313,646.)

(b), the string suspension C is in the form of an octagon, each corner of which is connected by other strings C_1 to a supporting ring R.

CURRENT TOPICS



Events of the Week in Brief Review.

SETS ON APPROVAL: NO LICENCE.

To encourage listening in Germany the Post Office is collaborating with the wireless trade in the introduction of a "sets on trial" system. Under this scheme, prospective purchasers are allowed a set on approval for eight days without taking out a licence.

IS RADIO-PARIS TOO ENGLISH?

The amount of British commercial publicity broadcast from Radio-Paris has led to a strong protest by the Paris evening paper, *L'Intransigeant*, which declares that listeners are praying for a new Joan of Arc to deliver the station while there is still time.

MEASURING SET PERFORMANCE.

"A Method of Measuring the Overall Performance of Radio Receivers" is the title of a lecture to be delivered by Mr. H. A. Thomas at a meeting of the Wireless Section of the Institution of Electrical Engineers on Wednesday next, January 15th. The meeting will be at 6 p.m. at the Institution, Savoy Place, W.C.2.

THE CENTRE OF GRAVITY.

The following extract from a school-boy's Christmas examination paper is forwarded to us by a well-known contributor:—

Question.—"What do you understand by the centre of gravity?"

Answer.—"The centre of gravity of the British Isles lies somewhere near Daventry, where the great wireless station is situated."

WIRELESS AT SCHOOLBOYS' EXHIBITION.

To-day is the closing date of the Schoolboys' Exhibition at the Horticultural Hall, Westminster. Several interesting wireless features are displayed, including a typical ship set, exhibited by the Shipping Federation, and an emergency wireless telephone transmitter for use in districts where land lines are impracticable. The latter is shown by the Telephone Development Association. Several well-known radio firms are represented.

WIRELESS SHOW IN HAVRE.

Havre is the first town to support the earlier exhibition movement. A radio and gramophone show will be held from January 31st to February 6th.

THE JOYS OF OLD AGE.

Exemption from payment of licence fees is now granted to German listeners who are too old to visit a theatre.

24-HOUR SHORT-WAVE SERVICE.

Kenya Colony, which has already won laurels with its broadcasting station at Nairobi, has now started a 24-hour con-

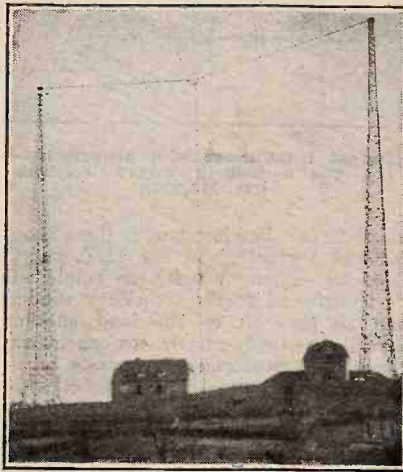
"GO HOME AND LISTEN."

A bigger listening public means a better broadcasting service. This is the animating principle of National Wireless Week, which opens on Sunday next, January 12th. The B.B.C. is doing its share in recruiting new listeners by providing special programmes. Much more can be done by listeners themselves, who will benefit their own interests by widening the circle of radio enthusiasts.

tinuous service from Mombasa. The Mombasa station works on 36.74 and 21.59 metres (C.W.) as well as on higher wavelengths for ordinary ship traffic.

FREE DINNERS FOR LISTENERS.

A new inducement to listening in Denmark is afforded by a guessing com-



HAMBURG'S SATELLITE. Kiel, one of the four stations which relay Hamburg programmes. The wavelength is 246 metres.

petition instituted by several broadcasting stations which transmit restaurant music. Listeners who can guess the titles of a given number of orchestral selections win a free dinner ticket.

KIT SET FOR BROADCAST RELAY.

Press cuttings from South Australia have just revealed to Messrs. A. C. Cossor, Ltd., the British valve manufacturers, that one of their Melody Maker kit sets (last year's model) was recently used by station 5CL, Adelaide, in a broadcast relay of a transmission from station KGO, San Francisco. The Cossor set picked up San Francisco on 23 metres, and, according to listeners' reports, the results were excellent.

THE RADIO "DIVINING ROD."

Oil prospecting by wireless and acoustic devices has engaged the attention of seven petroleum companies in the United States. The Federal Radio Commission has just allocated five frequencies for "geophysical exploration," these being 1,600, 1,652, 1,664, 1,680, and 1,704 kilocycles.

In the combined radio and acoustic devices calculations are based on the time lag between radio and sound waves transmitted simultaneously from a given spot. Geological and other considerations affect the speed of the sound waves, which often reveal the presence of oil.

HIDDEN ADVERTISEMENTS COMPETITION.

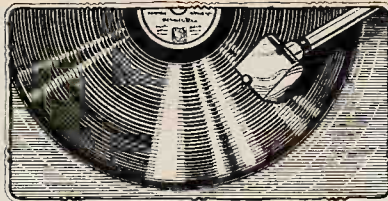
Since we announced the results of the recent Hidden Advertisements Competition, a number of readers have enquired as to the correct solution of the mystery. The clues were taken from the following advertisements:—(1) Ferranti, Ltd.; (2) Westinghouse Brake Co.; (3) Formo Co.; (4) C. A. Vandervell and Co.; (5) C. F. and H. Burton, Ltd.; (6) Wm. Bayliss, Ltd.

NATIONAL WIRELESS WEEK PROGRAMMES.

At the moment of going to press we learn of a change in the B.B.C. programme for Monday, January 13th. In place of the announced recital by Madam Suggia, referred to in this week's "Broadcast Brevities," Lionel Tertis will give a viola recital accompanied at the piano by Berkeley Mason.

GRAMOPHONE

Stroboscopic Indicator
for Use with A.C.
Lighting.



SPEED TESTER

By
H. LLOYD,
M.Eng., A.M.I.E.E.

This useful device has been accurately designed and affords a simple means of precisely checking the speed of a gramophone so that even a small error may be at once observed. The distorting effects produced by errors in the speed of rotation are explained. With the increasing use of electrical pick-ups where the load on the gramophone motor is uncertain the need for determining the rate of revolution of the turntable has become important.

THE original sounds recorded on a gramophone disc can only be reproduced correctly when the turntable of the gramophone rotates at a uniform speed, and, moreover, only when its speed is exactly the same as that at which the record was originally cut. Uniformity of speed is essential, and can only be ensured by the use of a good motor, properly adjusted, whilst the rate of revolution is set by means of the governor of the motor.

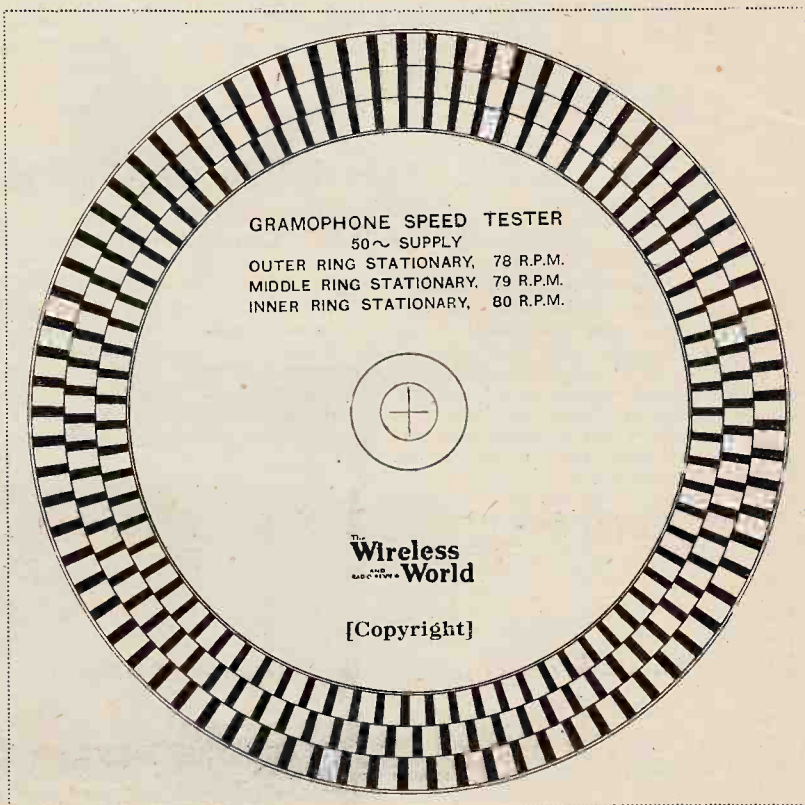
A record which runs too slow or too fast will produce sounds which differ from the original in several ways. In the first place, it is obvious that the tempo of music will be altered, though a slight deviation in this respect would generally, in the absence of other effects, pass unnoticed. There also occurs, however, a change in the pitch, music being transposed into a higher or a lower key, according to whether the record is running too fast or too slow. These two effects are well known to every gramophone user, and are not infrequently employed with deliberate intention—as in the case of dance music, to suit the speed to individual requirements, and for purposes of study, to “tune” the gramophone to the same pitch as a piano or other instrument.

Effects of Pitch Variations.

The divergence in pitch from that of the original performance may, however, produce decidedly undesirable effects. The pitch, or frequency, of every simple tone will be altered in the same ratio, and therefore a compound note, consisting of harmonic tones, *i.e.*, frequencies which are exact multiples of a fundamental, will be unaltered in quality. The simplest instance of this is the octave. An interval of an octave will remain an octave, whatever the speed of rotation of the record. All music, however, and especially that from some instruments, involves intervals which are inharmonic, and when these are modified by the speed of the gramophone,

the musical quality of the sound will be altered. The reaction of the ear to sounds is known to depend to a large extent upon the sensation due to subjective beat tones, and these will be altered when the notes combining to form them are changed in the same ratio, because the numerical difference, upon which a beat frequency depends, will no longer be the same. Transients in particular will be found to suffer to a marked degree.

This change in the quality of reproduced sounds occurs not only in music, but also in speech, and can



Paste the gramophone tester on to a piece of stiff card and carefully cut round the circumference. Punch a hole at the centre just large enough to admit the gramophone spindle. When placed on the revolving turntable and viewed by the light of a neon lamp connected to a 50 cycle A.C. supply the ring appearing stationary will indicate the running speed.

Gramophone Speed Tester.—

be demonstrated in a convincing manner even to an ear which is musically untrained by using a record of the speech of some well-known voice, such, for instance, as that of Sir Oliver Lodge. With the disc running a little too fast or too slow, the familiar tone of the voice becomes quite unrecognisable, altogether apart from the change in the speed of the discourse. That vowel sounds are modified can be shown by slowing down the record and listening for the *œ* sounds, which become *oo* quite distinctly.

All this serves to emphasise the point that the *quality* of sounds, as well as their pitch, may be affected adversely unless the motor speed is right. Most records bear the correct playing speed printed on the label, and this is usually either 78, 79, or 80 revolutions per minute. Except in the most expensive gramophones the speed indicator cannot be relied upon for great accuracy. Counting the revolutions of the turntable with the aid of a stop-watch is a simple but rather tedious process, but where alternating current lighting is available, there is an extremely convenient method, which depends upon the well-known principle of the stroboscope, of verifying the turntable speed.

If the accompanying illustration is pasted on to a piece of cardboard, and cut into a circular disc, with a hole punched in the centre having a diameter equal to that of the turntable spindle, it can be used as a quick

and accurate speed tester wherever there is A.C. lighting at 50 cycles frequency. Placing the disc on the turntable, and viewing it by the electric light as it rotates, the speed regulator of the gramophone is adjusted until one or other of the divided rings appears to be quite stationary, according to the speed requirements of the record to be played. If, for instance, 79 revolutions per minute is the desired rate, the middle one of the three divided circles is brought to rest by careful manipulation of the regulator. Under these conditions it is interesting to notice that the outer and inner rings appear to be slowly travelling round in opposite directions. The disc can also be used to detect any wavering in the speed of the turntable, and, since it is only four inches in diameter, it can be put on the top of a record whilst it is being played, to ascertain whether the load imposed by the pick-up is too great for the motor to handle satisfactorily.

The diagram illustrated is divided to suit a supply frequency of 50, which is rapidly becoming standard practice; any other frequency would require a different division of the circles. In cases where a pilot light is used in the instrument, just above the turntable for convenience in needle-changing, the substitution of a lamp of the Osglim neon-filled type shows up the stroboscopic effect very vividly, although it is sufficiently distinct enough for practical purposes with lamps of either the vacuum or half-watt variety.

(The disc shown on the previous page has been reprinted in more durable form on white opaque paper. Applications for copies should be accompanied by a stamp for postage.)

B.T.H. ELECTRIC GRAMOPHONE MOTOR.**A Universal Machine Embodying Sound Engineering Practice.**

THIS unit is of unusually massive construction and embodies the best engineering practice. Liberal use is made of aluminium alloy castings, and all bearings are of generous proportions. The main frame casting is mounted on rubber washers to absorb vibration.

The motor is of the universal type and can be used on either D.C. or A.C. mains. An adjustable resistance is provided so that the motor can be run off A.C. from 100 to 250 volts at 25 to 60 cycles, or D.C. from 50 to 250 volts—a range which covers most if not all the supply voltages available in this country. Measurements showed that the current consumption under load is of the order of 0.3 amp.

The drive is transmitted through a flat belt giving a reduction gear of approximately 4:1. The whole of the motor is mounted on swivel bearings and spring loaded to take up belt slack, the spring tension being adjustable.

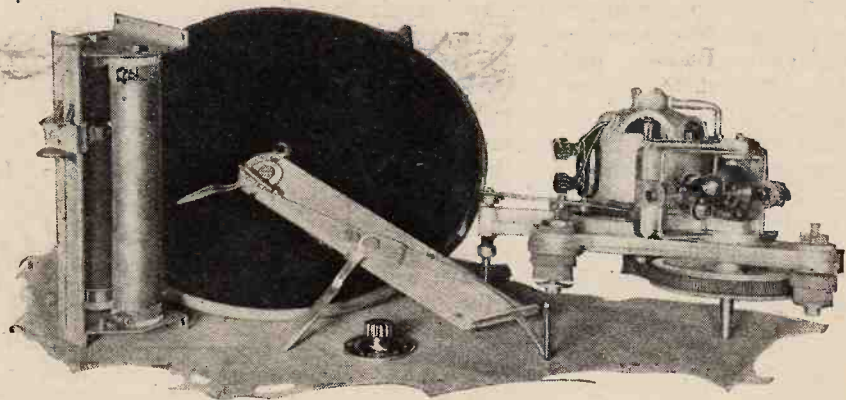
Speed regulation is obtained by means of a conventional friction governor driven through a skew gear of composition material mounted on the turntable spindle. The speed of the turntable is therefore unaffected by belt slip, provided the power transmitted by the belt is in excess

of the power absorbed in the record. Correct adjustment of the spring tension will ensure the attainment of this.

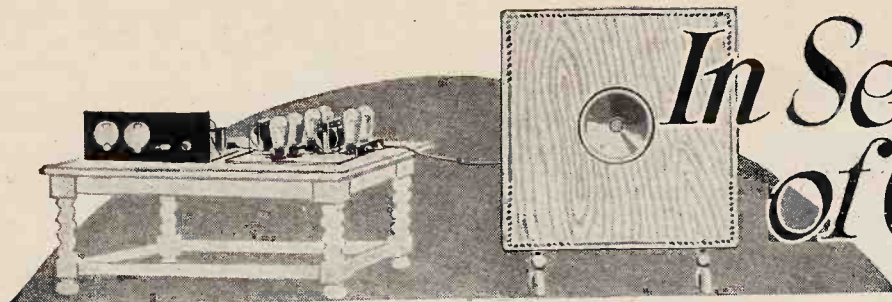
Tests showed that the reserve of power is in excess of all normal requirements, while the speed of rotation is constant and maintains its setting over long periods. A comparison between a stan-

dard tuning fork and the constant frequency records is a searching test of this quality.

The accessories include a neat trip switch actuated by the tone arm, which automatically cuts off the motor current at the end of the record. The price of the complete equipment is £6 6s.



B.T.H. electric gramophone motor and accessories.



In Search of Quality

A Reader Tells His Own Story.

By BERTRAM MUNN.

MR. R. P. G. DENMAN'S article in your issue of July 31st on the performance of logarithmic horns of adequate length was indeed refreshing.

At the risk of being shot at dawn, I must confess being guilty of *lèse-majesté* to King Cone and Co.—that is, to the reed-driven and the moving-coil-driven Monarchs of the Wireless World (by which I do not refer to your excellent publication). King Moving-Coil has, of course, been the worse tyrant of the two, for he has been the more powerful and dogmatic. During the last few years he has slowly and ponderously thudded his way into our presence (both in the streets and at home) until the life of the more gentle listener-in has become a veritable nightmare of noise.

It is no longer enough to own a loud speaker which fills an ordinary room with crisp and soothing music and speech; the thing now is: Can it deliver the LOW NOTES? Can it deliver them at full volume? Can you feel the thud-thud of the 32-cycle organ note hit you in the solar plexus? Do you get notes—real, deep, he-man sort of notes—which not only move you to ecstasy but even move heavy articles of furniture, make the floor vibrate, and disturb the plaster on the ceiling? When some coloured jazz musician smites the big drum at Savoy Hill, does it hit *you* at Tooting, Balham, Bedlam, or wherever you happen to be listening-in? Does it make the grandfather clock wobble? Is the jazz orchestra going full blast in your own house? If all of these hectic things do not happen, then you do not know what modern reproduction is.

Should you have—in your humble and obscure way—a reed-driven cone.

you are a man to be pitied—one who lives in darkness, or, rather, in comparative silence. Should you have a moving coil without a baffle board as big as the side of the room, you are living in a fool's paradise devoid of those cherished depths to which only a M.C. can descend. Even if you erect that terrific baffle board, or embed your loud speaker in the door or the wall of your private concert hall, you still cannot expect faithful results from your inadequate set. What? You have only *one power valve* in the last stage? No, even a super-power is insufficient. You want a carefully balanced crew of at least four—two push-pulling and two working in parallel.

Seeking to be modern, you pile valve upon valve, accumulators become useless, you resort to the mains, "juice" is poured through your set as though it were a miniature, electrically driven factory. And thus you become another lost soul who has been called to salvation. You thud. Your neighbour, hearing you, also thuds in due course. His neighbour, hearing him, becomes another convert to the band of thudders. And so the pounding and pounding of low notes goes on. It is literally contagious. The 32-cycle punch hits you—physically—and you fall for it.

If, like me, you have no cone, and you have no moving coil, you are anathema. What have you? What else *can* you have? You dare to whisper, simply and modestly, "just a little horn affair. . . ." The look of horror which sweeps over your interrogator's face is enough to make the strongest quiver.

And yet, Mr. Editor, here am I, hanging conservatively on to the old, old horn with which I be-



The author's 10ft. logarithmic horn speaker operating from a small reed-driven aluminium cone and mounted in an alcove to aid sound reflection.

In Search of Quality.—

gan imbibing sound waves when Edison's phonograph arrived and told me nasally that this was an "Edison Bell Record." When I say the old, old horn, I am, of course, guilty of poetic licence. Ordinary commercial horns are useless, except as examples of graceful curves and contortions, or as super ash-trays for cigar and cigarette ends. Long, long ago—back in the dark pre-cone ages—I decided that the only thing was to build one's own horn.

Sound Likes the Straight Path.

With the aid of endless penknives, safety-razor blades, oceans of glue, strips of all sorts and thicknesses of wood, and an extensive vocabulary of "cuss" words, I have built some dozen or so horns, varying from six to eleven feet in length. They have, however, all been straight and all have conformed—as really dutiful horns should do—to the logarithmic principle on which their lives are founded. It was clear from the first, even to my untutored mind, that sound hates to go round corners or curves. Any modern gramophone will tell you this, and those whose horns fold beautifully and fearfully in and out of themselves will tell it you best of all. However good their intentions are as regards space, they are "boxey." The deep baritone who sings to you of one moonlit night in Venice is incarcerated in a tub, a barrel, or some sort of resonating chamber from which he cannot escape. He is badly hampered by not getting a straight run for his money.

Solidity is naturally another very important factor. Any energy wasted in vibrating the sides of the horn is nearly that much less energy available for disturbing the peace. I have never placed my present ten-foot loud speaker on one of those penny-in-the-slot weighing machines, but it would certainly register more than any one of my flesh-and-blood offspring. It is hefty; but then it has some hefty work to do. One cannot expect to get either reasonable volume or depth from a portable pocket trumpet, or a cone disguised as a lamp shade.

It possesses neither a bell nor a well-defined flare. Instead of being dependent on one of these monstrosi-

ties, it flings its waves against the rocks of a suitably disposed reflector, which links up with the two walls of the room and the ceiling. The landlord charges me no more rent for utilising a portion of his house as part of my loud speaker. The arrangement is thus very economical as regards space. Scientifically, I may have committed a terrible *faux pas* by dispensing with that vital and terrific mouth which a big horn should possess, if it is to eat up the really deep notes.

I have heard moving coils so often and read so much about the complex laws to which they should bend the knee, that modesty forbids my calling any home-made loud speaker perfect; but, so far, I prefer my old-world "trumpet arrangement" to any other loud speaker I have heard at work in the ordinary room of an ordinary house.

