SHOW REVIEW—NEW FEATURES AT OLYMPIA.

The Wireless World
AND RADIO REVIEW
The Paper for Every Wireless Amateur

Wednesday, October 1st, 1930.

Burton Self-Locating Valve Holder
1/6 each
Manufactured by C. F. & H. Burton
Progress Works, Walsall, Eng.

Ultra
"THE SWITCHBOARD TO EUROPE"
Sensational Power
Wonderful Range
Brilliant Tone

The only 3-valve All-Electric Receiver using screened-grid valves. £23 complete.

McMichael Portable Receiver
22 Gns.

Workmanship.
Ten years of consistently high grade manufacture are reflected in the perfect workmanship displayed by this receiver.

L. McMichael Ltd., Westham Road, Slough, Bucks.
The P240 will give you increased volume and far better quality

Its huge power handling capacity and extremely low impedance assure this. It is sensitive, too, thus requiring a minimum of early amplification and giving a greater output—sufficient, in fact, to work a moving coil speaker at ample volume for domestic purposes.

Quality, too, is vastly improved and the P.240 will make a world of difference to any set using 2-volt valves—from the modest 2-valver to large sets designed to give an appreciable output.

**MAZDA P.240 CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplification Factor</td>
<td>7</td>
</tr>
<tr>
<td>Anode A.C. Resistance (ohms)</td>
<td>1,900</td>
</tr>
<tr>
<td>Mutual A.C. Conductance (MA/V)</td>
<td>3.7</td>
</tr>
</tbody>
</table>

**PRICE 13/6**

**THE AMAZING MAZDA RADIO VALVES**

THE EDISON SWAN ELECTRIC CO., LTD.
Incorporating the Wiring Supplies, Lighting Engineering, Refrigeration and Radio Business of the British Thomson-Houston Co., Ltd.
Radio Division
1a Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns

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

The Ferranti Screened Grid 3 was one of the outstanding receivers of last season. The charts were eagerly demanded, and from all parts of the country came keenly enthusiastic reports.

The 1931 Ferranti programme will be of even greater interest. There will be charts for a Screened Grid 3 and a Screened Grid 4 receiver—both for battery and mains operation. These receivers are well abreast of modern Radio practice, and incorporate improved coils and more efficient screening.

The charts will be ready almost immediately. Get yours before deciding upon your 1931 set.

FERRANTI

FERRANTI LTD. HOLLINWOOD LANCASHIRE

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

Accurate in workmanship and faultless in design and finish, J.B. Precision Instruments will add to the efficiency of any receiver.

Of particular interest is the new J.B. "Chassimount" the very newest and most effective method of one-dial control for multi-valve sets.

Another new J.B. Precision Instrument is the Differential Condenser, for smooth reaction control. The capacity change is the same for both halves, and is constant throughout the range.

Choose your components from the J.B. Precision range. There is a model for every purpose.

THE NEW J.B. "CHASSIMOUNT"
Type D4 (illustrated above) 4-stage .0005 with Drum Drive.

Price 42/6
2-stage .0005 - 26/6
3-stage .0005 - 35/-
5-stage .0005 - 50/-
6-stage .0005 - 57/6

PRECISION INSTRUMENTS

Advertisement of Jackson Bros., 72, St. Thomas' Street, London, S.E.1. Telephone: Hop 1837
Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
PHILIPS BATTERY ELIMINATORS
FOR A.C. & D.C. MAINS

A constant H.T. Supply is essential for your receiver to give you perfect reception. Even the best H.T. batteries are exceedingly unreliable and require frequent replacement, but a Philips Battery Eliminator enables you to take your H.T. supply direct from the electric mains thus ensuring absolutely faultless reception. Once installed, it requires no attention and the amount of electricity consumed is almost negligible.

- Type 3002 for A.C. Mains - Price £5.10.0
- Type 3009 for A.C. Mains - Price £5.15.0
- Type 3005 for D.C. Mains - Price £3.17.6

For 10/- down you can have any of these on Philips Easy Payment System.

PHILIPS BATTERY ELIMINATORS

Made by the manufacturers of the famous Philips Argenta electric lamps, all electric radio receivers, commercial and industrial fittings and neon signs.

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

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

**New Windings**
**New Core**
**New Genuine Bakelite Mouldings**

Perfected in every detail, Telsen Transformers now represent the embodiment of the very latest practical principles of Radio transformer construction. Built to give long and satisfactory service—the highest quality reproduction...in fact...built as well as it is possible to build a transformer...and yet the prices still remain the same...one of their attractive features.

**All “Telsen” Transformers are now fitted with an “Earth” Terminal,** which will improve the quality of the reception and greatly assist in stabilising the receiver in cases where the general layout is apt to produce inter-capacity action.

**See the New Range of Telsen Components.**
Designed and perfected by some of the greatest authorities in the science of radio—with one object in view—to produce the world’s best. After exhaustive tests we are convinced that in performance and appearance they are unrivalled.