Until recently the unit was the great difficulty, but at the moment I am getting along quite nicely with a small, reed-driven, corrugated aluminium cone, which seems to be 50 per cent. more efficient than the best stalloy diaphragm unit. I use a modified Everyman Four receiver, with push-pull at the business end, and (in a room eighteen feet by twenty-one) I am able to get everything I want from a whisper, for restfulness, to a full-blooded orchestra, for those wilder moments when one must dance—or burst. But I cannot deliver thuds. I get all the low notes I want, and, above all, a crispness and brilliance—which I also want. No one who has heard the loud speaker has yet told me that he knows of a better one—which may be due either to politeness (for which wireless fiends are not noted) or to love of truth.

Thus do I remain faithful to my old love. I am, however, still awaiting the advent of a well-designed unit (which does not clamour for too much "juice"). When it arrives on the jaded market my ten-foot horn, realising its own worth, will give the newcomer a cordial welcome and will look down on the moving coil with even greater scorn than it does to-day.

I now resignedly wait for a party of moving-coil patriots to convey me to some quiet spot in Richmond Park—there to shoot me in the cold grey light of the dawn (which I hate even more than I do the moving coil).

Ralph Stranger's Wireless Library for the "man in the street":

No. 1.—**MATTER AND ENERGY.** The Chemical Elements. Structure of the Atom, Heat, Cold, Energy, etc.

No. 2.—**ELECTRIFIED MATTER.** Electrons, Distribution of Charges, Electric Fields, Discharges, etc.

No. 3.—**ELECTRONIC CURRENTS.** E.M.F. Ohm's Law, Alternating Currents, etc.

No. 4.—**MAGNETISM AND ELECTRO-MAGNETISM.** Permanent Magnets, Electro-magnets, Induction, Dynamos, Motors, etc.

No. 5.—**THE MATHEMATICS OF WIRELESS.**

No. 6.—**BATTERIES AND ACCUMULATORS.** Charging, etc.

Written in simple language for the instruction of the ordinary non-technical man. Each part comprises sixty-four pages with numerous illustrations and

BOOKS RECEIVED.

diagrams. Published by George Newnes, Ltd., London. Price 1s. each part. Further parts in preparation.

General Physics and Its Application to Industry and Everyday Life, by Ervin S. Ferry, Professor of Physics in Purdue University, U.S.A. (Third Edition.)—A textbook for technical students comprising the Elements of Dynamics, Sound, Heat, Electricity and Light, with 1,634 Problems or Examination Questions relating to these subjects. Pp. 839+xix with 603 diagrams and illustrations.

Published by John Wiley and Sons, Inc., New York, and Chapman and Hall, Ltd., London. Price 20s. net.

Reminders for Company Secretaries (Fifteenth Edition), by H. W. Jordan.—Revised and rewritten for the assistance of secretaries of limited companies in view of the additional obligations imposed by the Companies Act, 1929, which came into operation on November 1st. Pp. 66+xxxii. Published by Jordan and Sons, Ltd., London. Price 2s. 6d.

Photoelectric Cells, Their Properties, Use and Applications, by N. R. Campbell and D. Ritchie.—A practical book explaining the theory and use of these cells and their application to Phototelegraphy, Television, Photometry, Absorption of Light, Colour Matching, etc. Pp. 209 with frontispiece and 41 diagrams. Published by Sir Isaac Pitman and Sons, Ltd., London. Price 15s. net.

LABORATORY TESTS.

A Review of Manufacturers' Recent Products.

WATES THREE-RANGE PANEL METER.

This measuring instrument provides a ready means of checking the H.T. and L.T. voltages, also the total anode current taken by the set. The three ranges read respectively 0-150 volts, 0-6 volts, and 0-30 mA. It is intended that the meter should be mounted on the panel together with an eight-socket range selector board supplied with each meter. By suitably interconnecting the sockets on this board the various ranges are brought into use. Two-pin plugs are supplied for this purpose. An illustrated leaflet explains clearly the correct method of wiring.

Two specimen meters were sent in for test, and measurements were made with these, using standard laboratory instruments to check their accuracy. The results are tabulated below.

Specimen I showed a maximum error of 5 per cent., and specimen II, 9 per cent.

On the 150-volt range the first-mentioned sample showed a maximum error of 4.4 per cent. and the second 6 per cent. This error appeared at the 50-volt mark, the meters showing greatest accuracy between 100 volts and 150 volts.



Wates panel-mounting meter and range selector board.

The first specimen had a resistance of 32.5 ohms per volt on the 6-volt range and 32.8 ohms per volt on the 150-volt range. In the case of the other sample the resistance was 33.3 and 33.6 ohms per volt respectively. These values are ad-

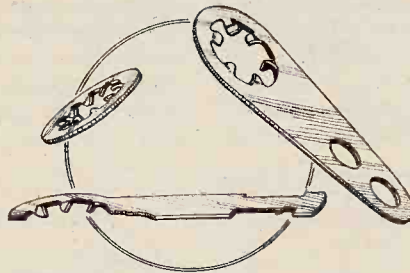
mittedly low, particularly for an H.T. voltmeter, and the instrument should be used only for making check readings, and not left permanently in circuit.

The makers are the Standard Wet Battery Co., 184-8, Shaftesbury Avenue, London, W.C.2, and the price, complete with accessories, is 13s. 9d.

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"SHAKEPROOF" LOCK WASHERS.

Special washers provided with teeth which grip firmly the locking nut and the assembled parts have been in use in



Examples of "Shakeproof" lock washers and terminal tags.

the U.S.A. for some time past, and are now to be introduced into this country. Messrs. Barber and Colman, Ltd., Brooklands, Manchester, have acquired the sole manufacturing and selling rights for Great Britain. Some early samples of these devices have been sent to us for review. These consist of lock-washers and special terminal tags. It is claimed that they will withstand shock and vibration and will not loosen. Those who have had much experience with nut and washer connections will appreciate the advantages of a sure and certain contact of this nature.

The locking washers have twisted teeth set at equal intervals around the internal edge. When the nut is tightened these teeth bite into both surfaces between

which it is placed and form a positive locking arrangement which is shake-proof.

Locking teeth similar to those on the washers are provided on the inside edges of the holes in soldering tags. The samples sent in are for use on 2- and 4-B.A. stems, but, no doubt, other sizes are available.

So far we have not been notified of the prices for these, and interested readers are referred to the manufacturers for this information.

o o o o

"CLIMAX" RESISTANCES.

The "Climax" potential divider, which readers may recall was hitherto wound on a grooved wooden former, thus dividing the whole into sections of equal resistance, has recently been re-designed.

Sectionalised winding is retained but the sections are of unequal resistance value, having been chosen to give more convenient voltages at each tap. A grooved paxolin former is used now in place of the earlier arrangement. The nominal value is 20,000 ohms; its measured resistance was found to be 19,400 ohms. The largest section was 22 per cent. of the total resistance, the other sections varying from 7 per cent. to 10 per cent. of the whole. The price remains at 5s.



Climax 20,000-ohm wire-wound potential divider and 600-ohm decoupling resistance.

An addition to their range of components takes the form of some wire-wound decoupling resistances. The wire is wound in a groove on a former the size of a halfpenny in diameter and equal to three in thickness. So far these are supplied in values of 600, 10,000 and 25,000 ohms. A 600-ohm sample was measured and found to have a resistance of 646 ohms. The price is 2s. in each case. The makers are the Climax Radio Electric, Ltd., Haverstock Works, Parkhill Road, Hampstead, London, N.W.3.

Scale.	0-30 mA. Range.		Scale.	0-6 Volt Range.	
	True Current.			True Voltage.	
	Specimen I.	Specimen II.		Specimen I.	Specimen II.
5 mA.	5.2 mA.	5.45 mA.	1 volt	1.02 volts	
10 "	10.5 "	10.8 "	2 volts	2.05 "	
15 "	15.2 "	15.2 "	3 "	2.98 "	
20 "	19.9 "	20.2 "	4 "	3.9 "	
25 "	24.8 "	25.1 "	5 "	4.85 "	
30 "	29.5 "	30.0 "	6 "	5.72 "	



Part XVI.—Resonance in Parallel Circuits.

By S. O. PEARSON, B.Sc., A.M.I.E.E.

(Continued from page 24 of previous issue.)

CONSIDERATION must now be given to another kind of tuned circuit, differing in several ways from the ordinary series or tuned grid circuit considered in the two preceding instalments. This is the parallel type of tuned circuit where the condenser and coil are connected in parallel with respect to the E.M.F. applied to the circuit. The condenser is connected across the coil and the alternating E.M.F. is applied to the ends

From Fig. 1 (b) it is quite clear that no E.M.F. is induced into the closed circuit, but that a voltage is applied between the ends A B. Under these conditions the behaviour is entirely different from that of the series circuit or tuned grid circuit, and so before we can deal intelligently with a tuned anode circuit and see what factors make for the highest efficiency, it will be necessary to investigate the general properties of the parallel circuit.

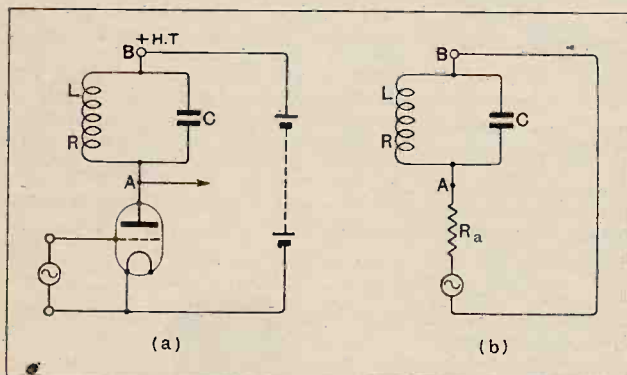


Fig. 1.—(a) Ordinary tuned anode circuit of high frequency and (b) the equivalent simplified circuit.

of the circuit, that is, across it, and not introduced into the closed circuit.

The commonest example of the parallel type of circuit is afforded by the ordinary tuned anode high-frequency intervalve coupling of a high-frequency amplifier valve, as indicated in Fig. 1 (a), where L R C is the tuned circuit. When an alternating voltage is applied between the grid and filament of the valve, a corresponding voltage, several times greater than that applied to the grid, is set up in the anode or plate circuit, and this drives an alternating current between +H.T. terminal and the filament of the valve, the circuit being completed through the high-tension battery. The part of the circuit between the anode and filament has a high resistance, being the internal resistance (so-called impedance) of the valve itself. Hence the complete anode circuit is electrically equivalent to the simplified circuit of Fig. 1 (b) where R_a represents the valve resistance and E_a the voltage "generated" in the anode circuit by the action of the valve. The D.C. voltage and current due to the H.T. battery play no direct part and do not affect the properties of the tuned circuit.

Simple Parallel Circuit Without Resistance.

Consider a circuit such as that shown in Fig. 2 (a) where a condenser of capacity C farads is connected across a coil whose inductance is L henrys. An alternating voltage whose R.M.S. value is E is applied to the ends A B of the circuit and thus drives a current through each branch.

It will simplify matters a great deal to assume in the first place that the coil has no resistance whatever, find the conditions obtaining at resonance, and then consider the effects of resistance afterwards. It should be noted that for a parallel circuit the applied voltage is common to all branches and a separate current flows through each branch and can be calculated, if the voltage is known.

So in our imaginary perfect circuit of Fig. 2 (a) the current through the coil will be $I_1 = \frac{E}{2\pi f L}$ amperes where $2\pi f L$ is the reactance of the coil in ohms, f being

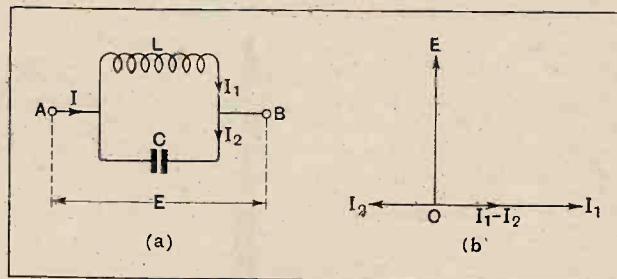


Fig. 2.—(a) Parallel circuit assumed to possess no resistance. (b) Vectors showing the phase relationships of the three currents I , I_1 and I_2 .

the frequency. This current I_1 lags behind the voltage by a quarter of a cycle. In the same way the current through the condenser branch will be $I_2 = 2\pi f C \times E$

Wireless Theory Simplified.—

amperes, where $\frac{I}{2\pi fC}$ ohms is the reactance of the condenser. This current leads the voltage by a quarter of a cycle. Hence if the line O E in Fig. 2 (b) represents the voltage applied to the circuit, OI_1 will give the current in the coil, lagging by 90° , and OI_2 the current in the condenser branch, leading the voltage by 90° .

Now, since I_2 is a quarter of a cycle ahead of the voltage and I_1 is a quarter of a cycle behind, it follows that the two currents are out of step by just half a cycle—that is to say, they are in exact phase opposition. This means that whenever the current in the coil is flowing in the positive direction, say from left to right, the current in the condenser branch will be negative or from right to left in the circuit, and *vice versa*.

These conditions of phase opposition are clearly portrayed by the sine waves of Fig. 3, and it is the existence of this state of affairs that accounts for the peculiar properties of the circuit. Note that each current is out of step with respect to the voltage by a quarter of a cycle. It means that the two currents I_1 and I_2 are always flowing in opposite directions with respect to the external circuit or source of supply, and so partly neutralise each other in the external circuit if they are unequal. Since the two current waves are in direct opposition the resultant current I taken from the source will be simply the numerical difference between I_1 and I_2 . So $I = I_1 - I_2$ amperes or $I_2 - I_1$ amperes, according to which is the larger.

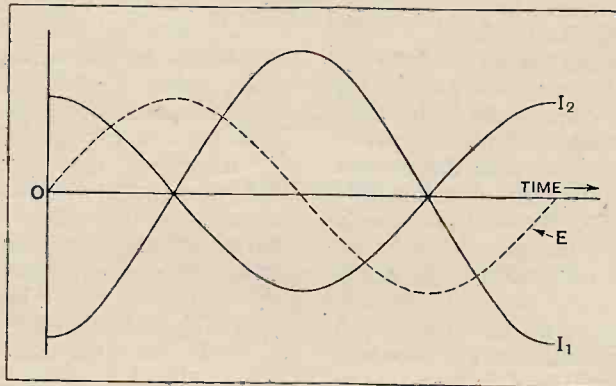


Fig. 3.—Curves showing that the current I_1 in the coil is in direct opposition to current I_2 in condenser. Each current is out of step with respect to the voltage E .

Conditions for Resonance.

Imagine now that the frequency of the voltage applied to the circuit is varied from a very low value to a very high value. The current I_1 taken by the coil is inversely proportional to the frequency, whereas the current in the condenser branch is directly proportional to the frequency. Hence as the frequency is raised the current taken by the coil will start from a high value and fall, whilst that taken by the condenser will build up from a very low value to a high value. This means that at low frequencies I_1 is greater than I_2 , and at high frequencies I_2 is greater than I_1 . Hence there must be one particular frequency for which the currents in the branches will be equal, and this is the resonant frequency of the circuit.

For complete resonance, then, we have $I_1 = I_2$, or $\frac{E}{2\pi fL} = E \times 2\pi fC$, whence $(2\pi f)^2 = \frac{I}{LC}$ or $f = \frac{I}{2\pi\sqrt{LC}}$ cycles per second, being exactly the same as for the series circuit considered previously.

The Oscillating Current.

Now, since the current I in the external circuit, drawn from the source of supply, is equal to the numerical

difference between the currents I_1 and I_2 in the branches, and since these two are equal at the resonant frequency, it follows that when a circuit like this, having no resistance, is tuned to complete resonance, it takes no current whatever from the source of supply, because $I_1 - I_2 = 0$. Yet at the same time a considerable current, whose value is $I_1 = I_2$, will be flowing backwards and forwards round the closed loop L C of Fig. 2 (a). It constitutes a true oscillating current.

This might at first savour of the impossible. In practice the condition cannot be fully realised, because we cannot get a circuit without *some* resistance, but, as will be seen later, it is actually possible to arrange a circuit so that the current supplied to it is only a small percentage of that oscillating round the closed loop. If we could get a resistanceless circuit, however, a heavy oscillating current would be produced as explained, without any current flowing in or out at the ends of the circuit.

It might appear at first sight that we are getting energy from nowhere! But, of course, this is not the case, and the explanation of the behaviour of the circuit is fairly simple. It will be remembered that the average power

taken by a pure inductance and by a condenser was zero, and therefore once the oscillating current has been started, no further energy will be required to maintain it. This principle can be very clearly illustrated by a simple mechanical analogy: Suppose a heavy pendulum is suspended in a perfect vacuum on a suspension spring absolutely free from losses. When once such a pendulum has been set in motion it would go on swinging for ever without being driven. There is

nothing to stop it. (In practice the small losses in the suspension would cause it to come to rest after several hours.) The same conditions exist in our imaginary perfect circuit; there are assumed to be no losses whatever.

Oscillation of Energy.

Before considering a more practical circuit where resistance, and hence energy loss, is present, we must consider what is actually happening within the closed circuit itself; it is necessary to have a sort of mental picture of what is going on. Although no energy is coming in from the outside source it must be obvious that energy is stored within the fields of the coil and condenser at any instant, and that because nothing is coming in or going out the sum of the energy stored in the magnetic field of the coil and in the electrostatic field of the condenser must be a constant quantity.

Now the current round the closed loop is exactly a quarter of a cycle out of step with respect to the voltage across the circuit, and therefore when the current through the coil is a maximum the voltage across the condenser

Wireless Theory Simplified.—

is zero. Hence at this instant the magnetic field linked with the coil will have its greatest intensity, and there will be no lines of electrostatic force in the dielectric between the plates of the condenser. This means that the whole of the stored energy in the circuit is in the magnetic field of the coil at the particular instant considered, and the condenser carries no energy at all. If I_m is the maximum value of the current, the energy stored in the magnetic field is $\frac{1}{2}LI_m^2$ joules at an instant when that in the condenser is zero.

Just a quarter of a cycle later the current will have fallen to zero, and the voltage across the condenser will be a maximum, and we find now that the whole of the energy is contained in the electrostatic field of the condenser, the magnetic field having fallen to zero. If E_m is the maximum value of the voltage, the energy stored in the condenser is $\frac{1}{2}CE_m^2$ joules, as explained in a previous section.

Now as we have seen that no energy is coming into the closed circuit, and neither is any being lost as heat (heat can only be generated in a resistance), it follows that during the quarter of a cycle considered *the whole of the energy originally possessed by the magnetic field of the coil has been transferred to the condenser*, there being no loss and no gain. During the next quarter cycle, when the voltage again falls to zero and the current builds up to a maximum in the opposite direction, the energy is transferred back again to the field of the coil. So every quarter-cycle there is a complete interchange of energy between the coil and condenser. The whole principle of action of a tuned circuit pivots on the fact that the condenser is always giving up its energy when the magnetic field is being established and is therefore calling for energy, and *vice versa*. *In a circuit tuned to resonance, then, energy is being oscillated backwards and forwards between the coil and the condenser.*

Comparison with Mechanical Oscillations.

It is here that a mechanical illustration will assist materially in obtaining a clear conception of what is occurring in the resonating circuit. It will be remembered that inductance was likened to the inertia or mass

of a material body, and that the reciprocal of capacity was compared with the stiffness or elasticity of a spring (see page 600, November 27th issue).¹ Now if a weight W is suspended on the end of a vertical spiral spring rigidly fixed at the upper end, as shown in Fig. 4, and if the weight is then pulled downwards a short distance and released, it will continue to oscillate up and down. If the whole contrivance were enclosed in a perfect vacuum to eliminate air resistance, and if there were no energy losses in the spring itself, the oscillations would continue indefinitely without any further supply of energy from an external source. In a similar way the electrical oscillations in the resistanceless tuned circuit maintain themselves, once they have been started, without drawing any further energy from the source.

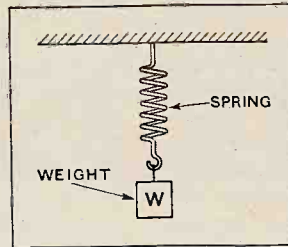


Fig. 4.—Weight and spring arrangement for illustrating electrical oscillations in a tuned circuit.

When the weight W is pulled down initially, energy is imparted to the spring in extending it. When the weight is released it is accelerated upwards by the pull of the spring and energy is transferred to it from the spring, being converted into energy of motion, or kinetic energy. At the instant the weight has reached its original position it has acquired considerable velocity,

the whole of the energy having been given up by the spring. Owing to its momentum the weight continues to move upwards and compresses the spring, which now retards the weight until it brings it to rest once more, and then accelerates it downwards again. When the weight is at its highest or its lowest point the whole of the energy is contained in the spring, whereas in the mid position, where the velocity is greatest, the energy is all kinetic and within the weight.

It will thus be seen that the energy is oscillating backwards and forwards between the weight and the spring in exactly the same way that the energy in the tuned circuit oscillates between the condenser and the coil.