**Telsen Components**
*Advt. of Telsen Electric Co., Ltd., Birmingham.*
What is the AVOMETER?

A SELF-CONTAINED portable measuring instrument that does the work of several high-priced instruments with the utmost accuracy, dependability and convenience.

Nothing to calculate but its immeasurable worth. No cost after the first cost. No extra accessories—no external shunts or multipliers are required. Such is the AVOMETER, which gives you instantly any one of 13 DIRECT and accurate readings in Amps, Volts or Ohms, at the turn of a single switch, with only one pair of leads, and without the need for calculations of any kind.

British manufacture & dependability. Portable, precise, complete and self-contained.

There is one AVOMETER only. It defies comparison in performance and is justly priced. It is a British standard first-grade instrument, measuring 7½ x 5¼ inches and weighing only 5 lbs.

To know its value fully you must experience it in use.

The AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.

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

Osram

NEW DESIGN
which represents an immense stride in radio engineering and technique. The design of the patented coil assembly ensures results comparable with the highest-class manufactured sets.

NEW SIMPLIFIED METHOD
OF CONSTRUCTION
The three-gang condenser is already assembled for you. You have no difficulty in placing the parts in position as the base plate is already bored for each component.

NEW STANDARD
OF RESULTS
It is difficult to realize that there are only four valves in this powerful, super-sensitive, super-selective set.

HIRE PURCHASE TERMS
You can either buy your "OSRAM MUSIC MAGNET 4" for cash or on these attractive HIRE PURCHASE terms: £1 + £1 deposit and 12 monthly payments of £1.

SPECIAL FEATURES
1. The two Screen Grid Stages give extreme selectivity and sensitivity with an unrivalled range.
2. Enormous amplification with perfect stability is given by the complete shielding of H.F. Circuits.
3. Equal efficiency guaranteed on both wave length bands.
4. Change of wave length is affected by an external switch and the set need not therefore be opened.
5. Maximum ease in tuning with a single knob controlling triple gang condenser.
6. Assembly is the essence of simplicity.
7. Volume control is provided not only to act as such, but to procure extreme selectivity.

THE SET THAT BRINGS THE CONTINENT TO THE BRITISH ISLES


Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
GET THE BEST OUT OF RADIO

To get the best out of radio you must put the best into your set. Varley Components have twenty-five years' experience behind them. Experience spells progress, and progress means ultimate achievement.

The Varley Power Potentiometer is the latest development in Power Control. Ideal for high voltage eliminators, the resistance element cannot "pack," and a spring loaded contact arm ensures an efficient and dependable connection.

Remember that when you buy Varley Components you buy quality—the results of twenty-five years' research—perfect efficiency.

Varley


Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
"The Wireless World" justifies the R.G.D. in the Special Exhibition Number:

THE SET

They say:
"The R.G.D. radio-gramophones have many points of interest both with regard to their circuit and details of construction. The present writer cannot claim to have yet examined all the apparatus in the exhibition, but believes that there are few, if any, other instances where this highly satisfactory method of tuning is employed."

THE R.G.D. DE LUXE MODEL.

For those desiring the very best that both Radio and Gramophone can give, the "R.G.D." De Luxe Radio-Gramophone is the ideal instrument. The Radio side of this instrument is so powerful that given favourable atmospheric conditions over 30 stations can be received with ample volume. The quality of reproduction from distant stations is equal to that of local stations.

In Oak £80 In Mahogany £85

The R.G.D. DE LUXE RADIO-GRAMOPHONE has many new features!
2 Screened Grid Stages!
Band Pass Filter!
Super Selective!
Single Knob Tuning!
Fader from Radio to Record!
All mains operated with exclusive cabinet design.

—Also Moving Coil Speakers, Cinema Amplifiers, Gramophone Amplifiers, etc.

"Visitors to Olympia have an opportunity of judging the excellent quality and very considerable volume afforded by these instruments."

THE UNIT


The Radio Gramophone Development Co.
72, Moor St., Birmingham.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The admiration of all the experts and the critics at OLYMPIA

THE REGENTONE 4-VALVE A.C.
ALL-ELECTRIC RECEIVER.

If the opinions of the numerous experts and critics who visited Olympia count for anything—then without doubt the Regentone 4-Valve A.C. All-Electric Receiver is the outstanding All-Electric Receiver of the year. In up-to-date design, in performance, in every detail of technique, you can trace the specialised experience of the firm who have specialised in Mains Radio since 1924.

ONE KNOB TUNING. Remarkable selectivity.
TWO SCREENED-GRID STAGES H.F.
All the principal European programmes at full loudspeaker strength without interference. With a short indoor aerial only, there is a considerable choice of stations.
ALUMINIUM CHASSIS.
Combining great strength with a workmanlike and "clean" appearance.
BOTH COILS and S.G. VALVES COMPLETELY SCREENED. Maximum H.F. Amplification.

MAINS-DRIVE COMPLETELY ENCLOSED IN SEPARATE SCREENED CASE.
Full-wave rectification by Westinghouse Metal Rectifier.
BEAUTIFULLY FINISHED MATCHED WALNUT CABINET.

PRICE COMPLETE £30 guineas
at £5 deposit, and balance in 12 monthly payments of £2 9s. 6d.
Available also in chassis form only price on application
WRITE TO-DAY FOR FREE COPY OF OUR NEW ART CATALOGUE

REGENTONE

RECENT RADIO SUPPLY CO., Regentone House, 21, Bartlett's Buildings, Holborn Circus, LONDON, E.C.4. (Telephoned: Central 8745 & lines)

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
AS GOOD AS ADDING ANOTHER VALVE

That's how your radio set responds when you fit a Pertrix Non-sal-ammoniac Dry Battery. Instantly, you notice the wonderful improvement in reception, the bell-like clearness of every sound, and entire absence of battery noise. And what is more, Pertrix Batteries keep up this wonderful performance throughout their amazingly long life.

Of course, there's a reason for it—Pertrix Dry Batteries are made by an improved process that prevents corrosion...that prevents deterioration when not in use...and that does lengthen life.

(12 m/a discharge.) (20 m/a discharge.)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>12 m/a</th>
<th>20 m/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 volt</td>
<td>8/-</td>
<td>13/-</td>
</tr>
<tr>
<td>90 volt</td>
<td>11/9</td>
<td>21/-</td>
</tr>
<tr>
<td>100 volt</td>
<td>13/-</td>
<td>25/6</td>
</tr>
<tr>
<td>120 volt</td>
<td>15/6</td>
<td>31/-</td>
</tr>
</tbody>
</table>

Non-Sal-Ammoniac Dry Batteries
PERTRIX LIMITED,
Britannia House, 233, Shaftesbury Avenue, LONDON, W.C.2.
Works: Redditch.

Get An Improved Pertrix Accumulator As Well.

**PERTRIX ONCE — PERTRIX ALWAYS**

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Osram Valves for A.C. Mains Sets

"The General Electric Company can fairly be called pioneers of the indirectly heated valve."

Wireless World, Sept. 17th, 1930

The FIRST indirectly heated valve—was an Osram

The LATEST Osram Indirectly Heated Valves still lead because they combine all the essential points of an A.C. valve—

- Absolute Reliability.
- Ample and LASTING Electron Emission.
- Stability in use.
- High Electrical Efficiency.
- No hum.
- Absence of parasitic noises.

Write for Booklet "Osram Valves for A.C. Mains & Rectifying Valves" OF 5568.
Electrical knowledge that all Wireless Mechanics and Amateurs should possess will be found in

PITMAN’S
ELECTRICAL
EDUCATOR

THE NEW, REVISED AND ENLARGED EDITION OF THE WELL-KNOWN TECHNICAL GUIDE AND REFERENCE WORK

EDITED BY SIR AMBROSE FLEMING, D.Sc., ETC.

The opportunity to obtain this Complete Modern Work in a simple and economical way should be taken by all who are engaged in any branch of the electrical industries. Pitman’s Electrical Educator is a valuable technical work, covering the whole field of Heavy Current Engineering, and including special sections dealing with Wireless Subjects. It is the combined work of Fifty Specialist Contributors, and ranks as one of the most modern and authoritative general surveys of the subject ever published.

"That it is going to be good is guaranteed by the fact that the general editor is Dr. J. A. (now Sir Ambrose) Fleming, a name to conjure with in our industry."—ELECTRICAL TIMES.

1,500 pages of detailed, expert information for electrical engineers, mechanics, apprentices, wireless workers, etc.

Published in 28 parts

Every Part is full of practical information, most interestingly written, and well illustrated with explanatory diagrams and photographs. The utility of the Work has been already proved by the issue of the First Edition. This new edition contains additional matter, and a revision of the various sections affected by the progress of electrical science and methods. The Sections have been entirely rearranged to facilitate reference and for the convenience of the reader. The complete Work is being issued in about 28 Fortnightly Parts, the first of which will be ready on October 1st. To secure the Work an order should be given forthwith to a newsagent or bookstall.

Each part 48 pp., 10 in. x 7½ in. Price 1/3 net.

SIR ISAAC PITMAN & SONS, LTD.
PARKER ST., KINGSWAY, W.C.2.
**SOLVE Your Power Supply Problems**

For **RECEIVERS** requiring:
- 150 v. 15 m.a.
- 200 v. 40 m.a.
- 300 v. 50 m.a.
- 400 v. 40 m.a.
- Etc., Etc.