The formula for the frequency of oscillation of the spring and weight is also of exactly the same form as that for the resonant frequency of the tuned circuit.

¹ Erratum: The 9th line of column 2 on page 600 should read:—" . . . that $\frac{1}{C}$ in the one case corresponds to S in the other "

(To be continued.)

Swiss Amateurs.

The Radio Club of Zurich is transmitting telephony tests on 42 metres from its station HB9D at 33, Spyristr. on the first and third Saturdays of each month between 13.00 and 20.00 G.M.T. and will welcome reports from Great Britain. Our Zurich correspondent, who sends this information, states that British amateur stations as a rule are received there very clearly, and he especially mentions G5JO, an amateur station at Cambridge.

A Correction.

A correspondent has drawn our attention to an error in the call-sign of the

Transmitters' Notes.

Barcelona station, as printed in our list of short-wave broadcasting stations on page 595 of our issue for November 27th. This should read EAR 25 instead of EAJ 25; the latter was the call-sign of the Malaga Broadcasting Station which is now closed down. EAR 25 is controlled by the Radio Club of Cataluña.

New Call-Signs and Changes of Addresses.

- G2FS L. K. Winsor, 375, Hessele Rd., Hull.
- G12KN B. McCann, 104a, Divis St., Belfast.
- G2XS H. W. Sadler, "St. Raphael," Anston Ave., Workop, Notts.
- G5CB Capt. K. Hartridge, 2, Westbourne Crescent Mews, London, W.2. (Change of Address.)
- G5DK J. S. Dykes, Thorncliff, Skelmorlie, Ayrshire.
- G5VA J. Wright, 13, New St., Ball Green, Stoke-on-Trent.
- G5ZN P. Nicoll, 167, Tomorden Rd., Burnley, Lancs. (Transmits on 7,146 kC. and 14,060-14,340 kC. and will welcome reports.)
- G6IO T. Woodhouse-Rayner, 25, The Gardens, London, S.E.22.
- G6TZ W. R. Bottomley, Providence Electrical Works, Luck Lane, Marsh, Huddersfield. (Change of address.)

New Method of Detection using A.C. Valves

Tests of the Marconi and Osram MHL4 and ML4 Valves.
The MHL4 as a Grid Detector.



WE have become accustomed to consider the leaky grid detector as a valve with an applied anode voltage of but 60, capable of handling rather less than one volt (R.M.S.) signal input. In these circumstances with the usual values of grid condenser and leak there has been a certain amount of high-note loss. With 240 volts. H.T. and modified grid circuit constants it is shown in the accompanying article that a valve such as the MHL4 when used as a grid detector can accept quite large inputs and give an output of a quality better than the best that the anode rectifier can produce. For local station reception where loading of the input circuit is of little consequence this new form of detection should be of great interest.

IN *The Wireless World* for January 26th, 1927, there appeared a review of the Marconi and Osram K.L.1 valve, which was the first indirectly heated mains valve that was introduced in this country. It was nearly a year before any competitor appeared to challenge its position as the only valve suitable for heating from alternating-current mains. We were therefore particularly interested in being able to examine the latest indirectly heated valves of the Marconi and Osram Companies.

The new series consists of four valves in all, one of which is a screen-grid valve, the other three being triodes of varying amplification factors. The two that we have had under examination are the low and medium-impedance triodes, known as the ML4 and the MHL4 respectively. The description of the valve is not arbitrary, but expresses its functions; M stands for "mains," L and HL indicate low and medium impedance, while 4 is the voltage required for the heater, at which voltage the current drawn is one ampere, the modern standard consumption for valves of this general type. Since the ampere in question comes from the mains, there is no need to attempt economy in consumption, with the result that the valves have a higher efficiency than is usual with battery-heated valves—a desirable feature which is accentuated by the fact that, as the emit-

ting surface does not carry current, it is at the same potential throughout its length. The whole of it—and not, as in battery-heated valves, a part only—is therefore effective in providing electrons for the plate circuit.

Construction.

Perhaps the most noticeable feature about the valves of this series, as compared with other mains valves, is their small size. Most A.C. valves are very decidedly larger than those intended for battery operation; the Marconi and Osram M valves are larger than the HL 610 of the same make, but smaller than the DE5A. A second unusual feature is the material of which the plate is made; this is not the sheet of metal that we have become accustomed to expect, but a piece of metal gauze instead. We suspect that this is meant to keep the grid of the valve cool, and so to help towards preventing grid emission, which is always difficult to avoid in mains valves. If this is the purpose of the gauze plate, it has achieved its object; no one of the four separate valves examined showed any reverse grid current, though half a micro-ampere would have been easily detected with the instrument used. The absence of reverse grid current also shows the valves to be absolutely hard.

The ML4.

The ML4 valve is modestly described as a "general-purpose"

valve, but as it has an impedance of no more than 3,000 ohms, and will run quite happily with a plate-current of 19 milliamps. at 200 volts, we feel that this description errs on the side of understatement. In a battery-heated series, such a valve would probably be called a "super-power" valve; it is adequate to run a moving-coil loud speaker at quite respectable strength. If greater power is needed, the ML4 may be followed by a valve of the LS5 class, for which it will easily provide the very large grid swing required.

The maker's rating of the valve is as follows:—

A.C. resistance	3,000 ohms.
Amplification factor	6
Mutual conductance	2.0 mA. per volt.
<small>(Measured about anode volts 100, grid volts 0.)</small>	

Both the samples we tested, which were practically identical, had the stated mutual conductance, but were a shade lower both in A.C. resistance and in amplification factor than the rated figures. The deviation is too small to signify, and low impedance is a virtue in a valve rather than a vice. Curves, on a large scale, are given for one of the valves, and the best working conditions, as determined from these, is very close to the suggestions made by the makers on their instruction sheet. Taking their advice, and adjusting the grid-bias to provide the current they mention as desirable for each value of plate voltage, we should

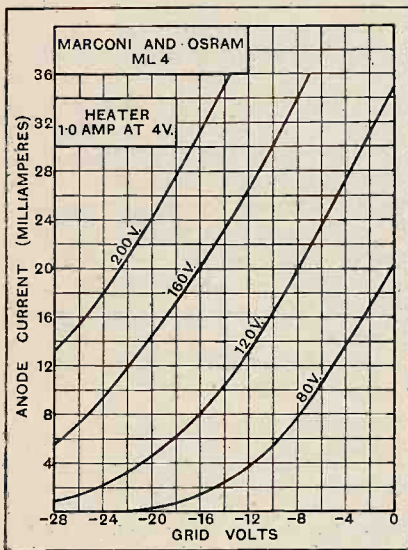
New Method of Detection Using A.C. Valves.—

suggest the following working conditions:—

Anode Voltage.	Grid Bias.	Anode Current.
100	10½ v.	10 mA.
120	12 v.	13 mA.
160	19 v.	16 mA.
200	23 v.	19.5 mA.

At the full 200 volts, the maximum anode voltage permitted, the valve will provide about three-quarters of a watt of undistorted power for the loud speaker. In watts this does not sound much, but it makes noise enough, when a reasonably sensitive speaker is used, to make conversation difficult in an ordinary room.

In addition to its possibilities in the output stage, the ML4 may be used as a detector or as a low-frequency amplifier. Supplied with very strong signals (about 15 to 20 volts R.M.S.) it would make a first-rate anode-bend detector for a



Grid voltage-anode current characteristics of the Marconi and Osram ML4 valve. Grid current starts at minus 0.4 grid volts. The measured A.C. resistance and amplification factor were 2,600 ohms and 5.2 respectively, giving a slope of 2.0 mA per volt.

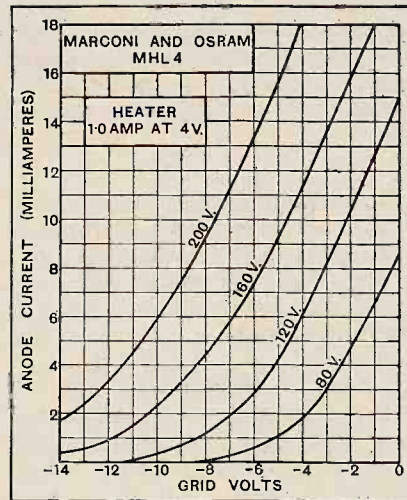
“ quality ” receiver. If followed by a transformer it would give very adequate reproduction of low notes, though it would be necessary to arrange a resistance- or choke-feed to prevent the heavy plate current from passing through the primary. The same precaution would be required if the valve were in use as a low-frequency amplifier.

The MHL4.

The maker's rating of this valve is as follows:—

A.C. resistance	8,000 ohms.
Amplification factor	16
Mutual conductance	2.0 mA. per volt.

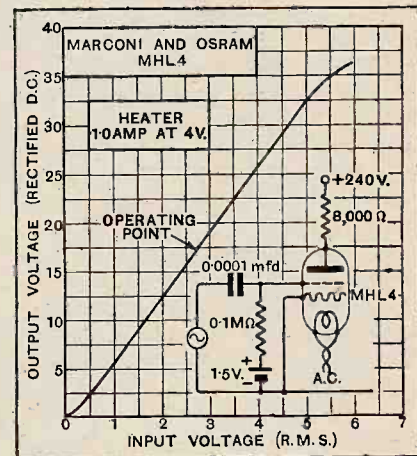
Both the valves tested had a higher mutual conductance than the nominal value, the amplification factor being a shade lower, and the A.C. resistance a good deal lower than stated. Curves are reproduced herewith to enable the anode current at different voltages to be estimated.



Measured characteristics of the Marconi and Osram MHL4 valve. Grid current starts at minus 0.75 grid volts. The A.C. resistance is 6250 ohms and the amplification factor 15, giving a slope of 2.4 mA per volt.

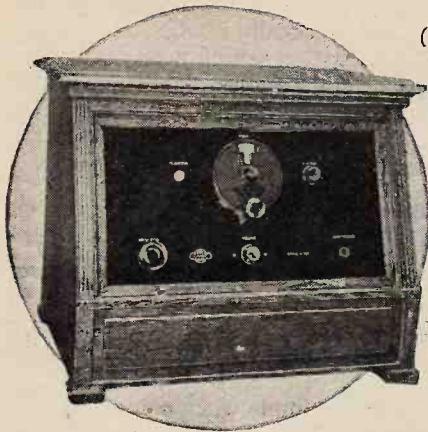
This valve is a very welcome addition indeed to the range of mains valves, for it fills a gap that has long been in existence between the high-impedance and the low-impedance mains valves. It is particularly suited for use as a rectifier, whether on the anode-bend or leaky-grid principle, and is equally serviceable either with resistance or transformer coupling in the low-frequency amplifier. Once again, a transformer should be resistance-fed unless its primary is capable of retaining a high inductance with some eight or ten milliamps. passing through it. In a resistance amplifier the MHL4 should combine good amplification with very perfect reproduction, especially of the high notes. A resistance of some 20,000 ohms is suggested as suitable for this purpose.

In the course of a recent conversation with Mr. Denman, who is designing a new demonstration receiver for the Science Museum, we were shown some rectification curves of a somewhat similar valve. We were therefore interested to examine the suitability of the MHL4 for use as a distortionless grid rectifier. A curve connecting input A.C. voltage with rectified output voltage is given herewith, and it will be seen that this curve is most gratifyingly straight over most of its length. With an input of 2.75 volts (R.M.S. signal voltage) rectification introduces no harmonics whatever until the modulation approaches 80 per cent., and the output of rectified signals, on average modulation, is in the neighbourhood of 8 volts or so. This implies a quality better than the best that the anode rectifier can give; the diode rectifier itself, which is taken as the standard for quality, can do very little better. The conditions under which the measurements were made is given in



The distortionless curve of the MHL4 valve used as a “ power ” detector working on the leaky-grid principle. The circuit constants are given. The anode current is 14 mA. and the change in current on tuning in the signal is 2 mA for optimum rectification.

the figure, so that immediate use may be made of the data by those who may be interested. The comparatively high anode current (14 milliamps.) would be hardly likely to shorten the life of the valve, since its maximum watts dissipation is 4. In any case the writer proposes to use it in a set destined for local-station reception.



BROADCAST RECEIVERS

IGRANIG NEUTROSONIC SHORT WAVE SET

A Successful Application of the Superheterodyne Principle to Short-wave Reception.

THERE is nothing essentially novel in the idea of applying the superheterodyne principle to short-wave reception: In the days when direct H.F. amplification below 600 metres was attended with considerable difficulties, the superheterodyne was employed to convert the incoming frequency to a value which would be successfully amplified with known methods. Although we have solved the problem as far as the 300-500-metre band is concerned, H.F. amplification on wavelengths below 100 metres stands much in the same position as did the 300-500-metre band, say, five years ago. It is therefore only logical to apply the superheterodyne principle until such time as we can obtain stable H.F. amplifications of 100 per stage or more below 100 metres.

It is one thing, however, to decide that this principle is desirable in theory, and another to put it into practice. Those who have had practical experience of reception below 100 metres will appreciate that it is extremely difficult to control the very high frequencies involved. The smallest stray capacities afford an excellent path for currents of the order of 10,000,000 cycles, and it is exceedingly difficult to prevent these wandering into the intermediate amplifier and other places where they are unwanted, particularly when a part of the receiver is itself oscillating at a frequency close to that of the input. In the Igranig set all these various frequencies would appear to be well under control, for the set functions rationally down to 15 metres, and is as easy to control as a broadcast

receiver. There is a notable absence of hand capacity and "threshold howl" near the oscillation point occurs only in the last few degrees of the lowest wave-range.

Advantages of Aperiodic Aerial Circuit.

The circuit employs six valves in all with 4-volt filaments. The first, a P.M.14 screen-grid valve, performs the dual function of H.F. amplifier and aerial coupler. It will be seen from the schematic circuit of Fig. 1 that the input voltage from the aerial is developed across a high-frequency choke H.F.C.1 between grid and filament of the H.F. valve. The resonant frequency of this choke is well above the longest wavelength the set is designed to receive, and the aerial circuit is therefore aperiodic throughout the whole range of the set (12.5 to 70 metres). Obviously, the voltage developed across the choke is much less than would be obtained with a tuned circuit, but this is compensated for by the amplification of the screen-grid valve. The input to the first

detector is therefore about the same as would be obtained with a good tuned circuit, but the choke-valve coupling has three distinct advantages over the more convenient method.

It is well known that harmonics in the aerial system are a frequent source of trouble in short-wave reception. In the conventional reacting detector - L.F. set these harmonics are one of the causes of blind spots where an abnormal degree of reaction is required to produce oscillation. The consequences in the case

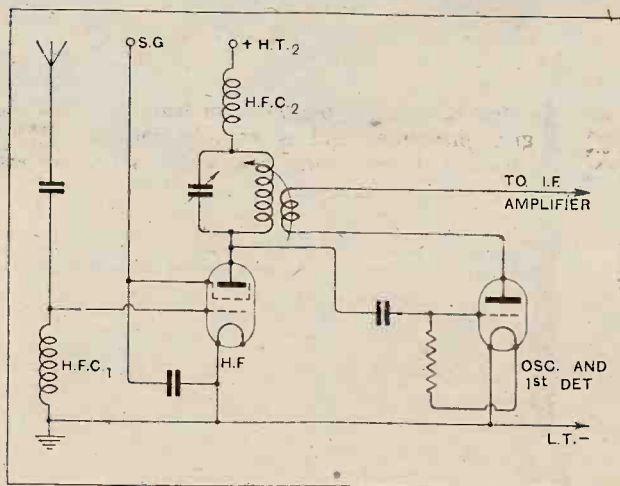


Fig. 1.—Schematic diagram of connections of the first two valves in the Igranig Neutrosonic Short Wave receiver.

Broadcast Receivers.—

of a superheterodyne would be even more serious, as the aerial load would damp out the local oscillator, and if the power of the latter were increased to overcome this difficulty, the oscillations would be too strong for efficient reception at other parts of the wave-range. In the Igranic set the screen-grid valve, with its low residual capacity, acts as an effective screen between the aerial and the oscillating detector, which is thus independent of variations in the aerial load. This arrangement confers the further advantage that the length of the aerial can be increased almost indefinitely without loading the set in any way. In addition, radiation due to the local oscillator is reduced to a minimum, and, finally, a tuning control is eliminated, thus producing a one-knob set.

The single Indigraph dial and three-vane condenser tunes the anode circuit of the screen-grid valve, which is virtually the grid circuit of the combined first detector and oscillator. To this coil is coupled the reaction coil in the plate circuit of the detector. Both coils, which are of the standard Igranic plug-in type, are mounted in a two-way coil holder, the reaction coil being fixed and the anode coil variable through a slow-motion control on the front panel. Little change in the coupling between the two coils is necessary, however, and the setting is maintained over the greater part of each waveband. Four changes of coils are necessary to cover the full range of the set (12.5 to 70 metres) and there is considerable overlap between the wavebands associated with each pair of coils.

The oscillator and first detector (PM3) is followed by two intermediate-frequency amplifiers (PM3A) associated with a standard Igranic I.F. unit as used in Neutrosomic sets designed for ordinary broadcast reception. In the set submitted for test the measured wavelength of the I.F. amplifier turned out to be 6,250 metres. At first sight this would appear to be an unnecessarily high figure, having regard to the low wavelengths received. It has one advantage, however, in that two reception channels for any given station are not more than two or three degrees apart on the tuning dial and there is much less confusion in tuning than would otherwise be the case. The cost of the set would also have to be increased if a special amplifier of lower wavelength were introduced.

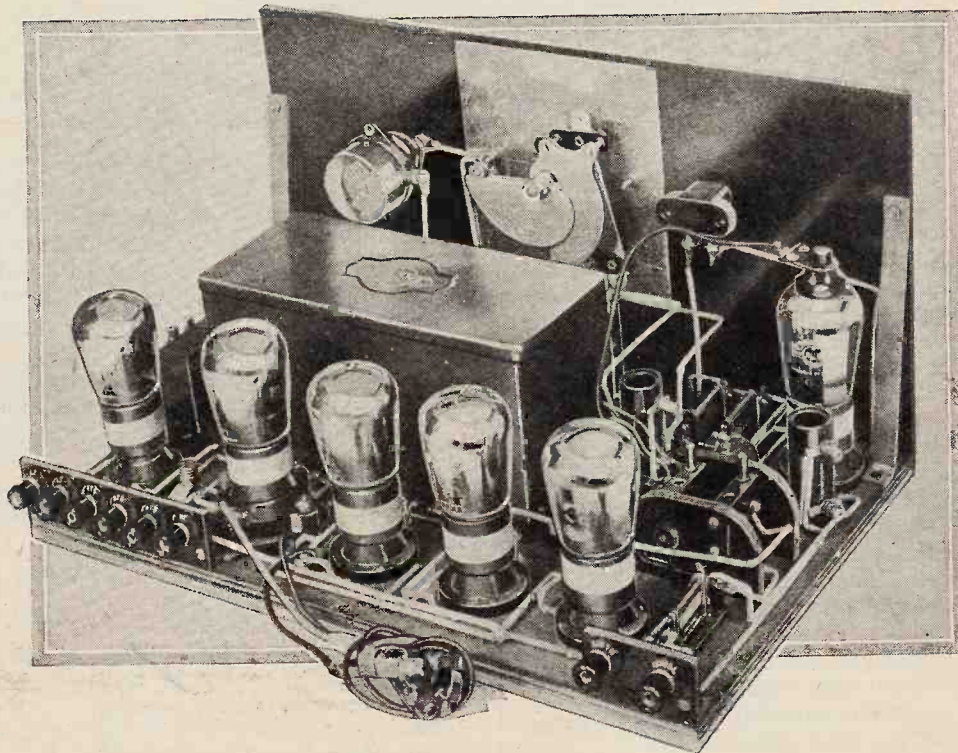
Reaction is introduced in the I.F. amplifier by means of a small variable condenser on the front panel. The

advantage of applying reaction in the fixed frequency amplifier is obvious; it is practically unaffected by alterations in tuning and the reaction setting need not be disturbed over wide sections of the tuning dial. There is also a volume control associated with the I.F. amplifier which takes the form of a high-resistance potentiometer in the grid circuit of the first I.F. valve.

Hints on Operation.

The second detector (PM3) is followed by a type "J" Igranic L.F. transformer feeding into a PM254 power output valve. The loud speaker is connected directly in the plate circuit and the volume is such that phones are unnecessary even when receiving the most distant stations.

The tuning is delightfully simple when compared with the usual reacting detector—L.F. short wave set. Having set the reaction control it is possible to go practically all round the dial, either with the receiver just oscillating for C.W. signals or just off the oscillation point for telephony. American stations have been picked up in this way without heterodyning the carrier wave at all. Right at the bot-



Igranic Neutrosomic Short Wave chassis removed from the cabinet. Note the I.F. amplifier unit and metal screen behind the tuning condenser. The short-wave plug-in coils have been removed to show the H.F. chokes associated with the aerial and screen-grid valve circuits.

tom of the wave-range, between 12.5 and 15 metres, there was a suggestion of threshold howl in the particular receiver tested but elsewhere the reaction control was smooth and free from backlash. The only precaution when tuning is to see that the first detector is kept in a continual state of oscillation. With the I.F. amplifier oscillating the detector oscillations may cease without being noticed as the I.F. amplifier may be already producing the breathing noise characteristic of oscillation. It

Broadcast Receivers.

was discovered in testing, however, that long-wave C.W. stations, due to direct pick-up in the I.F. amplifier, could be heard in the loud speaker when the first detector stopped oscillating. Normally these stations are inaudible, so that this effect is a useful reminder that the oscillator coupling must be increased. One soon learns the best average coupling for each pair of coils, however, and the "oscillator" knob needs adjustment only when coils are changed.

It would be impossible to give a complete list of stations received. On the two middle ranges there is a station—either C.W. or telephony—every two or three degrees on the dial and on each of the remaining two ranges there is enough material for several evening's work. The American end of the transatlantic telephone comes in well at all times of the day and night on one or

other of its alternative wavebands and the Eindhoven and German transmitters are always reliable. An evening was devoted to American broadcasting and six stations were logged at good loud speaker strength, including 2XAF, 2XBA, 3XAL and 8XK, the last two at full bore. The modulation from any of these stations could be easily found without once allowing the I.F. amplifier to go into oscillation.

As a result of more than a week's experience with this set we are of the opinion that it is definitely superior to any short-wave receiver having the conventional reacting detector circuit so far tested both on the score of range and ease of control. The price in oak, including valves, coils and royalties, but excluding batteries and loud speaker, is £28 and the makers are The Igranic Electric Co., Ltd., Bedford, and 147, Queen Victoria Street, London, E.C.4.

Picture Reception in the Air.

German Tests with the Fultograph.

OF what value are wireless pictures to the aeroplane traveller? This is the question that the Luft-hansa Company, of Berlin, recently set itself to answer, and the success of the experiments conducted is indicated by the announcement that it is intended to equip the company's machines with picture receivers for the reception of weather maps and aerodrome plans.

The aeroplanes are already furnished with up-to-date wireless apparatus—both for telegraphy and telephony—but there are grave limits to the amount of information which can be conveyed in a hurried Morse message or telephone conversation, especially in emergencies, and the new opportunities presented by the transmission of a picture or map capable of telling a long story at a glance are not to be neglected. It often happens that when a pilot encounters a storm belt he is quite ignorant of its extent and shape, and a blind attempt to fly round it may end in disaster. Here is a case in which a chart transmitted from the nearest meteorological station can be vitally useful. Again, during wet weather aerodromes may be flooded, or marshy patches may develop on which it would be unsafe to land. A picture transmission will at once indicate to the pilot what parts of the ground are still available.

The recent experiments were carried out on a

Lufthansa aeroplane in co-operation with the German branch of the Fultograph Company. The apparatus on the experimental plane consisted of a Fultograph with built-in rectifier, a type which has been on the market since the Berlin Wireless Exhibition. Use was made of the Telefunken receiver already installed in the aeroplane, but it is intended later to fit a special picture receiver designed for aerial service.

It is interesting to note that the operator finds it necessary to adjust the receiver from time to time to suit the direction of movement of the aeroplane with

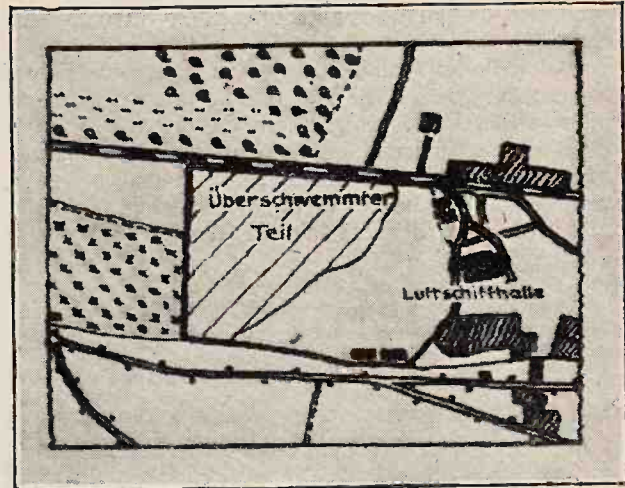


The Fultograph receiver in use in a Lufthansa aeroplane. To prevent spilling, a sponge soaked in potassium iodide solution was employed in the experiments. On the right is the Telefunken transmitter and receiver.

Picture Reception in the Air.

respect to the transmitter. The Lufthansa aeroplanes are nearly all fitted with aerials consisting of a single wire let down from the machine, so that the aerial is inclined in a direction opposite to that of flight, and its direction with regard to the transmitter is always varying. This fact will have to be taken into considera-

The experiments are primarily concerned with the ultra-short waves, which the Lufthansa Company are especially anxious to introduce into their service on account of the very light weight of the apparatus involved. Tests have already been carried out on the Berlin-Königsberg air route, but unfortunately they have not yet pointed to the possibility of establishing a twenty-



A sketch map transmitted to an aeroplane to indicate that a portion of the aerodrome was flooded and unsuitable for landing purposes. The original is shown on the left and the map as received on the right.

tion in designing the new picture receiver for aeroplanes.

Another field of research is being explored by the Lufthansa Co., viz., the use of short waves for aerial telegraphy and telephony. In this work the company is being aided by the combined firms of Telefunken and C. Lorenz, with the assistance of Professor Esau, of Jena, and the German Air Traffic Research Institute.

four-hour service. More recently attention has been turned to the Lübeck-Travemünde route, and a short-wave wireless equipment has been built into a Romar aeroplane. The results of these tests have not yet been published, but it is understood that the ultra-short waves are likely to prove of real value for aircraft navigation.

F. N.

NEWS FROM THE CLUBS.

Meetings Twice a Week.

The Kentish Town and District Radio Society commenced its new session on January 7th. New members are heartily welcomed. Meetings are held at 8 p.m. on every Tuesday and Friday at the Carlton Road Schools, Kentish Town, N.W. On Tuesday, January 14th, a lecture with lantern slides on the "Screened Grid Valve," prepared by the Marconiphone Co., Ltd., will be delivered. This will be the first of a series of three lectures. The Society caters both for novices and advanced amateurs. The keenness of its members can be gauged from the fact that bi-weekly meetings were held throughout the summer months. All enquiries should be addressed to the Hon. Secretary, Mr. A. H. Sartain, 40, Harrington St., Regents Park, N.W.

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All About Mains Sets.

Mains units and their use with wireless receivers was the subject of a lantern lecture given by the Marconiphone Co. at a recent meeting of the Tottenham Wireless Society. Early difficulties met with in the design and satisfactory operation of mains sets, particularly in respect of the filament heating, were dealt with, and interesting details were given regarding the latest types of all-electric receivers. The lecturer gave valuable hints on the most suitable voltages and adjustment of grid bias.

Hon. Secretary, Mr. W. B. Bodemeaid, 10, Bruce Grove, Tottenham, N.

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Mains Operation.

"Operation from A.C. Mains" was the title of a lecture given by Mr. Youle, B.Sc., A.C.G.I.,

A.M.I.E.E., of the Marconiphone Co., at a recent meeting of Slade Radio (Birmingham). Commencing with the question of H.T., the lecturer gave useful information regarding rectification, valves, chokes, and smoothing circuits. The question of L.T. was next explained, and details were given of A.C. mains, valves, etc. A convincing demonstration was given of a Marconi four-valve set and moving-coil speaker, together with a new gramophone pick-up.

The Society offers exceptional facilities to those interested in wireless, and full information may be obtained from the Hon. Secretary, 110, Hillaries Road, Gravelly Hill, Birmingham.

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Pick-ups on Trial.

A fascinating demonstration of various types of electrical pick-ups took place at the recent annual general meeting of the Croydon Wireless and Physical Society. Members formed the "jury" for the evening, and the results were interesting and instructive.

The next meeting will be held on the 20th January, when Mr. A. J. Webb will give a lecture on selectivity.

Visitors are heartily welcomed to the meetings. Particulars regarding membership may be obtained from the Hon. Secretary, Mr. H. T. P. Gee, Staple House, 51-52, Chancery Lane, W.C.2.

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The Siemens Film.

A combined meeting of the Whitgift Middle School Wireless Society, the Thornton Heath Radio Society, and the South Croydon Radio Society will be held in St. Paul's Hall, Thornton Heath, on January 28th, when a cinematograph

film dealing with Messrs. Siemens' products will be the chief feature.

All wireless enthusiasts will be welcome.

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Society Offers to Help.

That highly controversial question, the separation of 2LO's two wavelengths, was the subject of an open discussion at a recent meeting of the South Croydon and District Radio Society. Views on the subject were not lacking, for many members had them to air, and it soon appeared that the two transmitters were quite capable of being separated, but with precisely what type of set was debatable.

It was realised that the ever present "man-in-the-street" might be in difficulties if he did not possess a stage of high-frequency amplification. The majority of speakers agreed, however, that without a high-frequency valve it was still quite easy to perform the divorce of the two wavelengths, but then attention must be paid to the coils and tuning arrangements if reasonable results were to be expected. Some speakers insisted that at least two stages of high-frequency would be necessary.

The Hon. Secretary, Mr. E. L. Cumbers, 14, Campden Road, South Croydon, said that the Society was only too eager to get in touch with Croydon's wireless set owners who were troubled by the problem of selectivity, and he felt certain that as a result the Society could help them not a little. Indeed, he concluded, it was for matters such as this that the Society existed and it was essentially its duty to do all it could to ensure that the "man-in-the-street" received his alternative programme without trouble.

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BROADCAST



BREVITIES

By Our Special Correspondent.

The Dominions and Empire Broadcasting.—“Go Home and Listen.”—Something for Everybody.

New Stimulus to Empire Broadcasting.

How much longer is 5SW to be known as the “experimental short-wave transmitter”? Possibly the project for a permanent Empire broadcasting station will receive a fresh impetus on January 21st, when the speech of His Majesty the King at the International Naval Disarmament Conference will be sent out from Chelmsford primarily for reception throughout the Empire.

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Cash from the Colonies?

The B.B.C. can, I think, be spared any further criticism in the matter of Empire broadcasting, as the question is now in the hands of the Colonial Office. I understand that the Dominions and Colonies are now being canvassed for contributions towards defraying the expenses of a permanent service. His Majesty's speech will thus come at an appropriate juncture; the Dominions are sure to make a determined effort to hear it (as well as the speeches of the Dominion representatives on the Conference), and the degree to which 5SW can make itself heard on this occasion may directly affect the financial enthusiasm of its audience.

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Pre-breakfast Enthusiasm.

American keenness over the transmission is illustrated by the news that the National Broadcasting Company of America is arranging to relay the speeches through its chain of stations despite the fact that New York will hear the event at 6 o'clock in the morning!

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Regional Developments in 1930.

Several promising developments on the technical side should occur before we sing dirges for 1930. Everybody knows that twin programmes are to be expected from Brookmans Park, but nobody (no, not even the Chief Engineer himself) knows when.

After London Regional the next regional station to be officially constituted as such will be Daventry, the Midland Regional. The Northern Regional at Slaithwaite will begin testing by the autumn, but before then constructional work will have begun on the Scottish station at Falkirk and a site will have been chosen for the Western Regional in the Cardiff district.

B 33

“Go Home and Listen.”

I have already referred to the embarrassment of the Savoy Hill Programme Department when faced with an appeal for specially brilliant programmes in National Wireless Week, which begins on Sunday next, January 12th. The programme people felt it necessary to explain that all programmes nowadays are brilliant, so why gild the lily, etc. However, prodigious tearing of hair and burning of midnight oil have produced a bill of fare which is admittedly above the ordinary standard, and I would recommend everybody to follow the slogan of the week, viz., “Go Home and Listen.”

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An Appetising Menu.

Among the coruscating items must be mentioned the appearance of Madame Suggia in a 'cello recital from 2LO, 5XX

on Wednesday, a work in which Robert Louis Stevenson and his stepson, Lloyd Osborne, collaborated. And on Thursday we are to have “The Immortal Memory of Sir Walter Scott,” toasted by the Rt. Hon. Stanley Baldwin at the dinner of the Sir Walter Scott Club in Edinburgh.

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Something for Everybody.

A first-class symphony concert from the Queen's Hall, with Szigeti as solo violinist, the veteran Sir George Henschel singing to his own accompaniment, and two microphone appearances of Gracie Fields are among the additional attractions. So why stay out-of-doors?

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That New Year Broadcast.

Once again the B.B.C. “went all out” in its New Year celebrations. The idea of touring European cities was a good one, and was well carried out in spite of atmospheric. True, we had only a cough or two from Bratislava, but a cough from Eastern Europe is better than a paroxysm in the B.B.C. talks studio.

I listened to the “Grand Good Night,” or rather, part of it, *via* Hilversum. Eventually our Dutch friends gave up struggling with an alien tongue and broadcast orchestral music on their own account.

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Where Opportunity Counts.

America's latest record is that of a woman who listened to broadcasting continuously for “more than five days.” If the B.B.C. could be persuaded to broadcast continuously, the American record would probably be broken by the licence-holders of Aberdeen.

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Things we Want to Know.

Whether Big Ben is developing a bigger crack, or whether a new microphone is needed.

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“Burns Nicht.”

This year Mauchline will again be the stage for the broadcast celebration of the poet's birthday on January 25th. Instead of in Poozie Nansie's Inn, the microphone will be installed at Mossiel Farmhouse, outside the town, in which Burns wrote some of his best works. The celebrations will be broadcast from all stations except 5GB.

FEATURES FOR NATIONAL WIRELESS WEEK.

London and Daventry (5XX).

JANUARY 13TH.—Cello recital by Suggia.

JANUARY 15TH.—“The Wrecker,” play adapted from “R.L.S.”

JANUARY 16TH.—The Toast of “The Immortal Memory of Sir Walter Scott,” proposed by Rt. Hon. Stanley Baldwin, relayed from Edinburgh.

JANUARY 17TH.—Symphony Concert relayed from Queen's Hall.

JANUARY 18TH.—Running Commentary on Rugby Football Match, Wales v. England, S.B. from Cardiff.

Daventry Experimental (5GB).

JANUARY 12TH.—Oratorio programme.

JANUARY 16TH.—“Helmet and Haversack,” a Page of Military History.

JANUARY 17TH.—“As You Choose,” a reasonable Pantouque by Robert Rutherford.

Cardiff.

JANUARY 13TH.—“Mists of Sedgemoor,” a story of the Men of the West, by Dorothy Champion and David Thornton.

Manchester.

JANUARY 13TH.—“Cousin Sarah's Quilt,” a play of Lancashire life, by Florence Bone.

Glasgow.

JANUARY 14TH.—Folk Music of Caithness, Orkney and Shetland and Scottish Country Dances.

Belfast.

JANUARY 13TH.—Concert of First Prize Winners, North of Ireland Bands Association.

and other stations on Monday at 10.15 p.m. Those to whom radio drama appeals should not miss “The Wrecker”

A NEW RECTIFYING VALVE

A Gas-filled Full-wave Valve with Remarkable Regulation Curve.

By E. R. DIETZE.

ONE of the features of the Berlin Wireless Exhibition was the great number of mains-operated receivers and power-amplifiers as compared with those operated from batteries. The latter have practically disappeared altogether from the German market. One of the reasons for the great popularity of the entirely mains-operated set is, of course, the fact that throughout Germany the mains are standardised to a far greater extent than in England, where any number of different A.C. and D.C. voltages exist, where even the cycles of the A.C. mains are not standardised, but vary between 25 and 100 cycles. Also, there are still large stretches of country without any electric power supply whatever, such stretches, however, being comparatively rarer in Germany. On the other hand, the development of efficient and inexpensive battery eliminators for the mains operation of receivers, power-amplifiers, and radio-gramophones, has been greatly facilitated by the fact that a certain type of full-wave rectifying valve of the gas-filled variety possessing most remarkable characteristics has been available for some length of time.

The Rectron valve, under which name it is known in Germany, is filled with a mixture of rare gases and mercury vapour at low pressure. The effect of the mercury vapour is to keep the internal resistance of the valve as low as possible. It is this negligible internal resistance which is the outstanding feature of this valve, so that the rectified D.C. potential is to all practical purposes the same even when the load on the valve changes by as much as 100 per cent. Naturally, this property is of great value in the design of battery eliminators; for instance, the pot winding of a moving-coil loud speaker may be energised from the rectifier supplying the high tension to the receiver if thought fit, without the potential dropping to any serious extent, or, in the case of the pot winding being disconnected, rising to a value liable to harm the valves in the receiver. Another great advantage is the negligible loss of energy across the internal resistance of the rectifier valve, which is quite a considerable per-

centage of the D.C. wattage delivered in the case of the more usual rectifier of higher internal resistance. Incidentally, of course, the valve is capable of handling very large power without undue development of heat, even although the electrodes are very small.

A full-wave rectifying valve of this design yielding 120 watts D.C. is no larger than an ordinary receiving valve of the super-power type. The most remarkable property of all, however, is that the same valve may be used for both low-tension work up to more than one ampere and high-tension work up to 500 volts, according to the A.C. potential applied to the plates. This makes it possible to combine an L.T. charger with an H.T. battery eliminator by simply changing over the plates of the valve to a low-tension winding on the mains transformer and applying the rectified potential to the L.T. accumulator on switching off the set. All these properties, of course, are the natural result of the negligible internal resistance of the valve due to the mercury vapour present.

Low Internal Resistance Due to Mercury.

Considering this, it is remarkable that this valve is as suitable and as reliable for high-tension work as it has proved itself to be, the largest of these valves at present available handling 1,200 volts and 300 mA of D.C. output with ease and safety. A complete range for all low- and high-tension requirements is available, including heavy-duty types yielding 280 watts at 220 volts. A special type is manufactured with three or six plates to rectify three- or six-phase A.C. without the use of a transformer, yielding 280 or 560 watts of D.C. at 220 volts. The price of these valves compares favourably with those of other valves, and thus they have become very popular in Germany, especially for medium- and high-power work in large receivers, power-amplifiers, and radio-gramophones, where their use is a standard practice.

The conventional full-wave rectifying circuit is used for this valve. It possesses a filament heated at about 1.8 volt and taking about 2.5 amperes. The filament

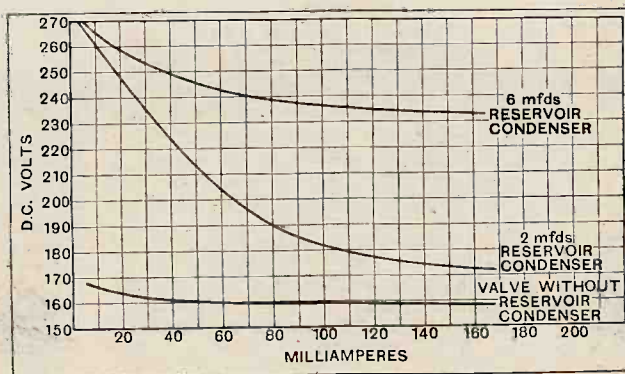


Fig. 1.—Regulation curves for different shunted capacity. With 6 mfd. there is little change in potential at the terminals of the filter when widely different loads are applied. With no capacity the regulation curve is better still.

A New Rectifying Valve.—

glows at a very dull red, and is extremely substantial, as its low resistance indicates, and therefore has a very long life. In fact, the life of these valves is only terminated by their vacuum reaching a degree of "hardness" at which the glow-discharge can no longer be effected and maintained in the usual way. The glow of the filament has the effect of evaporating the mercury, which is present for the greater part in liquid form when the valve is cold, due to the comparatively low vacuum and high gas pressure in the valve. The mercury then evaporated reduces the internal resistance and assists the glow-discharge taking place.

It would, therefore, seem advantageous to apply A.C. potential to the plates and heat the filament for several seconds before applying the load to the rectified potential, and this is borne out in practice. The life of the valves is considerably prolonged if this precaution be taken, especially if the load is near the maximum capacity of the valve. The average life of the valve under such conditions is in excess of a thousand hours, which

is a very good figure for a gas-filled valve of this design. Momentary peaks of load up to three to four times the normal maximum, such as would be brought about by accidental short-circuits, etc., can be sustained without "backlashing," which is the inevitable result of continuous overloading and applying maximum loads without first heating up the filament, especially in a valve of such low internal resistance working at potentials of several hundred volts.

Fig. 1 shows a series of curves taken of the D.C. output potential in relation to the load for different reservoir condensers. Especially the curve taken of the valve alone without any reservoir condenser shows scarcely any potential drop whatever with the rising load, the result of the extremely low internal resistance.

The development of this valve, largely due to Dr. Spanner, has been of the greatest importance for the mains-operation of sets in a simple and economic way, and has supplied mains-operated apparatus with a source of H.T. of such "elasticity" as to compare quite favourably even with an H.T. accumulator.

IN designing this instrument the makers kept in mind two salient points: (1) the attainment of a high standard of quality in the reproduction of both radio and gramophone records, (2) the maintain-

**THE CLARITH
RADIO-GRAMOPHONE.**

ance of engineering standards of robustness and reliability in manufacture and testing.

The accompanying photograph of the interior of the set shows that there is no suggestion of the delicate scientific toy about the amplifying equipment. The layout and massive quality of the components are reminiscent rather of transmitting practice.

The amplifier, which is common to both radio and gramophone pick-up circuits, is assembled on the base platform, which is metal covered. There are two transformer-coupled stages, the output valve being an AC/P1 capable of an undistorted output of 1,000 milliwatts, which is sufficient to drive the moving coil loud speaker at full volume.