**M-L ANODE CONVERTERS**

<table>
<thead>
<tr>
<th>Operate from</th>
<th>for</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 v. 1</td>
<td>The Mains-less Radio User</td>
</tr>
<tr>
<td>12 v. 1</td>
<td>Country Houses</td>
</tr>
<tr>
<td>32 v. 1</td>
<td>Ships</td>
</tr>
<tr>
<td>50 v. 1</td>
<td>Yachts</td>
</tr>
<tr>
<td>100 v. 1</td>
<td>Radio Users with D.C. Mains</td>
</tr>
<tr>
<td>200 v.</td>
<td></td>
</tr>
</tbody>
</table>

**For** **RECEIVERS, AMPLIFIERS, RADIO-GRAMS** requiring:
- 300 v. 120 m.a.
- 400 v. 150 m.a.
- 500 v. 100 m.a. Etc.

**M-L D.C. to D.C. ROTARY TRANSFORMERS**

<table>
<thead>
<tr>
<th>Operate from</th>
<th>for</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 v.</td>
<td>Public Address Work</td>
</tr>
<tr>
<td>24 v.</td>
<td>Large Country House Installations</td>
</tr>
<tr>
<td>32 v.</td>
<td>Ships</td>
</tr>
<tr>
<td>50 v.</td>
<td></td>
</tr>
<tr>
<td>100 v.</td>
<td></td>
</tr>
<tr>
<td>200 v.</td>
<td>Installations in D.C. Districts</td>
</tr>
</tbody>
</table>


*Write for Illustrated Lists describing above; also—M-L Machines for Transmitting; M-L Machines for Television; M-L Hand-driven Generators; M-L D.C. to A.C. ROTARY TRANSFORMERS.*

*Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.*
DUBLIERS
make a
mica condenser
for every job!

TYPE 620
For use in radio circuits
where comparatively
small capacity is re-
quired. Arranged for
vertical mounting.
PRICES 1/8 to 3/-

TYPE 610
As 620, but arranged for
horizontal mounting.
PRICES 1/8 to 3/-

TYPE B775
Primarily designed for
resistance coupling, but suitable
for use in other circuits where
a comparatively large capacity,
capable of withstanding
several hundreds of volts, is
required.
PRICES 3/- to 18/-

Use Dubilier Condensers and be
certain of satisfaction.

DUBLIERS
CONDENSERS
DUBLIERS CONDENSER CO. (1925) Ltd.,
DUCON WORKS, VICTORIA ROAD, N. ACTON, W.3.

All you look for
in a Reproducer
you'll
find in an R.K.

G. From whatever viewpoint you judge a re-
productor you will find the R.K. completely
satisfying.

FIDELITY
G. For four years R.K. has held unassailed
leadership in the Reproducer field. For home
or public use there's no reproducer as good as
the R.K.

VOLUME
G. There are three R.K. Reproducers, all ob-
tainable complete in
handsome cabinets of pol-
ished oak, mahogany or
nut; the Senior with
built-in rectifier for use with A.C. mains, from
£20, the Standard Senior and the Permanent
Magnet from £16:16s., as well as the Junior
Model, without cabinet, £4:15s., all of which are
obtainable through your
radio dealer.

SENSITIVITY
G. Ask your dealer for particulars of hire-
purchase terms.

THE NEW
PERMANENT R.K.
MAGNET
REPRODUCERS

THE EDISON SWAN ELECTRIC CO., LTD.
Incorporating the Wiring Supplies, Lighting Engineering, Refrigera-
tion and Radio Business of the British Thomson-Houston Co., Ltd.
Radio Division
1a Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns.

Mention of “The Wireless World,” when writing to advertisers, will ensure prompt attention.
ENTHUSIASTIC reports are being received from users trying the new Full O’Power Battery for the first time.

In performance, efficiency and length of life the Full O’Power Battery makes a very striking advance over the old types and—costs no more. This is made possible by the application of automatic machinery and entirely new methods of manufacture.

The Full O’Power range includes Popular Type, Power Type, Super Radio Type, Special Type (for Portable Sets) and Grid Bias Batteries.

These are fully described and illustrated in the Full O’Power Booklet—which also contains notes of interest to every owner of a Set. Ask your Dealer for this Booklet or write for a free copy to-day.

ENTHUSIASTIC reports are being received from users trying the new Full O’Power Battery for the first time.

In performance, efficiency and length of life the Full O’Power Battery makes a very striking advance over the old types and—costs no more. This is made possible by the application of automatic machinery and entirely new methods of manufacture.

The Full O’Power range includes Popular Type, Power Type, Super Radio Type, Special Type (for Portable Sets) and Grid Bias Batteries.

These are fully described and illustrated in the Full O’Power Booklet—which also contains notes of interest to every owner of a Set. Ask your Dealer for this Booklet or write for a free copy to-day.
UNFETTERED REPRODUCTION

PERFORMANCE COUNTS

The Purchaser knows that the name Magnavox means something definite, and that it indicates a maintenance of leadership for fifteen years in the manufacture of loud speakers. The new Magnavox moving coil or dynamic speaker is the only type of unit capable of giving a perfectly natural performance and reproduction which cannot be distinguished from the original. There are positively no other loud speakers, irrespective of cost, which can possibly compare with a Magnavox in respect to design, construction and quality of reproduction. The moving-coil type of loud speaker was originated by the Magnavox Company, and we have to thank their engineers for the great part they have played in this great development.

THE ROTHERMEL CORPORATION LTD.
24, MADDOX STREET, LONDON, W.1. Phone: Mayfair 0578/9.
Continental Sales Office - - - - 27, Quai Da Gemmace, Brussels, Belgium.