Indirectly heated valves are used in both the A.C. and D.C. models. In the A.C. model illustrated H.T. is derived through a Mazda S.P.42/U (U60/250) full-wave rectifier, while the loud speaker field is energised from a Philips P.506 full-wave rectifier.

The moving coil loud speaker is also mounted on the base platform in a position coinciding with the aperture in the cabinet. The diaphragm is of the corrugated type which automatically adjusts its effective diameter to the frequency applied.

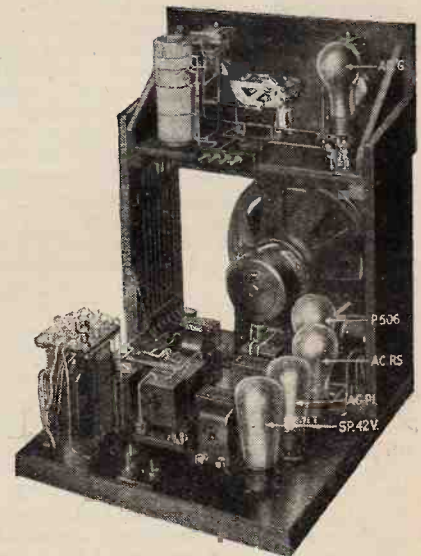
The radio unit and control panel, which is wired as a separate unit, is mounted immediately above the loud speaker, and is linked to the amplifier through cleated leads running down the side supports. A leaky grid detector in conjunction with a dual range reacting tuner unit provides local station reception with the possibility of alternative programmes. An external aerial varying in length accord-

ing to circumstances is necessary. The volume control takes the form of a Centralab which controls both radio and gramophone volume.

We have had an opportunity of testing one of the receivers and found the reproduction full and round with excellent volume. A noticeable feature of the reproduction from gramophone records is the entire absence of surface scratch.



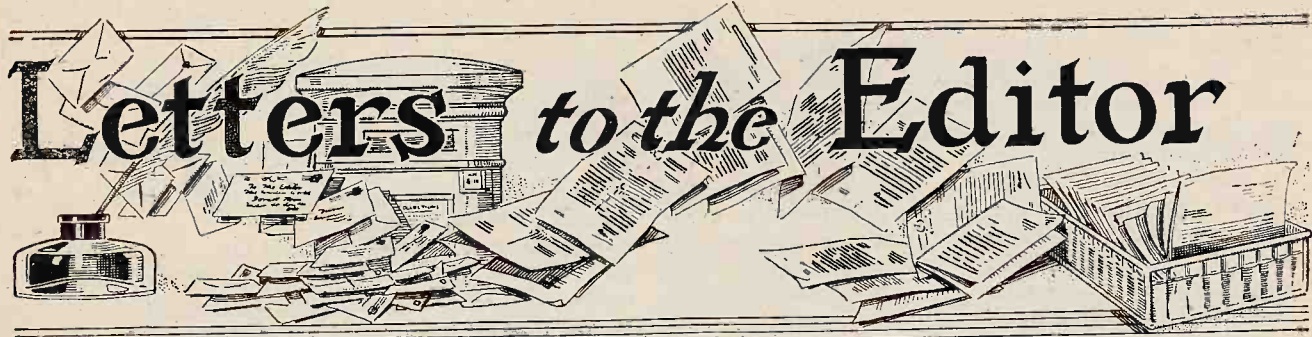
General view of the Clarith radio-gramophone, showing simplified control panel and moving coil loud speaker grille.



Amplifier-receiver unit for A.C. mains. The receiver unit and control panel are mounted above the loud speaker, while the power amplifier and rectifier units occupy the base platform.

A rigorous system of testing has been evolved for each component and for the various stages of assembly, and taking into account the rugged appearance of the finished product it is safe to predict that this reproducer is destined to set new standards in reliability and long service.

The makers are Messrs. Clarith Reproducers, Ltd., East Street Mills, Leeds.



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.

EMPIRE BROADCASTING.

Sir,—The many letters published in your paper convince me that G5SW is a washout east of Suez. One correspondent thinks we are rather rubbing it in when we say that nearly everything but British is on the SW. In vain do I tune in to 25.53, and for days, and even weeks, I could not get the carrier till last week at 7 p.m., I.S.T. (1.30 p.m., G.M.T.) I heard the announcer say, "G5SW at Chelmsford, England, closing down till 7 p.m. G.M.T." Also that G5SW *sometimes* worked on 11.55 metres—that is, if I heard correctly the wavelength, and note, please, the "sometimes." Why not send the wireless Press a short paragraph giving times and days? Why so casual? Within a few minutes of this (of G5SW on R2 or 3 strength) Stockholm came roaring in up to 9.30 p.m.

These are the hours we want, i.e., between 2 to 7 p.m. G.M.T., and if Holland, Germany, Manila, and now Sweden can do it, what is wrong with G5SW? I have before mentioned there are 50,000 British lads in the Army out East who would be glad to get some home-news, etc. Most of the present Army had their crystal sets in England, and by clubbing together could get a 3-valver to while away the often too long evenings between sunset and bedtime. Is the British manufacturer unconcerned, and is he going to allow the opportunity to slip by? If Britain is on the "air," then people will buy British sets to hear her. Geographically, Huizen, Hilversum, Leesen, and Stockholm are not so situated as to make things different for G5SW, and so far as Irak, India, and the F.M. States are concerned, G5SW is included in the fanwise direction, and "what one fool can do, etc."

India.

RADIOX.

December 11th, 1929.

THE PROGRAMME DIFFICULTY.

Sir,—Referring to the article with the above title in your issue of December 25th, you were good enough some time ago to publish a letter from me in which I suggested a scheme of broadcasting on lines similar to that put forward by your contributor. I mention this particularly because in the article referred to your contributor states, "It is somewhat remarkable that the means by which these alternatives can be provided have not previously been suggested."

The scheme I suggested called for a large number of stations of low power, each relaying simultaneously a number of programmes produced at a central controlling station, wavelengths being employed to distinguish the separate programmes only, and not the individual stations as at present. The relay stations would be fed either by land line or wireless.

The chief objection to the scheme, apart from expense, would appear to be the difficulty of providing land lines capable of transmitting the programmes without appreciable distortion. There is also the question as to the practicability of radiating on four (or more) wavelengths from the same site without mutual interference, especially as the frequency separation might in certain cases have to be quite small.

Bristol.

G. B. BENNETT.

Sir,—Major MacCallum's suggested synchronised transmission scheme is either five years too late or at least five years too soon. In the old days of bad receivers and horn speakers it mattered little that land lines added adenoids to artistes. But wireless can no longer amuse by its novelty. The possibilities of reception have reached a very high standard, far higher than that of present land-line transmission. S.B. is no longer tolerable. Possibly in the uncertain future, when line transmission has been enormously increased in quality, it may become acceptable. For the present, however, any extension of the use of land lines is a step in the wrong direction. Admittedly the Regional Scheme is not ideal, but it is the best solution of the problem yet advanced.

Bexley Heath.

A. G. WARREN.

"KILOHMS."

Sir,—May I suggest that much time, ink, paper and breath would be saved by the introduction of a term for thousands of ohms? I have had this in mind for some time, and the need is emphasised by a perusal of the "Valve Data Supplement" (*The Wireless World*, December 4th, 1929) with its armies of noughts in the A.C. resistance column.

The obvious suggestion for such a term is "kilohms." Your assistance in securing the general adoption of this would, I have no doubt, be greatly appreciated.

E. H. LAISTER.

Hon. Sec., North Middlesex Radio Society.

THE SELECTIVITY-QUALITY PROBLEM.

Sir,—I expected to see in *The Wireless World* at least one letter commenting on Mr. Bertram Hoyle's article in the November 27th issue, for there must be several of your readers who were not deceived by his explanation of the greater selectivity obtained as he describes. The following extract from a paper on the detector read before the Cambridge University Wireless Society last October bears on the point.

"There is a fallacy which has appeared in different forms so much in the literature on this subject that I think it is worth pointing out here. It is said that when a rectifier is insensitive to weak signals the strong components of the input are relatively enhanced. This is not a mathematical consequence; in some cases it is true, in others it is not. This is because the rectifier does not act on each input component separately, but on their sum.

"When the rectifier has the simple 'square law' characteristic $i = av + bv^2$ (where i = current, v = applied voltage, a and b are constants) if the input is a strong signal $V \sin pt$ and a weak $v \sin qt$ we have:

$$i = a(V \sin pt + v \sin qt) + b(V^2 \sin^2 pt + v^2 \sin^2 qt + 2Vv \sin pt \sin qt) = a(V \sin pt + v \sin qt) + \frac{b}{2}[V^2 + v^2 - V^2 \cos 2pt - v^2 \cos 2qt + 2Vv \cos(p-q)t - 2Vv \cos(p+q)t]$$

In this case the direct current in the output is $\frac{b}{2}(V^2 + v^2)$, so that the strong component V is relatively enhanced. We may

also note the term $bVv \cos(p-q)t$, the heterodyne beat note, which is proportional to v . If the two input signals are carrier and sideband, this is the required audiofrequency note, and is DIRECTLY PROPORTIONAL to the amplitude of the sideband. [This was forgotten in an article in *The Wireless World* in December, 1927.] The detector is, however, not ideal, as unwanted beat notes are also produced between the sidebands, resulting in distortion.

"When the rectifier has the characteristic $i=av+bv^2$, which is even less sensitive to small inputs, we find the direct current in the output for the same input as before is $\frac{2}{3}b(V^2+v^2+4V^2v^2)$. Hence if the signal $V \sin pt$ stopped, this would fall by $\frac{2}{3}b(V^2+4V^2v^2)$, and if the signal $v \sin qt$ stopped it would fall by $\frac{2}{3}b(V^2+4V^2v^2)$, so the ratio of the two components in the output is $\frac{V^2+4V^2v^2}{v^2+4V^2v^2}$

"If $V=2v$, and V is not enhanced, this ratio should be $\frac{V}{v}=2$, but it is $\frac{16+16}{1+16} < 2$, so that the WEAK component v is relatively enhanced."

The above applies to a rectifier alone or a detector in which the load impedance is negligible. A simpler explanation is that the weak signal modulates the stronger signal at the difference frequency $p-q$, the input varies from $V+v$ to $V-v$, hence the response is quite independent of the response to v alone.

The variation of selectivity with variation of detector grid bias is connected with the de-modulation effect described by Dr. Beatty in *Experimental Wireless* for June, 1928, and is not as simple as suggested by Mr. Hoyle. W. B. LEWIS.

Beckenham, Kent.

Sir,—I was interested to read Mr. Lewis's letter commenting on my recent article, "The Selectivity-Quality Problem."

The article he refers to was published after I had sent in mine. It shows mathematically the ratio of the two components in the output to be $\frac{V^2+4V^2v^2}{v^2+4V^2v^2}$, so that unless $\frac{V}{v}$ to begin with is >2 no gain is obtained; in fact the weaker signal is enhanced. Where the device works as described is with a considerable difference between V and v . With $\frac{V}{v}=10$ the ratio given above comes out to 26, and is greater for larger values of $\frac{V}{v}$.

Since it was only on stations having a large difference of initial intensity that the scheme was attempted, no cases of its failing were noted.

I am glad of this opportunity of thanking Mr. Lewis for his criticism, which gives readers this more accurate outlook on the phenomenon.

The references given in his letter should prove useful to readers wishing to follow up the mathematics of the case. Heaton Moor, near Stockport. BERTRAM HOYLE.

RECEPTION OF CONTINENTAL STATIONS.

Sir,—I have read with awe and veneration the descriptions of various achievements in the way of reception of distant programmes which certain of your correspondents have related in letters which you have published. I am particularly intrigued by one gentleman's account of his "conveniently agreeable" reception of some twelve Continental programmes which he assures us he usually receives on a four-valve portable receiver (admittedly expensive!)

If only these wizards could be prevailed upon to come to the assistance of the B.B.C. with what delights might we not be regaled in the way of Continental relays, and no land-line distortion to spoil the excellent quality for which so many Continental broadcast stations are noted.

I remember a somewhat sweeping assertion of one "Ixion" in your sister journal, *The Motor Cycle*, which runs, "Motor cyclists, like anglers, are constitutionally untruthful."

I hardly like to be rude enough to suggest that certain wireless listeners might be included in the same category. Salisbury. E. W. ARNOLD.

B 37

Sir,—It is possible to receive foreign transmissions without all the interference of which Mr. A. W. Scott complains. It just depends on the receiver and one's ability to use it to the best advantage. With two efficient stages of screened grid high-frequency amplification and anode bend rectification it is possible with careful control of input and output to cut out interference. My receiver is a "Kilo-mag Four," with a resistance-capacity coupled low frequency stage, and I can receive Budapest, Vienna, Prague, Milan, Rome, Bucharest, Radio-Toulouse, Barcelona and all the powerful German stations at good strength on a moving-coil speaker. I listen regularly to operas from Vienna, Milan and Rome. The long-wave stations are there, too; one has only to select a suitable programme.

I suggest that as Mr. Scott is disappointed with foreign station reception he should build a "Kilo-mag Four." I am certain that he will not be disappointed with the results. Grimsby. J. H. BORRILL.

Sir,—It is not the set usually that causes the trouble but the locality in which it is used.

My own house is dreadful for reception, which is much upset by local static, Sunday evenings excepted. The set used is a Superhet.

I also have a set exactly similar at a relative's near where the Trent and Ouse meet to form the Humber, apparently miles from anywhere. Here the foreign stations come in with a clarity unbelievable, on a background of silence.

I also pay a weekly visit to a friend two miles outside Rotherham; he also uses a Superhet, and his reception is perfect, with just a slight trace of interference from trackless trams now and again. The quality and strength of foreign stations are quite equal to that of our own British stations. ALFRED FRANCE. Rotherham.

Sir,—I am interested to note that Mr. W. Oliver has taken up the cudgels on behalf of the "reacher out" in your issue of December 11th. I quite understand his point of view and congratulate him upon his faculty for enjoying upwards of twenty Continental transmissions on most evenings. Happy man! How I envy him! Let him now add a second H.F. stage to his receiver and he can then enjoy twenty or thirty more.

Perhaps my expressions "absolute myth" and "awful noises" were a trifle more forcible than accurate—they should not be read too literally. Doubtless there are people who enjoy these noises—Mr. Oliver appears to be one of them. I myself, and I believe the majority of your readers, are not so easily pleased, and I entirely agree with the remarks of your correspondent, Mr. L. N. Grover, in this connection.

Of course, the main point of my letter was that it is no concern of the B.B.C. to give the slightest regard or consideration to the "reacher out." A. W. SCOTT.

Chipstead, Surrey.

Sir,—I get a great deal of enjoyment by listening to some of the foreign stations, and I will admit that some of their programmes are well worth listening to. But I think that for quality of transmission and quality of programmes the B.B.C. stations can claim first place every time. Croydon. K. H. RANDALL.

B.B.C. TRANSMISSIONS.

Sir,—Mr. E. C. Richardson's suggestion in your issue of 4th ult., that amateurs should combine in constructive criticism by comparing notes, is very apt. I think listeners must accept the fact that variations in output from different studios and halls may be technically necessary, and that errors of judgment as to the moment of modulation may humanly occur. Secondly, we must accept the testimony of experts (not all on the B.B.C. staff) that there really are such effects (or causes) as "transients" with which even the best receiver or loud speaker may fail to cope. There may be very costly three- or four-valve sets which get over this "transient" difficulty, but they are out of the question for the majority. My own set consists of one S.G. H.F. stage, anode-bend detector without reaction, R.C. coupled to L.F. stage which again is transformer coupled to a P.625a output valve, working a Magnavox M.G. speaker through a

choke-capacity filter circuit. The detector anode circuit includes H.F. choke, H.F. by-pass condenser, and stopping resistance between coupling condenser and grid of L.F. valve. The H.T. is supplied by a mains unit, and the L.T. is kept "up to scratch" by a trickle charger. My ear is fairly sensitive, but my only complaint as to errors in reception is an overload effect with high soprano solo notes or heavy choral work, manifesting itself as a horrible "hard breathing" effect below the musical note. I cannot fairly blame the transmission on the engineering side for this effect. Again, one piano only in one of the London studios broadcasts with horrible "dithers" almost through its entire compass. On the same evening, without any adjustments to my set, other pianos either from Savoy Hill, or outside, have broadcast with perfectly pleasing results.

Now, to what conclusions do these details point? I suggest that the trouble is not so much in the engineering output or modulation, but in the input from the instrument or vocalist.

To my mind, most of these transmission troubles are due to the old telephone speaking fallacy, translated into various forms, i.e., that to make one's self heard clearly it is necessary to shout into the mouthpiece. Most habitual telephone users know with sorrow that the effect is precisely the reverse.

I am not a great lover of dance music, but honour should be given where due—Jack Payne seems to have discovered the art of "positioning" his players to a nicety; the result is a perfect balance of tone. And his voice is always clear. Other more ambitious players and singers, please copy.

W. C. BURBRIDGE.

Sir,—I trust your readers have not been misled by that deceiver of the young, Mr. Munn, and his vivid similies.

The human ear may be compared in some respects with the loud speaker, but the senses have little in common with a thermionic valve amplifier.

In addition to varying sensitivity at different frequencies, the amplifier rectifies above a maximum amplitude, the actual maximum varying with the frequency and with the characteristic of the amplifier. Hence the great piano controversy, which I had hoped was long since dead.

A comparison between 5GB and 2LO is very misleading; with most receivers the side-band cut-off is more pronounced in the case of 5GB owing to its higher wavelength. Its modulation is also deeper, and, in my experience, it requires a diode detector.

I am using a modification of the receiver described by Mr. Kirk in *The Wireless World* about a year ago; I work on up to 1 milliamp. rectified current, the L.F. amplifier being a 6,000 ohm valve resistance coupled (20 ohms, -25 mfd., 100,000 ohms) to two P.625s in parallel, 230 volts H.T., and choke filter output.

It may interest Mr. Richardson to know that I never experience lipping or blasting on the ordinary transmissions from 2LO, 5GB, or 5XX, although occasional "O.B.s" or long-distance land-line transmissions (e.g., Liverpool, Plymouth) through London are sometimes distorted.

The speaker I use is a moving coil built to Dr. McLachlan's specification, but I have obtained satisfactory high-note reproduction from a 12in. reed-driven cone employing Brown, Blue-Spot or Lissen (old type) units.

Finally, I tested, and found quite satisfactory, a linen-diaphragm speaker, which gave very poor results on a neighbour's conventional set; incidentally, he had found 2LO far superior to 5GB, but on making alterations in detector bias, anode resistance and shunt capacity the position was reversed!

Wherefore I am in full agreement with "Fair Play," and say: Look to your set, especially the detector valve and associated circuits.

G. G. HANKEY.

Maidenhead.

Sir,—

No, Mr. "Fair Play," of Yalk, Yalks, I'm afraid you are wrong, by long chalks.

It's long land-lines which mangle

Transmissions and tangle

Up Hamilton Hartly and Talks.

Woking.

G. M. PART.

Sir,—The differences in land-line qualities noted by your correspondent, Mr. E. C. Richardson, obviously point to that much-maligned B.B.C. department, the Control Room, and as the B.B.C., in their own interest, and not being bigger fools than their critics, must have done their level best to maintain the highest possible equality of control throughout their long transmissions (most days 10.15 a.m. till midnight), no fair-minded person can believe that this department has yet succeeded in perfecting this matter, although it must be generally admitted that its transmissions taken as a whole are the best in Europe. Incidentally, I have yet to read any constructive criticisms in this connection.

HERBERT S. COPPOCK.

Didsbury, Manchester.

Sir,—Mr. Bertram Munn, who writes in your issue of December 4th, has missed his vocation in life; he should have been a comic writer (he may be!), but, having finished with the comic stuff, I take it that he thinks outside broadcasts rotten. I am afraid that I and a great many other people up here think that transmissions from Queen's Hall, People's Palace, and various other public places absolutely eclipse the studio quality, which is stuffed up and unnatural.

Arnside, Westmorland.

WILFRID SHARPE.

Sir,—I have spent a considerable amount of unnecessary time "looking to my set," when the fault has proved to be the "other end."

Some weeks ago the quality of the service relayed from Bournemouth was so bad that I dismantled the M.C. speaker, as the coil is wound with a copper strip, and I had decided that this was causing the chatter. To my great annoyance, on substituting a spare coil, I found the trouble persisted, only to become perfect on reverting to London for the "news."

Crawley, Sussex.

ERIC J. PEARCE.

Sir,—There is one point which has so far not been clearly brought out, viz., the general poor level of the quality of transmissions from 5XX Daventry. The higher and lower frequencies seem both sadly lacking, and improving the L.F. amplifier, increasing the H.T. voltage, and improving loud speaker response on the receiving side only seem to bring this fact into greater prominence.

It is, however, a matter of common experience that programmes performed in London and transmitted from 5GB can be, and usually are, of excellent quality, with a brilliant upper register and thumping bass. And yet, presumably, the same length of land line exists in each case.

A. M. ROACH.

Kingston Hill.

Sir,—With reference to your correspondence regarding land-line transmissions, it may interest your readers to hear that from here (Geneva) the difference in quality and volume between direct and relayed broadcasts from British stations is always noticeable, and often most marked.

At a distance of roughly 500 miles one has, of course, to be content with comparatively imperfect reception, and the good old days of five years ago, when one could pick up all the main British stations (even relays), are past, and the only British station now left unswamped by the Germans is 5GB. Nevertheless, there is always a sharp difference between the woolly obscurity of the first news bulletin, for instance (relayed from 2LO), and the second (broadcast from the Birmingham studio); and the light music following the first bulletin seems suddenly to jump out of the loud speaker after one has been straining one's ears and nerves to hear how Lindrum and Smith are progressing.

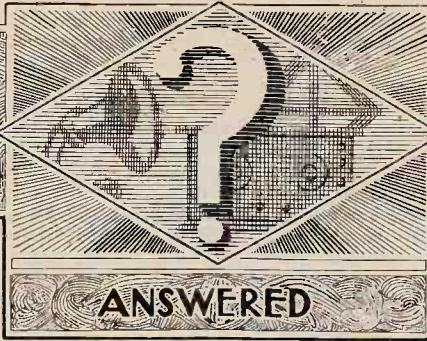
Moreover, it is sheer nonsense to say that imperfect reception is invariably the fault of the receiving set. One has only to turn the dial over from a British station at its best or from the German stations (which also give excellent quality, though rather hard tone) to stations like Lyons, Toulouse, or Seville, which seem to suffer from perpetual sore throat, due to rank bad modulation. After all, if one can get good and bad quality signals on the same set within a few minutes of each other, the fault for the bad signals obviously lies at the transmitting end.

G. D. MILLAR.

Geneva, Switzerland.

READERS

PROBLEMS



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 Wireless World" Supplies a Free Service of Technical Information.

H.F. Transformer Primaries.

I am using "The Wireless World" Kit Set coils in constructing a four-valve A.C. mains receiver having a single H.F. stage with a Mazda A.C./S.G. valve. Will you please tell me how many turns should be added to the primary windings of the H.F. transformer?
D. G. B.

In order to attain maximum amplification a considerable increase should be made in the number of primary turns, but actually the windings specified make a good compromise between the requirements of range and selectivity, even though the valve in question has a considerably higher impedance than that for which they were originally designed.

We recommend that you should try the H.F. transformer as it stands, and then, if selectivity and stability are both in excess—the latter quality will, of course, depend to some extent on circuit details and screening—add another primary section to both long and medium wave transformers.

o o o o

Modernising an Eliminator.

I have a rather out-of-date eliminator giving a main output rated at 120 volts 25 milliamps, and another terminal intended for feeding a detector valve, which is supposed to give up to 100 volts, variable in five steps by a rotary switch. It was thought that this latter output would be suitable for supplying the screening grid of my "S.G. Regional" receiver, but a test shows that this is not so. As a temporary measure I am feeding the three anode circuits from the main output terminal, and have connected a battery of small dry cells for the screening grid. These cells now show signs of decline, and, if possible, I should like to devise a more satisfactory and permanent arrangement. Can you help me?

I should perhaps make it clear that, as far as results go, the present eliminator leaves nothing to be desired; it is mainly to avoid renewing the cells that a change is desired.

M. M. R.

We advise you to try the arrangement suggested diagrammatically in Fig. 1; this requires the addition of a wire-wound

potentiometer of between 30,000 and 50,000 ohms, which is connected externally between eliminator and set in the manner shown.

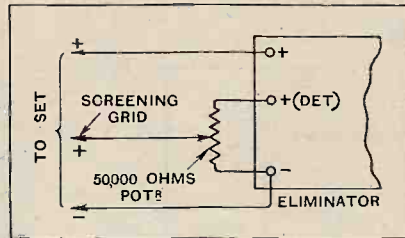


Fig. 1.—Critical adjustment of eliminator output voltage is obtained by adding an external high-resistance potentiometer.

In the absence of full details as to the method adopted for "breaking down" the voltage supplied from the "detector" terminal of your eliminator, we cannot say definitely that this connection will afford the desired voltage for the screening grid. In all probability all will be well, but if any trouble is experienced the external potentiometer must be joined between the negative and main positive terminals of the eliminator.

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.

Long Wave Troubles.

My "2 H.F. set," built in accordance with suggestions made in recent articles is working exceptionally well on the medium broadcast waveband, but is totally lacking in stability on the long waves. This puzzles me, as I have always thought that the small residual capacity of a screen-grid valve has little effect at comparatively low radio frequencies, and that, having achieved stability with regard to high frequencies, the rest should automatically follow.
J. W. W.

It is correct to assume that there should be less tendency towards H.F. instability on the long waveband in an amplifier such as you describe. When a set of this kind fails to operate satisfactorily on this band, although it puts up a good performance on medium waves, the first thing to suspect is imperfect separation of H.F. and L.F. components in the anode circuit of the detector valve; failure in this respect often gives rise to an effect not quite the same as ordinary self-oscillation due to interaction, but very similar to it.

To assure yourself if this is at the root of the trouble it is a good plan temporarily to connect a much larger condenser—say 0.002 mfd., or even more—than can be generally tolerated from the "L.F." point of view between detector anode and earth. If this provides a cure for instability, it can safely be assumed that the normal filtering devices are inadequate.

It should be added that trouble of this kind is sometimes traced to the use of decoupling condensers of excessively low value.

o o o o

Parallel-fed L.F. Amplification.

Will you please tell me if the parallel feed method of L.F. amplification is applicable only with modern inter-valve transformers having high-permeability cores, or whether it can be used with ordinary transformers.

V. H. R.

Generally speaking, this system confers greater advantages when dealing with the modern "Mu-metal" transformers, but it is a mistake to assume that it cannot be successfully applied to the larger transformers with ordinary cores.

Unsuspected Current Leakage.

Will you please examine my circuit diagram (on which resistance values and details of valve types, etc., are marked), and say whether I am correct in assuming that the total anode current consumed will amount to about 25 milliamps with a common input of 150 volts. My problem is to know whether it is safe to take this figure in calculating the value of resistance necessary to absorb the surplus voltage delivered by my eliminator. J. B. V.

With regard to the valve anodes, your estimate as to total current consumed is as correct as need be, but you have ignored the fact that the screening grid potentiometer will also impose a load on the eliminator. This potentiometer is, according to your diagram, composed of

wavelength adjustments, and it might possibly be found that your aim to achieve a simple switch changeover would be defeated by the fact that the reaction adjustment for one wavelength might not hold good for the other. However, as you are situated at less than 20 miles from Brookmans Park, we do not think that this objection will hold in your case, as it should be quite unnecessary to tighten the reaction coupling to anything approaching the oscillation point for either wavelength. It should be easy to find an adjustment which holds good for both stations.

We have shown a fixed condenser in series with the aerial; you might find it convenient to make this either variable or semi-variable in order that it may be used as a rough-and-ready form of volume control.

trame limit of their range where a good deal of reaction is necessary.

Increasing Wavelength Range.

I find that my det.-L.F. set will not tune down to the new Regional station working on 261 metres; a reduction in aerial length does not have any appreciable effect in extending the lower limit of its wavelength range. Should this be so? Will you please suggest a way of altering the set so that the alternative transmissions may be received. E. C.

From the fact that alterations in aerial length (and consequently in aerial capacity) do not have any appreciable effect in changing the tuning range of the grid circuit, it is fair to assume that your set includes either an "aperiodic" aerial-grid transformer, or that the aerial is coupled to the grid through a very small fixed condenser. In either case the remedy is the same; you must make a reduction in the inductance of the tuned circuit, and if provision is not made for using interchangeable coils the only way of doing this is to remove a few turns from the winding. We suggest that you should take off a few turns at a time until the desired wavelengths are received.

A Composite Receiver.

Can you see any disadvantage in combining the high-frequency amplifier of the original Everyman Four with the detector and L.F. amplifier of the new (1930) set? The aerial tuning arrangement of the latter receiver would be embodied, and interchangeable coils would be used for the two wavebands. D. W. B.

Up to a point, this circuit arrangement should be highly satisfactory, but it must not be expected that it will provide as much H.F. amplification as that afforded by the "1930" Everyman Four" with the best type of modern screen-grid H.F. valve. Selectivity will be of a very high order if proper use is made of the aerial coupling adjustment.

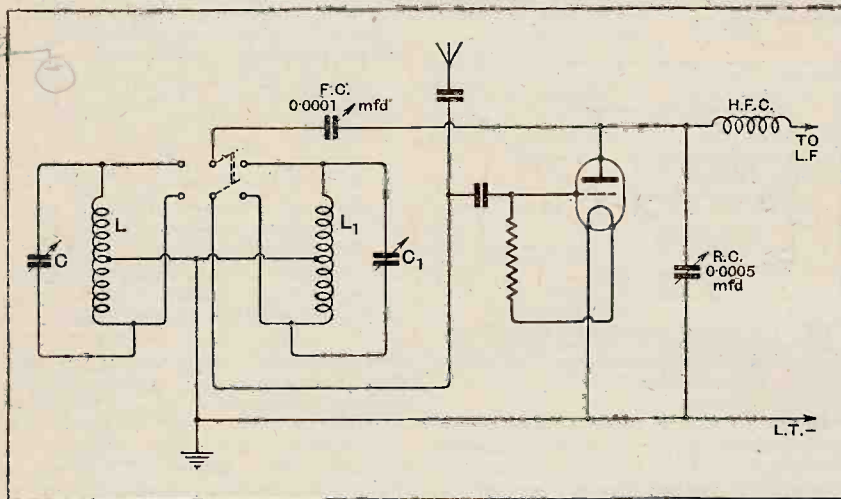


Fig. 2.—A regenerative detector circuit arranged for easy switching-over to alternative transmissions. Standard components may be used.

a fixed and variable limb, with values, respectively, of 10,000 and 20,000 ohms. This gives a total of 30,000 ohms, which will pass 5 milliamps when 150 volts are applied. This extra current must be added to that consumed by the anode circuits, so you should allow for a total of 30 milliamps.

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Alternative Programme Reception.

Will you please give me a circuit diagram of a throttle-controlled reacting detector valve arranged for alternative programme reception? I should like so to arrange matters that it is possible to change programmes by switching over from one tuned circuit to the other. I am, of course, prepared to use separate pairs of tuning coils and condensers. T. S. S.

We think that the circuit shown in Fig. 2 should be entirely suitable for your purpose. In this diagram the two separate tuning circuits are represented by L, C and L₁, C₁.

It will be observed that the reaction control condenser R.C. and the reaction feed condenser F.C. are common to both

Frame Aerials and Quality.

The majority of frame aerial sets to which I have listened seem to be deficient in the matter of quality, or at any rate they do not give such good reception as receivers with outside aerials. Do you consider that this is inherent in the design of a self-contained set? S. D. H.

There is no basic reason why a frame aerial set should not give quite as good results as one with an outside aerial, although it is admitted that risk of trouble is somewhat increased in the case of the self-contained receiver. In the first place, there is generally greater tendency towards H.F. instability, and some sets are found to be on the verge of self-oscillation over a considerable part of the tuning scale; this incidental reaction will naturally impair quality. Again, many sets must of necessity be fitted with small-capacity H.T. batteries in view of the space available, and this in turn leads to the use of an output valve with strictly limited power-handling capacities.

Further, it is possible that you may have formed your opinion after listening to frame aerial sets working at the ex-

FOREIGN BROADCAST GUIDE.**TUNIS-KASBAH**
(North Africa).

Approximate Geographical Position: 36.48° N. 10.18° E.

Approximate air line from London: 1,360 miles.

Wavelength 1,350 m. Frequency 222.2 kc. Power 0.6 kW.

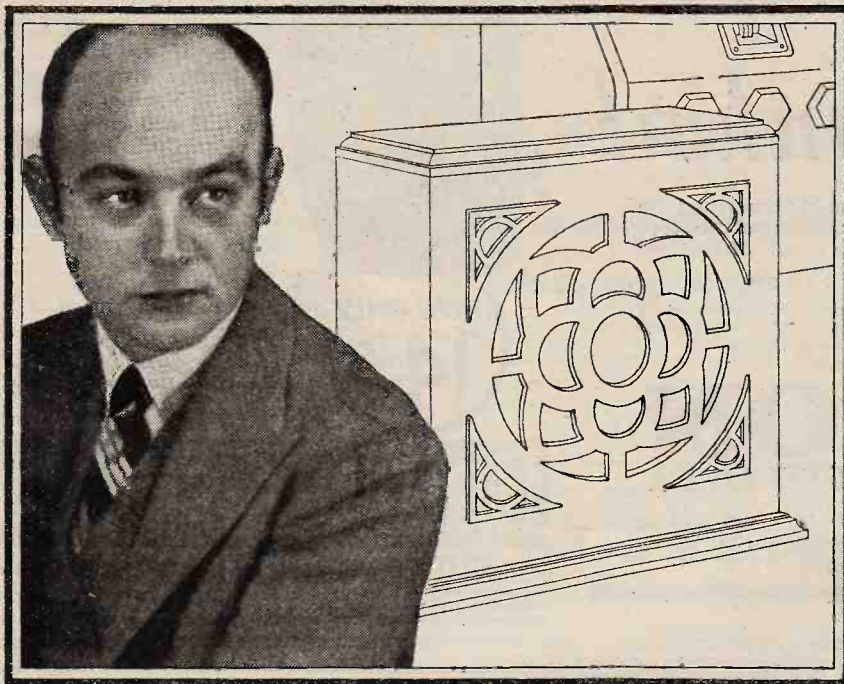
Time: Central European (one hour in advance of G.M.T.).

Transmits daily from 8.15 p.m. G.M.T. Male Announcer. Call: *Allo! Allo! Ici le Poste Radiotéléphonique de Tunis-Kasbah.* Announcements are made in French and Arabic.

Under the heading "Foreign Broadcast Guide," we are arranging to publish a series of panels in this form, giving details regarding foreign broadcast transmissions.

MISCHA LEVITSKI

hears 'the impossible'!



"I have heard what I thought impossible," says Mischa Levitski, the brilliant pianist—"the true authentic notes of a piano coming from a radio loud speaker. The radio was a Marconiphone, and so was the speaker."

Choose your programme—orchestra, dance music, a speech. On a Marconiphone loud speaker it will come through clear-cut, flawless. Sir Edward Elgar, Theodor Chaliapine, Albert Coates, many other famous musicians, have found in the Marconiphone tone and volume unrivalled today.

Marconiphone engineers make these speakers. All the skill of thirty years' leadership in wireless is in their construction. Ask any dealer for a demonstration. If there is no dealer near you, write to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

Listen with a

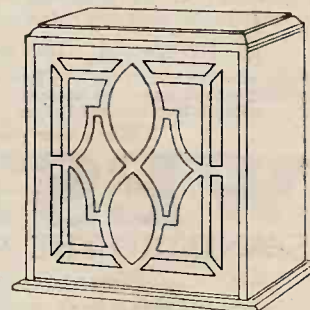
MARCONIPHONE LOUD SPEAKER.

THE FIRST AND GREATEST
NAME IN WIRELESS



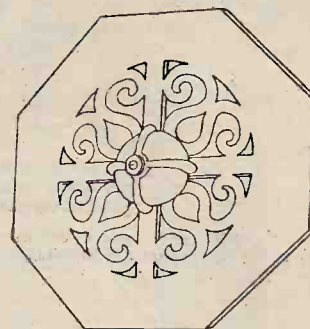
MODEL 60 CABINET CONE
(shown on left)

Obtainable at the very moderate price of £3, the Model 60 is an extremely efficient "all-purpose" speaker. Embodying the Marconiphone reed system, it is outstandingly clear in tone.



THE FAMOUS
MOVING COIL SPEAKER

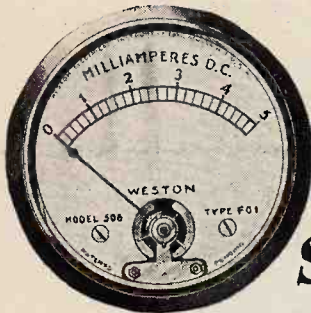
The highly accurate centring of the Moving Coil and the one-piece fibrous diaphragm ensure absolutely accurate reproduction. Units from £4.10.0. Cabinet models: for 6-volt accumulator, £7; for D.C. mains, £7.10.0; for A.C. mains, £12.12.0.



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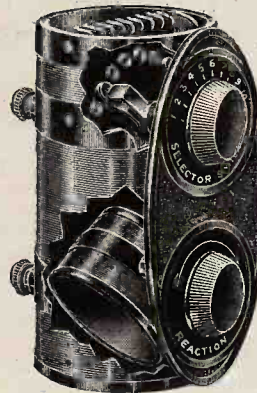
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A3

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—to tune-in with a British General Aerial Tuning Unit. There is no fussing with plug-in coils. Tuning is on one dial and covers all wavelengths between 220 and 2,000 metres. Easy two-hole fixing and connections are simple and clearly defined.

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All we ask is the chance to prove that you can earn £300, £400, £500 per year or more. Other men are doing it, and you can do the same.

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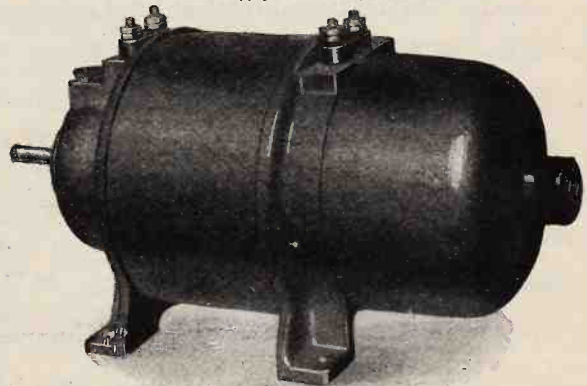
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An entirely new M-L production for the ALL ELECTRIC RECEIVER, the D.C. to A.C. Converter.

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Power Supply Units our Speciality.



IF YOU ARE ON D.C. MAINS employ the above machine for running your ALL ELECTRIC RECEIVER. The only safe way to operate receivers from D.C. Mains. Suitable for well-known makes of Receivers

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B42

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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 : 13 consecutive insertions 5% ; 28 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, Hertford Street, Coventry ; Guildhall Buildings, Navigation Street, Birmingham ; 260, Deansgate, Manchester ; 101, St. Vincent Street, Glasgow, C.2.

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.

The proprietors retain the right to refuse or withdraw advertisements at their discretion.

Postal Orders and Cheques sent in payment for advertisements should be made payable to **ILIFFE & SONS Ltd., and crossed & Co.** 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, counting from receipt of goods, after which period, if buyer decides not to retain goods, they must be returned to sender. If a sale is effected, buyer instructs us to remit amount to seller, but if not, seller instructs us to return amount to 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

1930 EVERYMAN FOUR	47/3 set
KIT SET, Coils with Switches	45/- set
NEW KILOMAG.	45/- set
RECORD III	45/- set
FOREIGN LISTENERS 4 B.B.C.	30/- set
METAL CABINETS	5X 37/6 set
5 1/2" DRUM DIALS with Escutcheons	38/3 to 46/6
WAVETRAP, Litz Wire	5/6
	10/6 eac

B&J Wireless Co.

2, 3, & 4, Athelstane Mews,
Stroud Green Road, N.4.

Arclway 1695

"END OF YEAR CLEARING."

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FOR BARGAINS WATCH Phone : Paddington 8928 (3 lines)

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For Modern High-grade Material Only.

CHAPEL ST., LONDON, N.W.1

OPEN TILL 7 P.M. SAT. 1 P.M.

KUSHA

PICK-UP ARM

Showing a new swivel "Continental" fitting which allows turn of pick-up for easy insertion of needle from the top whilst maintaining the advantage of the long drop section.

LENGTH 10 1/2 ins.
HEIGHT 3 1/2 ins.

12'6

Also H.M.V. Fitting.
STANDARDISED BY G.E.C.

Vibrationless. Weight-relieving (adjustable).
Adaptable in angle and length to ensure true tracking under all conditions.

Of G.E.C., all best Factors and Dealers, or

R. H. GLASSCOE & CO.,

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MUCH IMITATED

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NEVER EQUALLED

REDUCED PRICES!

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POWER TYPES. WERE 15/- " 13/6

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40 Page Illustrated Booklet with Scale Drawings all types mains apparatus etc.

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76, OLDHALL ST., LIVERPOOL.

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SCOTT SESSIONS and Co., Great Britain's Radio Doctors.—Read advertisement under Miscellaneous.

3-VALVE All-wave Receiver, latest type, powerful, perfect; £4.—V. Taylor, 57, Studley Rd., Stockwell, London. [0274]

RECEIVERS for Sale.—Portable 5-valve, suit case type, complete, as new, perfect; £9/17/6.—N. Taylor, 57, Studley Rd., Stockwell, London. [0323]

G.E.C. 7-valve Supersonic Portable Receiver, complete with valves, L.T. battery, and H.T. unit (A.C.), as new; reasonable offer accepted.—T. Bridger and Son, High St., Slough. [7710]

MARCONIPHONE Type 35 Screened Grid 3-valve Sets, brand new; £9, with valves; hire purchase arranged; only a few at this price.—Hall, 91, Fore St., Edmonton. [7722]

WIRELESS Portable Sets, with 5 Cossor new process valves, for 9 guineas; less than components cost, comparable with any set double this price, Royalty paid; seen between 1 and 2 p.m., or particulars sent on receipt of stamped addressed envelope.—G. Hodgson, 53, Windsor House, Victoria St., Westminster. [7737]

READ and MORRIS, Ltd., the mains pioneers, who in 1925 equipped the hospital with mains sets, still supreme in all-mains receivers and units.