JUNIOR MODELS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>110-190 D.C.</td>
<td>£5 7 6</td>
</tr>
<tr>
<td>118</td>
<td>180-300 D.C.</td>
<td>£5 7 6</td>
</tr>
<tr>
<td>210</td>
<td>6-12 D.C.</td>
<td>£5 7 6</td>
</tr>
<tr>
<td>410</td>
<td>105-125 v. 60 cy. A.C.</td>
<td>£8 5 0</td>
</tr>
<tr>
<td>414</td>
<td>220-240 v. 50 cy. A.C.</td>
<td>£8 5 0</td>
</tr>
</tbody>
</table>

SENIOR MODELS.

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>110-150 D.C.</td>
<td>£6 10 0</td>
</tr>
<tr>
<td>119</td>
<td>150-300 D.C.</td>
<td>£6 10 0</td>
</tr>
<tr>
<td>211</td>
<td>6-12 D.C.</td>
<td>£6 10 0</td>
</tr>
<tr>
<td>411</td>
<td>105-120 v. 50 cy. A.C.</td>
<td>£8 15 0</td>
</tr>
<tr>
<td>415</td>
<td>220-240 v. 50 cy. A.C.</td>
<td>£8 15 0</td>
</tr>
</tbody>
</table>

The Purchaser knows that the name Magnavox means something definite, and that it indicates a maintenance of leadership for fifteen years in the manufacture of loud speakers. The new Magnavox moving coil or dynamic speaker is the only type of unit capable of giving a perfectly natural performance and reproduction which cannot be distinguished from the original. There are positively no other loud speakers, irrespective of cost, which can possibly compare with a Magnavox in respect to design, construction and quality of reproduction. The moving-coil type of loud speaker was originated by the Magnavox Company, and we have to thank their engineers for the great part they have played in this great development.

Write for the new Dynamic Booklet and Special Folder.

The ORIGINAL Jelly Acid Battery

The popularity of the C.A.V Jelly Acid Battery is not explained by the mere fact that it contains jelly electrolyte—there are other jelly electrolyte batteries! There are three reasons why the C.A.V. is the most effective non-spillable yet produced:

The Jelly Acid. Its composition is unknown outside our own laboratories. It maintains perfect contact with the whole of the plate surfaces, yet allows unrestricted gassing when on charge. It is chemically pure, and allows maximum conductivity.

The Container. Of special construction, contains a baffle-plate and moisture pad, which serves the triple purpose of arresting acid spray during charge, feeding the electrolyte with moisture to maintain an even consistency, and definitely confines the jelly to the plate chamber.

The Plates. These have been specially developed to give the utmost possible capacity when used with C.A.V. Jelly Acid.

The Whole. The C.A.V. is the lightest, cleanest, and most compact non-spillable on the market. By avoiding cumbersome acid-traps, the greatest possible capacity for bulk is obtained.

CAVANDERELL & C.P.
ACTON, LONDON, W.3

Obtainable from our Depots and Battery Agents throughout the country and from all Radio Dealers.

Compact, Clean & Non-Spillable

We issue a useful booklet on the care and maintenance of C.A.V. non-spillable batteries. Would you like a copy? Free on request to Dept. 44.

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

The Sensation of OLYMPIA

Ormond’s latest in Quality Condensers

Ormond, always to the fore in condenser design and construction, now introduce their latest achievement. These condensers, with a new skeleton-like construction, are rigid, robust and amazingly efficient. Moreover, they are handsome in appearance and beautifully finished. Two new Ormond products worthy of the great Ormond reputation for value.

THE ORMOND No. 4 LOG
Designed to follow the Logarithmic Law, it has such value that it will be found very suitable for use under average conditions in the modern receiver. The vanes are of aluminium, firmly secured to slotted spindles. The condenser ends are of best quality bakelite, with the greatest possible reduction in size. This condenser is not supplied with dial.

Cat. No. R/421. Capacity .00025. Price 4/-

Cat. No. R/422. .00035. 4/-

Cat. No. R/423. .0005. 4/-

The ORMOND No. 4 LOG SLOW MOTION
Direct drive is obtained by means of a beautifully finished 24-inch diameter bakelite dial engraved 0 to 180 degrees. Slow motion ratio approximately 9 to 1 is obtained by means of the upper small knob. Complete with 24-inch dial and slow motion control knob.


Cat. No. R/425. .00035. 6/-

Cat. No. R/426. .0005. 6/-

The Ormond Engineering Co. Ltd.
Ormond House, Rosebery Ave., London, E.C.1

Registered Trade Mark.
Telegrams: “Ormondeco, Smith.”
Nine Centuries Ago...

the first tower of the Tower of London was built. It still stands, mellowed but not harmed by the passing of time. Like the White Tower (built in the Conqueror’s time), the famous T.C.C. Condenser has stood the test of time. From the first years of this century the Telegraph Condenser Co. has made nothing but condensers. And so, to-day, when you buy "The Condenser in the Green Case," you know that you are buying the unrivalled experience of those many years of condenser-specialising. You are safe in buying T.C.C. Condensers. They will stand the test of time.

The illustration is perhaps a little far-fetched, but the moral is true enough. Every day firms are losing customers through antiquated methods of storage. No customer enjoys waiting while aimless search is being made in some apology of a store for some component he requires. Time is money. With "Tiltrack" the goods can be found instantly, and handled with ease and rapidity. Far better than old-fashioned dark and dismally wooden shelves. They save many pounds per year.

THE "BENCHRACK"
(Tiltrack Principle)

A real help for storing small parts such as Terminals, Nuts, Washers, Insulators, etc. Made to stand on the work bench, it enables all small parts needed for the job in progress to be stored where they are immediately to hand. All the trays are tilted so that the parts stored can be seen at a glance, and the front faces of the trays are rounded to ease the grasp of the fingers of one hand. Each is provided with patent hanging partitions which can be moved quickly to make smaller compartments. Being so accessible, these racks greatly facilitate stocktaking and being all steel there is no danger of fire.

The Experimenter will do his jobs much quicker and with greater pleasure, and the Factory will say many pounds per year by installing this Benchrack.

No Wonder he Loses Customers! With a Stores Like This.

The illustration is perhaps a little far-fetched, but the moral is true enough. Every day firms are losing customers through antiquated methods of storage. No customer enjoys waiting while aimless search is being made in some apology of a store for some component he requires. Time is money. With "Tiltrack" the goods can be found instantly, and handled with ease and rapidity. Far better than old-fashioned dark and dismally wooden shelves. They save many pounds per year.

"TILTRACK JUNIOR"

This all-steel rack is designed to hang against a wall or other convenient position, and is a most excellent rack for storing small parts. It is supplied complete with white canvas protective cover to keep out the dust. All the trays are tilted and have movable partitions.

TOWER OF LONDON


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

WE WILL BUY YOUR OLD RADIO SET

How would you like an up-to-date 3-valve Receiver which will tune in to all wave-lengths? Not an ordinary Receiver which tunes in only to the high and medium wave-lengths, but one which will always receive the wonderfully efficient short wave stations of the World—stations you have probably never heard. These Short Wave Sets are so amazingly efficient that listeners who possess Short Wave Sets hear America and other far distant stations regularly. Pittsburgh—Schenectady—Manila—Bangkok—Eindhoven—New York—Sydney—Nairobi—and many others come in clear, loud and free from interference. "World Radio" gives a list of over 70 Short Wave Stations—you can listen to them yourself with the "Empire Link" Receiver.

Imagine the finest Radio Receiver you have ever heard then add the advantages of Short Wave reception and you have some idea of the enjoyment you will get from the possession of an "Empire Link" Receiver.

NOW YOU CAN HAVE A NEW AND UP-TO-DATE "EMPIRE LINK" RADIO SET WHICH WILL TUNE IN TO EVERY BROADCASTING WAVELENGTH IN THE WORLD

No need to wait—you can buy an "Empire Link" now, selling your old Receiver to us in part exchange. In order to make it still easier for you the "Empire Link" is supplied as a Kit of Parts so that you can build the Receiver yourself and save pounds. No technical knowledge is necessary—the Components almost fall into position, that's how easy it is to put together.

The "Empire Link" Short Wave Kit comprises every part necessary to build the complete Receiver. Cabinet, Couplings, Valves and Coils for all wavelengths from 15 to 2,000 metres.

The cash price of the "Empire Link" Short Wave Kit complete is only £11 11/-, and we will buy your old set in part exchange. Take advantage of this generous offer now of new radio for old. Or if you wish you can purchase your "Empire Link" by easy monthly payments of 21/-.

Fill in and post the coupon now.

FORM A

To Ready Radio (R.R. Ltd.), 159, Borough High St., London Bridge, S.E.1.

I wish to purchase one of your new 1931 "Empire Link" Short Wave Kits.

(a) Complete Kit £11 11/-
(b) Complete Kit (except for valves) £10 10/-

NAME ........................................
ADDRESS .....................................

(CROSS OUT WHICHEVER DOES NOT APPLY)

Fill in Form "A" if you wish us to purchase your receiver.

NOTE: Part Exchange does not apply to Hire Purchase System.
AMPLION
BALANCED ARMATURE SPEAKERS

High notes and low notes crisp and true and evenly balanced, speech so clear that you can hear the slightest inflection of the voice, volume that is full and free from distortion—such superb reproduction is due to the Amplion Unit, made specially for the AB41 and AB45, and a great step forward in the perfection of loudspeakers.

<table>
<thead>
<tr>
<th>Model</th>
<th>(Oak)</th>
<th>(Mahogany)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB41</td>
<td>£5.15</td>
<td>£6.6</td>
</tr>
<tr>
<td>AB45</td>
<td>£6.15</td>
<td>£7.7</td>
</tr>
</tbody>
</table>

The Popular AB6 Model
The first Amplion Balanced Armature Speaker and one of the most successful speakers that Amplion have produced.