LOW Tension A.C. Eliminators, permanently replacing batteries, now only £5/15; electrolytic condensers, 2,000 m.f., as used in above, 13/-; including postage.

BARGAINS—Second-hand sets, units, meters, speakers.—Read and Morris, Ltd., 31, Eastcastle St. (facing back of Warrings), Oxford St., W. [7769]

OSRAM Music Magnet, latest 1930, perfect, used a few hours only, £7/10.—Touchstone: Four, single dial, 60 stations, faultless, but no cabinet, 28/-; Bus Spot 66K, unused, 17/6; R.I. transformer, 5/-; P.625A, as new, 9/6; P.M.I.H.F., 5/-—51, Beechwood Av., Kew. [7766]

SILVER Marshall Intermediate Unit, including 4 valves, oscillator couplers and coils, 0.20 to 2,000 meters; £3/10.—W. V. Hughes, 7, North Rd., Caerparvon. [7765]

PHILIPS Model 2514, 3-valve, A.C., absolutely unused; £17.—Box 4364, c/o The Wireless World. [7786]

SPLIT NEW 1930 Osram Music Magnet and Orgola, tested sets, Brown speaker; £7/10, £8/10, 35/—Box 4366, c/o The Wireless World. [7788]

MAHOGANY 4-valve Radio Gramophone, complete, wonderful tone and volume; write for demonstration; £35, cost £65.—Box 4365, c/o The Wireless World. [7787]

F. W. SMURTHWAITE, A.M.I.R.E., manufacturer of all types of high grade radio apparatus, desires to announce that orders can again be accepted for reasonably quick delivery.

ALL A.C. Receivers of Unique Performance, radio-gramophone outfits, etc., specially made to your particular needs, all first class published designs quoted for, etc.

WHATEVER Your Wireless Requirements may be, my unbiased advice is at your disposal. I quote the lowest prices for guaranteed first class work; contractor to the B.B.C., Board of Guardians, etc.

F. W. SMURTHWAITE, A.M.I.R.E., 15a, Onslow Gardens, Wallington, Surrey. 'Phone: Wallington 1982. Showrooms, 104, South End, Croydon. [7783]

MARCONI 5-valve Receiver, 2 S.G., Det., and 2 L.F., complete valves, extra coils, £10; speaker, extra; offers; demonstration.—Write F. K., 44, Lordship Park, N.16. [7780]

SOLOBYNE Five (2 S.G.), complete in handsome mahogany cabinet; cost £20, for quick sale, £6/10.—4, The Drive, Edgware. 'Phone: 0626. [7772]

WE Offer You the Following Inducements to Purchase Your New Receiver or Other Apparatus from us.

FIRSTLY.—Unbiased advice. The Principal of the firm has twenty years' professional wireless experience, having been at Government Experimental Stations in 1910. He has been Manager for the Sterling Telephone Co., radio expert to the G.E.C., and Chairman of the Technical Committee of the National Association of Radio Manufacturers. His advice has saved our clients many thousands of pounds, for, as everybody knows, there is no hobby on which more money is wasted on useless apparatus by the uninitiated.

SECONDLY.—We take your old apparatus in part exchange for new. Send us a list of your old apparatus, or, better still, send us the apparatus, and state your new requirement. We will then make our offer for your goods, and if you do not approve, which is unlikely, we will return the parcel, carriage paid.

IF You are in Doubt as to the Make of Receiver or other Apparatus you should Purchase, write to us, and we will advise you; we have no leaning towards any particular maker, and will tell you the particular instrument you should buy for your purpose.

SCIENTIFIC DEVELOPMENT Co., 51, Fishergate, Preston. Tel.: 1364. [0226]



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2½" - 2/4
BABY
3" - 2/6
STANDARD
4" - 2/9
In Black or Brown.

"ISO" DIALS

"Iso" Dials have a definite grip. They do not slip.

ISOMONA 70 PRECISION

SIZE PRICE
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HAW & Co. Ltd.

20, CHEAPSIDE, London, E.C.2. Tele.: CITY 9510. Sole Distributors for "Iso" Products. Coils, Units, Transformers, Chokes, Condensers, Trickle Chargers, Eliminators, etc.



Our 1930 Super Power Model.



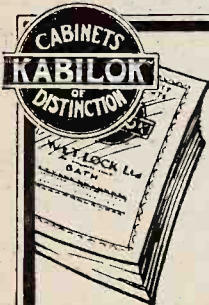
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Radio - Gramophone music and speech reproduced with amazing and uncanny realism. The most efficient speaker money can buy.

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SEND TO-DAY FOR OUR FREE 36-PAGE BOOKLET "SOUND ADVICE."

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BUILDING THE Mullard Orgola, Magic 3 or a set described in "Wireless World" or other radio publications?
Select a **KABILOK CABINET** of distinction. Illustrated Catalogue Free on request.

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ST. PETER'S WORKS - - - - BATH.
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SIMMONDS BROS.—Receivers constructed to your own or any published design; also repairs, reconstructions; and modernisations at moderate charges; best materials and workmanship guaranteed; numerous testimonials; quotations free.—Address, Shireland Rd., Smethwick. [5882]

SUPER Range 3-valve Set, guaranteed, genuine, complete with all accessories, new; 9 guineas; approval 7 days.—Box 4377, c/o *The Wireless World*. [7828]

KOLSTER-BRANDES 169 All Mains 1930 Model, perfect condition, guaranteed, 13 guineas; also Stork speaker, as new, 40/—Box 4374, c/o *The Wireless World*. [7818]

COSSOR Melody Maker, 1929, S.G., Pentone Amplion, A.C.4, speaker, £7, or offers.—Box 4373, c/o *The Wireless World*. [7817]

2-VALVE Amplifier, output 25 milliamps, complete with valves, accumulator, charger, H.T. eliminator (200/220 A.C.); the lot £10, bargain.—19, Gairloch Rd., Eltham, S.E.9. [7807]

MARCONI V.1 Receiver, mahogany cabinet, valve, headphones, coils, accessories, 35/-; Dinkie L.S. 7/6.—Lawrence, Park Lodge, Holbeach, Lincs. [7798]

3-VALVE S.G. All-mains Transportable, for 100/250v. A.C., beautiful cabinet, amazingly selective and sensitive, superb reproduction, brand new; £22/10; demonstrated London area willingly, or sent on approval.—Heaton, 42, Green Lane, Thornton Heath, Surrey. [7797]

PHILIPS All-Electric 3-valve, with Celestion speaker; cost £28, just new; for quick sale, £20, or nearest offer.—McEwen, 17, Craven Rd., London, W.2. [7793]

GREAT Opportunity.—Having many requests for famous Royal Air Force 3-valve receivers, we have now procured limited number; these receivers give excellent loud-speaker reception, each set specially tested before delivery to ensure satisfaction, all are guaranteed brand new and perfect; the original cost of these sets was £18; special travelling case with each set; we are sacrificing at the absurdly low price of 32/6.

GUARANTEED and Absolutely New McMichael Supersonic Kits, including mahogany cabinet, book instructions, blue prints, clearance price only £3; these sets can get the whole world; without cabinet, price £2.

J. B. HUMPHREYS and Co., 23, College Hill, Cannon St., London, E.C.4. [7802]

TRUVOX Concert Grand, radio-gramophone, incorporating the famous 120-inch exponential horn, superseding moving coil, quite new, cost £55, wonderful instrument; reasonable offer accepted.—12, Wembury Rd., Highgate, London, N.6. [7808]

BURNEDEPT Superhet De Luxe, 7 P.M. valves, Brown Q15 loud-speaker, cost £91, all in excellent condition; seen any day after 6 p.m.; what offers?—Address: Bruzard, 9, Atherstone Terrace, Gloucester Rd., London, S.W.7. [7827]

NATIONAL, Portable, as new, £7/10; new battery.—Box 4379, c/o *The Wireless World*. [7830]

PANATROPE Super Cinema Model for Sale, cost recently £200, twin turntables, 3 power speakers, etc., in perfect condition, owner installed talkies; accept £95 for quick sale.—Box 4380, c/o *The Wireless World*. [7831]

5-VALVE Portable, new, list 21 guineas, sell £12; also 5-valve transportable in mahogany cabinet, complete, £4; also wireless surplus, cheap.—2, St. George's Rd., Bedford Park, W.4. [7835]

ACCUMULATOR HIRE.

DON'T Buy Accumulators or Dry Batteries, join our C.A.V. low- and high-tension accumulator hire service, the largest and best in London; better and cheaper reception with no trouble; regular deliveries within 12 miles of Charing Cross; no deposit, payment on delivery or by subscription; over 10,000 satisfied users; explanatory folder post free; phone or write to-day.—Radio Service (London), Ltd., 105, Torrington Av., N.W.5. Phone: North 0623-4-5. [7596]

C.D.E.S. Accumulator Hire and Maintenance Service (5 mile radius).—98, Cherry Orchard Rd., Croydon. [6374]

BATTERIES.

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]

PENTODE Users.—Write for details of new size self-charging wet battery; 20,000 milliamps, 6d. per volt; illustrated catalogue giving data, post free.—U. Taylor, 57, Studley Rd., Stockwell, London. [0273]

WET H.T. Batteries.—Parts per dozen, jars, No. 1, 2¼x1½ square, 1/3; No. 2, 1/6; zincs, No. 1, 10d.; No. 2, 11d.; sacs, No. 1, 1/2 dozen; No. 2, 1/9; terminals, 8d., 10d.; dozen cells (18 volts), complete with bands and electrolyte, No. 1, 4/1; No. 2, 5/-; post 9d.; high efficiency, long life, self charging, upkeep small; send 6d. for sample unit; illustrated booklet free, carriage free order 10/-; write for free list wireless bargains, trade supplied.—W. Taylor, 57, Studley Rd., Stockwell, London. [0039]

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invited for
POSITIONS AS REPRESENTATIVES
by
TELSEN ELECTRIC CO. LTD.

The positions are for whole time, and salary, commission and expenses will be paid.

Applications must state full detailed experience during the last seven years, age, number of years experience in car driving and remuneration required, also the particular area or district preferred, or, where best known.

Only first-class men with good references need apply.

All applications will be treated with strict confidence.

TELSEN ELECTRIC CO. LTD.
Miller Street, BIRMINGHAM.

Order Your
1930 "EVERYMAN FOUR"
Metal Cabinet as described in "Wireless World,"
January 1st, 1930.



Eaton metal cabinet, with 3 screened compartments.
Delivery from Stock,

46/6 each; Without Woodwork 35/-
Metal Cabinets for all "Wireless World" Sets in stock.
Finished crystalline Brown, Black or Blue.

Trade Enquiries invited.
Samuel Eaton & Sons (Manufacturers of Lighting Goods),
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ENGRAVED ON THE TOP



—like the
Terminals

The finishing touch that stamps Belling-Lee as the best. Completely insulated engraved top. The prongs, made of special spring metal, make a firm efficient connection. Entire flex—copper, rubber and braiding—individually gripped without use of tools.

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FOR EVERY RADIO CONNECTION

Ask your dealer, or send to us, for Belling-Lee Handbook, "Radio Connections."

Advertisement of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.

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VORTEXION Transformers, chokes, etc., wound to any specification; write or 'phone for quotation; best quality components only.—Vortexion, 72, Merton Rd., Wimbledon, S.W.19. Tel.: Wimbledon 2814. [0319

TANTALUM and **Lionium** for A.C. Rectifiers; make up your own inexpensive chargers; blue prints for H.T. and L.T., 1/- each; Lionium electrodes fitted with terminals, 2-3 amps. and 5-8 amps.—Blackwell's Metallurgical Works, Ltd., Speke Rd. Works, Garston, Liverpool. 'Phone: Garston 980 (2 lines). [6282

PHILIPSON'S Safety High Tension Battery Eliminators.

10/- Down and the Balance in Easy Monthly payments secures the finest high tension supply available.

PHILIPSON'S Safety Eliminators are Guaranteed for 12 Months.

PHILIPSON'S Safety Eliminators are the Cheapest to Install and the Cheapest to Run; prices: Model A.C.5 £4/17/6, A.C.7 £3/17/6, complete with full wave, rectifiers; D.C.4 37/6, D.C.5 45/-.

ALL Models Obtained for 10/- Deposit; take advantage of this and get constant high tension immediately.

WRITE for Our Booklet, "Radio Power" to Philipson and Co., Ltd., Radio Engineers, Astley Bridge, Bolton. 'Phone: 2038. 'Grams: Safety, Bolton. Est. over 50 years.

CHEBROS—Chebros for all types of transformers and chokes, high grade instruments at a very moderate price; enquiries invited.—Chester Bros., 244, Dalston Lane, London, E.8. [5290

TRANSFORMERS and Chokes for Battery Eliminators and for all wireless purposes, receiving or transmitting; enquiries invited.—Chester Bros., 244, Dalston Lane, London, E.8. [7587

FEL-ECTRIC High Tension Eliminator Kits, improved output 15 milliamps at 120 volts; complete; 25/-.

FEL-ECTRIC Eliminator Kits are the Best and cheapest in England; complete, 25/-.

FEL-ECTRIC Kits are Complete, except valve, and we recommend Philips 373; 15/-.

FEL-ECTRIC Kits have been Sold in Hundreds, and are guaranteed, satisfaction or money returned.

FEL-ECTRIC Kit will be sent c.o.d. if desired, state voltage and periods, also whether Philips valve is required at 15/- extra.

FEL-ECTRIC Eliminator Kit is Post Free; price 25/-.

FOLDER and Lists on Request to Fel-Ectric Radio, 56, Garden St., Sheffield. [7742

PHILIPS Charger, 12 volts 1.3 amps., 200 volt 50 cycle; £2/10.—Nichols, 74, Childbeart Rd., Balham. [7762

SAVAGE'S Specialise in Wireless Power from the Mains, reliable apparatus at reasonable prices. **SAVAGE'S** Transformer Laminations and Bakelite S. Hobbins; intending home constructors should write for list.

SAVAGE'S Reliable Smoothing Condensers.—1,000 volts D.C. test, 2 mid. 3/-, 4 mid. 5/3; 500 volts D.C. test, 1 mid. 1/6, 2 mid. 2/3, 4 mid. 3/8.

SAVAGE'S Super Smoothing and Output Chokes.—Many types available, write for list.

SAVAGE'S Mains Transformer for Westinghouse Rectifiers.—H.T.4, 19/6; A3, 17/-; A4, 20/-.

SAVAGE'S Mains Transformer for Westinghouse H.T.4 Unit, with additional winding, 4 volts 3 amps.; 23/-.

SAVAGE'S Mains Transformer.—V.T.31, 200-0-200 volts 60 m.amps, 2+2 volts 2 amps., 2+2 volts 3 amps.; 28/-.

SAVAGE'S Mains Transformer.—B.T.3 500-0-500 volts 120 m.amps., 3.75+3.75 volts 3 amps., 3+3 volts 3 amps., 2+2 volts 3 amps.; 51/-.

SAVAGE'S Mains Transformers and Power Chokes are carefully and individually constructed from first class materials with an exceptionally generous margin of safety.

SAVAGE'S, 146, Bishopsgate, London, E.C.2. 'Phone: Bishopsgate 6998. [6808

REGENTONE Eliminator A.C. W.I.B.S.G., 200-250, 40-60, new, unused; 70/-, cost 100/-.—Bailey, 28, Birchwood Rd., West Byfleet, Surrey. [7822

RECTIFIER, output 300 milliamps at 200 volts, input 230 volts, 50 cycles, full smoothing equipment, Ediswan H.M. 235X valve, cost £10, guaranteed perfect condition; £5/10.—186, Normandy Rd., Handsworth, Birmingham. [7789

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ARTCRAFT Radio Cabinets are Britain's Best Value. [0313

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 components; from 58/- to £12.

DIGBY'S Cabinets Made to Customer's Own Designs.

DIGBY'S Cabinets.—Write for new 16-page art catalogue.—F. Digby, 9, The Oval, Hackney Rd., E.2. 'Phone: Bishopsgate 6458. [0128

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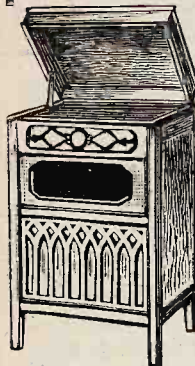
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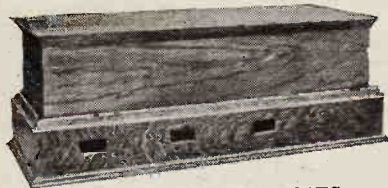
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TRANSFORMERS.—Ferranti A.F.4, 10/-; A.F.3, 15/-; A.P.5, 21/-; A.P.5C, 22/6; O.P.6C, 16/-; O.P.3C, 16/-; O.P.1, 14/-; R.I. Varley general purpose, 8/-; straight line super, 15/-; Hypermu, 16/-; Pentam output, 15/-; old type, 5/-; pair B.I. Duplex push-pull, 38/-; B.I. Duplex heavy current, 27/6 type, 15/-; Formo, 5/-; Lissen, 5/-; Lissen Super, 13/-; Geophone, 9/-; Royal, 6/-; Eureka, 5/-; Telsen Ace, 5/-; B.T.H., 7/6; Brandes, 5/-; Igranite shrouded, 5/-; Marconi universal output, 15/-.

SLOW Motion Dials.—Ormond white face, 2/6; Burndept, 3/-; Utility, 3/-; Cleartron, 1/9; Brownie, 2/-; Igranite Patent, 2/6; others, 1/6; anti-microphonic holders, all makes, 9d. each; 2-coil holders, all makes, 1/6 each; rheostats, all makes, 9d. each; fixed condensers, all capacities to 0.05, 9d. each.

WIRE Wound Resistances, R.I. Varley, Dubilier, Mullard, 100,000 ohm 1/9, 250,000 ohm 2/3 each; bases, 6d.

R.I. Varley Permanent Crystal Detectors, 1/6; plug-in coils, all makes, half list price; also 6-pin coils and bases, ditto; Bowyer Lowe short wave chassis, with coils, H.F. choke, L.F. transformer, screens, metal panel, etc., £3.

IGRANIC Neutroregenerative Short Wave Kit, with 1 extra coils, short wave chokes, etc., 55/-.

LOTUS Relays, 10/-; Centralab 500,000 ohm resistance, 6/-; Igranite megohm ditto, 3/-; Clarostat volume control, 5/-; Royalty eliminator resistances, zero-5,000, 1,500-100,000, 10,000-700,000, 100,000-7 megohms, each 5/6; Gambrell wavemeter, with chart, 25/-; R.I. volume control, 5/-; loud-speaker units, gramophone or horn type, Lissen 5/-, Brown C.T.S. 6/-, Bullphone 7/-, other 4/-.

LASSMAN 4-pole Cone Unit, 10/-; Goodman P.G.3, with cone chassis, 25/-; Blue Spot 66K, 15/-; Goodman P.G.4, 20/-; Cylidon, 6/-.

VARIABLE Condensers.—0.0005 Geophone S.M., 7/6; Brandes, 7/6; Ormond 20/- type, 8/-; Igranite Lokvane, 6/-; Burton, 4/-; Ormond, 4/-; Formo, 3/-; others from 2/6 each; all S.L.F. or L.M.L.

ALL Makes 0.0003 Condensers Two-thirds Above Prices; Cylidon dual condensers, 0.0005, 5/-; J.B. twin gang condenser, 39/6 type, 20/-; Cylidon triple gang, 20/-.

ELIMINATORS.—A.C. Benjamin Majestic, 160 volts 60 m.a., £4; Metvick, 220 volt 60 m.a., £6; Burndept, 50 m.a., £4; direct current type, Radielle, give 220 volts 100 m.a., £4; Ecco, 10 m.a., 17/6; Climax, 20 m.a., 20/-.

NESPER Trickle Charger, 25/-; Burndept ditto, 25/-; Metvick elastic aerial units, 7/6; Harlie wave trap, 7/6.

VALVES, all guaranteed full emission.—P.M.256, 7/-; P.M.5X, 4/-; P.M.5B, 4/-; P.M.6, 5/-; P.M.6D, 5/6; Philips 505, 8/-; D.E.H.610, 5/-; P.M.26 Pentode, 14/-; H.L.610, 5/-; D.U.2, 10/-; P.X.650, 14/-; D.E.5A, 5/-; D.E.5, 2/6; D.E.5B, 2/6; L.S.5A, 10/-; S625, 8/-; Cossor S.G.210, 8/-.

H. F. Chokes.—R.I. Varley, 5/6; Lewcos, 5/-; Varley, 3/-; Climax, 4/-; Sovereign, 3/-; Lissen, 2/6; Success, 4/-; Weatite, 4/-; Detex, 3/-; Colvern All Wave, 5/-.