- Oak  £4.10
- Mahogany  £4.17
- Walnut  £4.17

Catalogues from GRAHAM AMPLION LIMITED, 26, SAVILE ROW, LONDON, W.1

THIS OUTSTANDING UNIT MAKES ANY SET ALL-MAINS

STANDARD or PORTABLE

NOW you can obtain All-Mains efficiency and cheapness from any type of set. This remarkable new "ATLAS" Unit ensures smooth, steady High and Low Tension current entirely free from hum. It is no larger than an H.T. Battery and fits the battery space in cabinet and portable receivers.

There are two variable tappings of 0/100 and 0/120 Volts respectively, and one fixed of 150 Volts. Output 25 mA. The Trickle Charger caters for 2, 4 or 6 Volt Accumulators.

Incorporating the Westinghouse Metal Rectifier Complete with wander plugs and guaranteed for 12 months.

Price £6.0.0 Cash, or 10/- down, the balance in easy monthly instalments.

"CLARKE'S ATLAS"
MODEL A.C.188

H. CLARKE & Co. (M/c) Ltd., Old Trafford, Manchester.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Columbia’s New Model

3 VALVE RECEIVER
MODEL NO. 307 £21

Another very efficient station-getter by Columbia. 3 Valve Circuit employing Screen-Grid, Detector and Pentode. Easiest of all tuning with illuminated drum calibrated in wavelengths. Variable aerial coupling for maximum selectivity. Adaptable for Gramophone reproduction. Tone of wonderful purity throughout. Low cost of upkeep from A.C. and D.C. Mains.

AT OLYMPIA—

"The Wireless World" described the "H.S.P." Portable Set as "ONE OF THE MOST AMBITIOUS PORTABLES" in the Radio Show.

15 GNS. to 29 GNS. to suit all requirements.

H.S.P. Portable, with three separately tuned circuits.

The FAMOUS WEST OF ENGLAND "H.S.P." PORTABLES

The Sets that get the Stations in the badly screened hills and rocky districts of the West.

This season's designs and prices on application to

The H.S.P. Wireless Co., LANGFORD WORKS or
30, The Boulevard WESTON-SUPER-MARE
OCTOBER 1ST, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS. 23

The Wireless World

OLYMPIA SHOW

COMPETITION

DIRECTIONS AND RULES.

1. Enter on the form, in the spaces provided, the names of the manufacturers and the official description of what you consider the best apparatus at the Show, based on a consideration of value at the price asked.

2. Write your name and address clearly and in ink on the entry form in the space provided, and send the completed entry form not later than Monday, October 6th, to: The Competition Editor, The Wireless World, Dorset House, Tudor Street, E.C.4.

3. The prizes will be awarded to the competitors who correctly forecast the outstanding single exhibit (No. 8 below), as decided by the majority of votes, and have also the largest number of correct forecasts in the other classes of apparatus.

4. No correspondence can be entered into in connection with the Competition, and the Editor will not be responsible for any entries lost in the post or otherwise. Only one entry form to be sent in by each competitor.

5. The decision of the Editor must be accepted as final on all questions arising out of this Competition.

FIRST PRIZE: £50 in Cash

FREE ENTRY FORM

Enter your choice of the best apparatus at the Show in each of the following classes:

<table>
<thead>
<tr>
<th>Definition of Class</th>
<th>Name of Manufacturer</th>
<th>Official Description of Apparatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Receivers of all types, either Mains or Battery operated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Radio Gramophones.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Batteries of all kinds, including accumulators for both high tension and low tension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Mains supply units, both D.C. and A.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Loud speakers of all types.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Valves.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Other apparatus not classified above, also amplifiers, composed parts such as transformers, condensers, tuning coils, resistances, etc., etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 The outstanding single exhibit at the Show, irrespective of the class to which it belongs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I agree to accept the rules and declare that this is the only entry form that I have completed.

NAME (In Block Letters)

FULL ADDRESS

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
THE ELEMENTARY PRINCIPLES
OF WIRELESS TELEGRAPHY
AND TELEPHONY

By R. D. BANGAY.


For many years this volume has been the standard book of instruction for wireless beginners and students. The progress of wireless during recent years has made necessary the New Edition, which covers the whole subject in a clear and simple style and deals thoroughly with modern developments. Attention is given to the theoretical elements of electricity and magnetism, the dynamo and the properties of waves.

Many new chapters have been added and descriptions of modern circuits have also been included.

A leaflet giving full particulars of the volume and a synopsis of chapters will be sent on request.

Price 10/6 net. By post 11/-

From all leading Booksellers or direct from the Publishers:


FOURTH EDITION NOW READY!

HANDBOOK OF TECHNICAL INSTRUCTION
for Wireless Telegraphists

Author of "Wireless Telegraphy and Telephony," etc.

This work constitutes a complete text-book for the use of wireless telegraphists and others interested in the subject. In addition to dealing fully with general theory, the book describes in detail the various types of marine wireless equipment, and gives also much practical information on maintenance. The subject matter of this new edition has been entirely recast and the scope of the book has been widened to meet the more exacting requirements of the operator's duties of to-day. There are more than 450 diagrams and illustrations.

A leaflet giving full particulars of the volume and a synopsis of chapters will be sent on request.