BASEBOARD Mounting Neutralising Aerial Condensers, Peto-Scott 2/-, Formodenser 1/6, McMichael 1/9, Igranite 2/-, Bowyer Lowe 2/-, Gambrell 2/6.

VARIABLE Reaction, panel mounting, Ormond, Dubilier, Peto-Scott, Magnum, 2/6; resistance capacity coupling units, R.I. Varley 7/-, Mullard 9/-, B.T.H. 5/-, Cosmos 4/-, Dubilier 4/-, Ediswan 3/-, Carborundum 3/-, Polar 2/-; Ready Radio selectivity unit, 13/-.

CLIMAX Mains Transformer, 20/-; Ferranti E.M.1, 100 milliamps, 27/6; Climax smoothing chokes, 7/6.

LOUD-SPEAKERS.—Loewe cone, mahogany cabinet, 28/-; Primax, 27/6; Brown disc, 50/-; Sterling Mellovox, 10/-; Brandes Tablecone, 50/-; Mullard cone and unit for portable, 20/-; Six-Sixty ditto, 15/-; Marconi 105 speaker, 55/-; Celestion C14, as new, £8; Webson M.C., 55/-; Marconi 6-volt chassis, £3.

SETS.—McMichael All Mains Screened Dimic Three, 200-240 volts, £19/10; Burndept 1929 model Screened Grid Four, £17/10, as new; R.I. Varley, 4 valves, in mahogany cabinet, with folding doors, with valves, £6; Marconi 4-valve type 42, £6, in mahogany cabinet, with doors; Mullard Portable, less valves and H.T. battery, £7/10; Burndept Super-het Ethodyne, H.T. battery, cabinet damaged at back, but otherwise perfect, with 2 frame aerials, £6; Burndept 2-valve, in mahogany cabinet, wonderful results on loud-speaker, with valves, £3; General Radio 2-valve, new, £2; Marconi V2 long range, 20/-; etc.

WATMEL Pick-up Arm, 4/-; Kusha balanced ditto, 7/6; Ferranti portable meter, 7.5v., 150v., 30 m.a., 32/6; another, but only 15 m.a., 27/6; Weston Piujack voltmeter, 30/-.

ALL Above Items Postage Extra or Carriage Forward; sent c.o.d. if required; no part exchange.

SCIENTIFIC DEVELOPMENT Co., 51, Fishergate, Preston. Tel.: 1364. [7778]

WATTS AN OHM WITHOUT A DIX-ONEMETER

50 Electrical Instruments in 1
AMPS VOLTS OHMS

Only Six Terminals, but what Ranges!

The DIX-ONEMETER is portable size to go in the pocket, but big enough to cover the whole range of D.C. electrical measurements. You can have multipliers to work from 50 micro-amps to 150 amps and 20 milli-volts to 2,000 volts. What other instrument to Brit. Elec. Standard Assocn. Standard of Accuracy for First Grade meters is available at the price? None! A novice can use it as accurately as an expert. No switch to be accidentally turned with disastrous results, as each range has its independent multiplier and a safety button controls the moving coil.

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Electrical and Radio Test Booklet Free

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DIX-ONEMETERS are now 50/- only, a remarkably small price for a meter worth £10 in comparison with others.

Latest Model. To 1st Grade Brit. Eng. Standard Mirror Double Scale. Moulded Base. The finest Precision Multi-measuring instrument is the DIX-ONEMETER, the acknowledged Radio standard beloved by Expert and Amateur.

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218, Upper Thames Street, E.C.4.
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BERCLIF COILS

1930 EVERYMAN 57/- the Set.
NEW KILO-MAG 50/-
RECORD III 50/-

CABINETS AND DIALS.

SIMMONDS BROS.,
SHIRELAND ROAD SMETHWICK

**"It may
interest you
to know**

that my advertisement in 'The Wireless World' brought over 70 replies in three days, which is, I think, a wonderful testimony to the advertising efficiency of your paper."

J. MITCHELL,

10, Hilton Avenue, Frizinghall,
Bradford, Yorks.

Full particulars of advertising in the Classified Columns of "The Wireless World" are given on the first page of Miscellaneous Advertisements.

W.W.76.

Components, Etc., for Sale.—Contd.

WESTON Moving Coil Relay; 30/-, or offer; unused, exchange for Brown microphone amplifier.—Coffey, Daisyhill, Rawdon. [7777]

A.F.S.C. 20/-; A.F.5, 20/-; 0-100 Weston milliammeter, 20/-; 3 P625A valves, 22/6; Philips pick-up, 30/-; all as new.—Murray, Coldstream. [7770]

L.F. Transformers, Lissen, 5/6; Success, 7/-; Lissenola unit, 8/-; mains winding for moving coil speaker, 18/-.—Pritchard, Granville Gardens, Ealing, W.5. [7759]

FERRANTI A.F.50 Transformer, Metro Vic A.C., S.G. valve, indirectly heated, for use with adaptor, Brown pick-up, with Kusette arm; lot £2/10, or 15/-, 12/-, and 23/-.—C. O. Pattison, 548, Shields Rd., Newcastle-on-Tyne. [7760]

COMPONENTS for 3-valve Set, dual wave, choke output, and 3 valves; £2/10.—Box 4361, c/o The Wireless World. [7768]

METER Suprecision 3, 12, 120 mA., 1.2, 6 amp., 6, 24, 120, 480 volts, 30/-; also 6-volt moving coil speaker, £2.—71, Burbage Rd., Herne Hill, S.E. [7812]

R1 Hypermu Transformer, 12/6; Celestion Woodruff pick-up, 30/-; Lewcos 75X, 200X coils, 2/6 each; all guaranteed new.—Box 4369, c/o The Wireless World. [7813]

PRIVATE Sale Like New Goods.—Sets, no cabinet, 3-valve 25/-, 2-valve 20/-; pick-ups, Blue Spot, G.E. Co., 17/6; B.T.H. C2 speaker, 25/-; Brown's V unit, chassis cone, 27/6; double microphone amplifier, £3, cost £20; meters, coils, transformers, H.F. chokes, condensers, leaks, resistances, switches, etc.; send requirements; call evenings.—78, Lavender Sweep, S.W.11. [7804]

30/12/29.—Dear Sirs, I must say how pleased I am with your prompt attention to my order and the satisfaction of the part exchange; I had tried several other firms before writing to you to see what they would give me for my surplus parts, but every time was disgusted with their offers; I shall be pleased to get any further radio components from you when next requiring same. The above is genuine and unsolicited; we receive many of a similar nature. Why?—Bostock and Stonnill, 1, Westbourne Terrace, Park Rd., London, S.E. 23. [7799]

EKCO D.C. All-mains Units, hardly used, £3; A.F.5, 20/-; P.M.2, 9/6; pair Orgola coils, new, 11/6; Goltone D.C. eliminator, 15/-; Cosmos A.C. S.G., 18/6; large assortments of high class condensers, coils, valves, transformers, chokes, resistances, etc., both used and new, to be cleared; send for lists.—Heaton, 42, Green Lane, Thornton Heath, Surrey. [7796]

MULLARD H.T. Unit, new, £4; O.P. 3C, 10/6; Utility 3-pole, 4/6; Mullard 100,000 resistance, 5/-; headphones, 5/-; Brookmans rejector, 8/-; D.E.P. 7/6; S.S. 210, 5/-; 220 P, 7/6.—Lodge, Crookhill Hall, Conisbrough, Rotherham. [7794]

CONTROL your Receiver from that Other Room by Means of the Foolproof and Inexpensive Yarg Relay, no maintenance or attention; model for battery operated sets, 10/6 post free; mains models, 17/6, 22/6, 25/-; stamp particulars.—Yarg, 1, Eccles Old Rd., Manchester. [7790]

BANKRUPT Stock, guaranteed.—Dubilier R.C. units, 5/6; transformers, Telsen Radiogrand, 9/-; Varley Nicore I, 12/6; Nicore II, 7/6; R.I. Hypermu, 15/-; Ready Radio selectivity units, 15/-; B.T.H. phones, 12/6; cash with order or c.o.d.; satisfaction or money returned.—Sencer, Sheep St., Northampton. [7776]

BLUE Spot 66K Unit, as new, 17/6; Blue Spot chassis, 8/6; B.S.A. Kone, 35/-; Edison-Bell pick-up, 12/6; Mullard's new P.M. 24 pentode, 17/6.—13, Hawkesley Mill Lane, Northfield, Birmingham. [7791]

APPLEBY'S Bargains.

END of Year Clearing.—The following slightly used material is offered subject to sale; every article will be severely tested before despatch, and guaranteed in workable condition; the following items quoted are net cash and carriage paid in Great Britain (except condensers as below):—

END of Year Clearing.—L.F. transformers: Ferranti A.F.5, as new 25/9 each, second grade 21/9 each, limited number; Ferranti A.F.3, as new, 19/- each, second grade 15/9, limited number; Ferranti A.F.4, 12/6 each; Marconi Ideal, 2.7 to 1, 17/- each; other ratios, 15/9 each, limited number; small Ideal Marconi, 9/6 each; R.I. straight line transformers, 15/- each; Climax L.F.A., 13/9; Mullard Permacore, as new, 19/- each, second grade 15/9, limited number; likewise Phillips, 19/- and 15/9 each; Marconi Popular, 8/6; G.E.C. Pye and B.T.H., 9/- each; Telsen Grand, 7/6; R.I. Hypermu, 17/6, as new, limited number; more next week!

END of Year Clearing.—Variable condensers: Ormond No. 3 S.L.F. and Log, 0.005 and 0.00035, 3/9 each, as new; second grade, 3/- each; friction control model, 7/6 each, as new; in lots of two or more post paid; singles, postage 6d. extra; more next week!

APPLEBY'S, Number Forty-four, Chapel St., Marylebone, N.W.1 (four minutes from Oxford St., London). [0316]

How to sell a Portable!

For the sale or purchase of Portable or other Receivers use the Miscellaneous Columns of "The Wireless World." A recent advertiser writes as follows:

"I am very satisfied with the results obtained. The Portable set was sold the same day, and I had over twenty other replies, including prepaid Telegrams. I also had a large number of callers, and altogether am very pleased with the pulling powers of your valuable paper."

M. A. FROST,
54, Clerkenwell Road,
London, E.C.1.

W.W. 85

Wonderful Response!

A recent advertiser in "The Wireless World" writes:—

"I should like to inform you of the wonderful response to my advertisement in 'The Wireless World.' I have received no less than 20 applications for the Ferranti and Marconi Transformers and most of the other goods have been sold."

W. H. Trevett,
80, High Street,
Erith, Kent.

W.W.82.

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

MISCELLANEOUS.

ALEXANDER BLACK.

PLEASE Note New Address.

THE Original Wireless Doctor, will call (London and Home Counties) and cure your set.

CONSULTATIONS by Appointment Without Obligation, sets installed, maintained, and brought up to date, gramophone pick-ups, eliminators, and Webson moving coil speakers demonstrated; purity reproduction specialist.

55 Ebury St., Victoria, S.W.1. Sloane 1655. [0277]

EASY Payments.—We supply, by easy payments, components, accessories, and sets, any make; 10% down, balance spread over 10 months.—Send list of requirements to London Radio Supply Co., 11, Oat Lane, London, E.C.2. [0097]

WIRELESS Notes.—A monthly service of information for all those who want the very best in wireless or gramophone reproduction; frank criticism of receivers and components; immediate postal help and advice in all difficulties; something new and unique; you must have it if you want to know the truth.—Full particulars free from Ernest H. Robinson, Langmead, Pirbright, Woking, Surrey. [7607]

SCOTT SESSIONS and Co., Great Britain's radio doctors, officially approved as wireless repairs by Radio Society of Great Britain and Wireless League; old sets of every type repaired, rebuilt, modernised; send set for immediate quotation.

SCOTT SESSIONS and Co.—New sets constructed with your or our components, guaranteed finest workmanship; we specialise in "The Wireless World" circuits; remember, we have satisfied customers throughout the British Isles and in three Continents; if you so desire, we will design and construct high grade apparatus to suit your special circumstances for quality, range and selectivity.—Tel.: Tudor 5326. Muswell Hill, London, N.10. [0262]

ENGINEERS.—Can't we get together? All we ask is the chance to prove that you can earn £300, £400, £500 per year and more. Other men are doing it, and you can do the same. We have an unrivalled and world-wide organisation waiting to help you, whether you be novice or expert. If you wish for something more than a bread-and-butter job you owe it to yourself to investigate our service. Our handbook, "Engineering Opportunities," has pointed the way to better things to over 20,000 of your fellows. It contains details of A.M.I.Mech.E., A.M.I.C.E., A.M.I.E.E., A.M.I.A.E., A.M.I.Struct.E., C. & G., G.P.O., etc., exams, and outlines home study courses in all branches of Electrical, Mechanical, Motor, and Wireless Engineering. In a brilliant article Professor A. M. Low shows clearly the chances you are missing. The book and our advice are quite free. We guarantee No Pass—No Fee. Don't miss this opportunity; send a postcard—now (state branch, post or exam.)—British Institute of Engineering Technology, 87, Shakespeare House, 29, Oxford St., London, W.1. [7640]

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]

KING'S PATENT AGENCY, Ltd., 146a, Queen Victoria St., E.C.4.—Free advice and handbook on patenting inventions and registering trade marks by registered agent with 43 years' experience. [0002]

PATENTS.

THE Proprietor of Patents Nos. 262752 and 263753, Variable Directional Electric Wave Generating Device and Directive Projecting and Receiving System for use in Wireless Telegraphy or Telephony, is desirous of entering into arrangements by way of licence or otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country. All communications should be addressed in the first instance to J. E. Evans-Jackson and Company, Registered Patent Agents, Bath House, 57 to 60, Holborn Viaduct, London, E.C.1, and 34, Dame Street, Dublin, Ireland. [7712]

PATENTS and Designs Acts, 1907 to 1928.

NOTICE is hereby given that The Mullard Radio Valve Co. Ltd., of 45, Nightingale Lane, Balham, London, S.W.12, seek leave to amend the Specification of Letters Patent No. 287,958 granted to Harold Wade for an invention entitled "Improvements in or relating to circuit arrangements and discharge tubes for amplifying electric oscillations." Particulars of the proposed amendments were set forth in No. 2136 of the Illustrated Official Journal (Patents), published on the 27th December, 1928. Any person, or persons, may give Notice of Opposition to the amendment by leaving Patents Form No. 19 at the Patent Office, 25, Southampton Buildings, London, W.C.2, within one calendar month from the date of publication of the said Journal.—W. S. Jarratt, Comptroller-General. [7826]

TO Manufacturers.—Loud-speaker patent for sale.—Box 4372, c/o The Wireless World. [7816]

POPULAR

The Brownie POPULAR Transformer is every bit as good as it looks. Its purity of amplification gives vivid clarity throughout the full musical range, while its sturdy British construction ensures that it will give this quality of reproduction not just now and then, but always. It costs only 9/6, and does the work of transformers at double its price.

BROWNIE WIRELESS CO. (G.B.) LTD.
Nelson Street Works, London, N.W.1



BROWNIE WIRELESS

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21 VARIETIES for every form of contact

<p>No. 15</p>	<p>No. 15. ALL-IN PLUG AND SOCKET.</p> <p>Wherever a terminal of any sort is required, the Clix Plug and Socket can be utilised. It is entirely insulated as well as when connected or disconnected. Price complete 8d. Flex Portion 4d. Panel Portion 4d. Both Portions engraved.</p>	<p>No. 3</p>
<p>No. 4</p>	<p>No. 3. 'FIT-ALL' SPADE TERMINAL. 2d.</p> <p>No. 10. CLIX-LOX WANDER PLUG. 2 1/2d.</p> <p>No. 4. HOOK TERMINAL. 2d.</p> <p>Supplied with engraved insulators. Full range of markings 1/2d. extra. Write for the Clix Folder.</p>	<p>No. 10</p>

LECTRO LINX LTD. 254, Vauxhall Bridge Road, S.W.1

REPAIRS.

TWELVE Months' Guarantee Accompanies all our Repairs; any make of L.F. transformer, headphones, or loud-speaker repaired and despatched within 48 hours; 4/- post free; don't discard if burnt out; terms to trade.—Transformer Repair Co., (Dept. W.), 214, High St., Colliers Wood, S.W.19. [0011]

SCOTT SESSIONS and Co., Great Britain's radio doctors; read advertisement under Miscellaneous column. [0263]

REPAIRS Returned Post Free, and to ensure satisfaction send remittance after appraisal of same.—Leeds Wireless Repair Service.

LOUD-SPEAKERS, headphones, rewound to any resistance and remagnetised, 3/-; transformers rewound, 4/-; Blue Spots, Triotrons and 4-pole units, 4/6; work guaranteed.—Leeds Wireless Repair Service, 5, Boston Place, Green Rd., Leeds. [7652]

GUARANTEED Repairs by Experts; loud-speakers, headphones, cone units, pick-ups, any type, re-wound, remagnetised and adjusted; post free, 4/-; transformers from 4/-.—Howell, 91, Morley Hill, Enfield, Middlesex. [7795]

WANTED.

MARCONIPHONE Moving Coil Cabinet, oak or mahogany.—Phillips, 6, Cheapside, Spennymoor, Co. Durham. [7758]

WANTED, D.E.L. and D.E.P. 610; would exchange for P 625 and Mazda B 11.—Hoare, Brownlow, Hindhead. [7775]

GOOD Portable, full particulars.—X. P. Z., Smith's Bookstall, Warrior Square, St. Leonards, Sussex. [7820]

WANTED, two 2-volt Mullard S.G. valves, 50,000 and 10,000 ohms resistances, iron core H.F. choke, air core ditto, 3 0.01 and 3 0.001 condensers, 2 Coscor 250 X.P. valves, matched if possible, push-pull transformer, 1 Clarostat, Midget 0.0005 Ormond log, also Ormond drum dials; for sale. National portable, as new, £7/10; new H.T. battery.—Box 4378, c/o The Wireless World. [7829]

MARCONI Ideal, 2.7-1, heavy duty H.T. eliminator chokes, new pattern Tonatuna, variable 0.00025 transmitting condensers. P.625.—Particulars to Box 4370, c/o The Wireless World. [7814]

BUSINESSES & PROPERTY FOR SALE, TO BE LET, OR WANTED.

OLD Established Radio Business, with large shop and living accommodation, in main road; stock, workshop, plant, etc., well connected, excellent opportunity.—Box 4375, c/o The Wireless World. [7819]

EXCHANGE.

YOUR Old Apparatus Taken in Part Payment for Latest Type; see our advert in column Receivers for Sale.—Scientific Development Co., 51, Fishergate, Preston. [0230]

BRAND New Goodman Moving Coil Speaker; exchange for 3-valve set or good parts.—C. Jackson, 53, Lavender Sweep, Clapham Junction. [7825]

SITUATIONS VACANT.

SITUATIONS Guaranteed as Wireless Operators, age 15-30, day-evening postal courses; boarding students' fee payable after situation found.—School, 321, Mansfield Rd., Nottingham. [7746]

DRAUGHTSMAN for Radio Components and Sets, good, capable designer to take charge of section.—Full details of experience, age and salary to Box 616, Sells, Fleet St., E.C.4. [7803]

BOOKS, INSTRUCTION, ETC.

WET H.T. Batteries are now a proved success; write for new illustrated booklet, giving cost and method of building and maintaining free; mention paper.—Taylor, 57, Stuyley Rd., Stockwell, London. [0077]

STEP by Step Wireless; a complete course of the theory of electricity in relation to the practical design of wireless apparatus, eliminators, circuits, etc., with extracts from a designer's notebook, giving up-to-date practical application; issued weekly; send 1/- p.o. for first 4 weeks.—Clifford Pressland, A.M.I.E.E. Inc., Dept. W.W., Hampton-on-Thames. [0195]

FREE: Inventor's Guide on Patents.—T. A. A., 253 (W), Gray's Inn Rd., London, W.C.1. [6373]

LOUD-SPEAKERS, by C. M. R. Balbi.—A practical hand book for wireless amateurs on the selection, construction and performance of loud-speakers, with notes on the detection and remedying of faults; 3/6 net, of bookellers or Pitman's, Parker St., Kingsway, London, W.C.2. [7069]

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.

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USE THE PRIZE WINNING
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Write for Handbook on Windings and Circuits, Post Free 4d.
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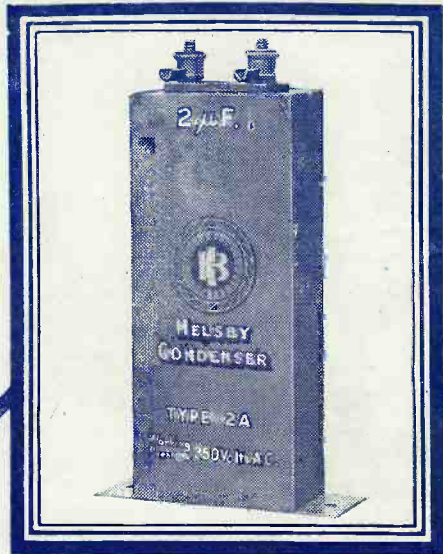
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