Price 25/- net. By post 25/9

From all leading Booksellers or direct from the Publishers:

Metal Rectification

Important Developments have taken place in IGRANIC-ELKON RECTIFIERS

Since the introduction of IGRANIC-ELKON METAL RECTIFIERS, intensive and systematic research in the Modern Laboratories of the IGRANIC BEDFORD WORKS have resulted in—

IMPROVED RECTIFIERS

which are

SMALL in Bulk.
HIGH in Efficiency.
LOW in Price.

Suitable for all purposes, including H.T. Supply Units, L.T. Supply Units, H.T. and L.T. Accumulator Chargers, GRID BIAS SUPPLY, Excitation of Moving Coil Speaker Fields, etc., etc.

In addition a range of dependable yet inexpensive components for use in conjunction with IGRANIC-ELKON RECTIFIERS have been developed, including POWER TRANSFORMERS, CHOKES, CONDENSERS, RESISTORS, etc.

May we send you a Catalogue?

Write for a copy of "THE LINK BETWEEN," a booklet containing valuable data, for Mains Users. Address your enquiry to Dept. U 315.

"IF IT'S METAL RECTIFICATION, IT'S IGRANIC."
NEW

WESTINGHOUSE METAL RECTIFIERS FOR HIGH TENSION

DID YOU SEE THEM AT THE RADIO EXHIBITION?

If not, send 3d. stamp for "The All-Metal Way 1931," now enlarged to 40 pages, a valuable book for mains users, giving circuits, technical instruction, and components for all types of A.C. Units.

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

H.T.5 - 15/-
120 volts. 20 m.a.

H.T.6 - 17/6
175 volts. 25 m.a.

H.T.7 - 21/-
200 volts. 28 m.a.

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.

THE POINT

of the new Lisenin Wander Plug overcomes all contact troubles. The patented construction effectively prevents "wobbling" in the socket. It makes perfect electrical and mechanical contact and does not require constant opening of the prongs.

Price 2d. each.

We have moved to larger premises. Note new address:

THE LISENIN WIRELESS CO.,
5, Central Buildings, HIGH ST., SLOUGH, Bucks.
Phone: SLOUGH 62. 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.
TWO OF THE BLUE SPOT RANGE

51R This new speaker is driven by the world’s wonder unit, 66R. That fact alone stamps 51R as supreme in its class. And the beautiful walnut cabinet—unconventional without being bizarre—will add to the appearance of any room. Price 84/-

29R—the best Blue Spot speaker that has yet appeared. There is no higher praise. Whatever type of programme you enjoy, you will enjoy it better with this magnificent speaker. If your taste is for chamber music you can now hear it as hitherto you could only hear it in the concert room; if you prefer jazz you can listen to it with all its pep and snappiness. And the cabinet is a splendid piece of furniture in keeping with its wonderful output. Price £6-6-0

Meet us at—MANCHESTER RADIO SHOW, Oct. 8-18, Stand No. 26, Main Hall

THE BRITISH BLUE SPOT COMPANY LTD.
BLUE SPOT HOUSE, 94/96, ROSOMAN STREET, ROSEBERY AVENUE, LONDON, E.C.1

Distributors for Northern England, Scotland and North Wales: H. G. RAWSON (Sheffield and London) LTD., 100, London Road, Sheffield; 22, St. Mary’s Parsonage, Manchester; 183, George Street, Glasgow.

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

"The Wireless World," in an impartial review, says of the Hegra Magnet-Dynamic Speaker—"We have no hesitation in placing this instrument in the highest class of . . . cone loud speakers." Also—"general effect indistinguishable from the (standard) moving coil loud speaker."

The Hegra Magnet-Dynamic, in its new and improved form, handles big inputs—well up to 4 watts. It requires no field current, but embodies the special Hegra Magnet system.

It costs no more than an ordinary cone-type speaker, yet gives a controllable volume ample for all private purposes and even for a large hall.

The Hegra Magnet - Dynamic Loud Speaker

Chassis Form (as illustrated) Complete in Polished Walnut Cabinet.

£2:16:0 £5:10:0

OBTAINABLE FROM ANY REPUTABLE DEALER

TANNNOY PRODUCTS

ALL-ELECTRIC RADIO-GRAMOPHONE SENIOR MODEL.

This instrument represents the embodiment of the best that modern technique and skill can produce.

All-Electric H.T. L.T. Grid Bias matched transformer coupled moving coil speaker, slow speed induction motor, four-valve receiver, high stage gain Screen Grid H.F. power detector, one R.C. Stage, and 10-Watt power output stage, fitted with illuminated dials.

Prices:
- 60 gns. in quartered walnut cabinet.
- In Mahogany Case 65 gns.
- In Oak Case 70 gns.

TANNNOY Mains Units are available for H.T. or L.T. or combined units suitable for practically any set, including portables. Switch on... that's all.

Illustrated is the C.P. 2 Unit for H.T. and L.T., giving 120 V. at 15/20 ma.

Price complete £5 10 0

TRY A TANNNOY at our expense.

Write for Catalogues to—

TANNNOY PRODUCTS,
1-7, DALTON ST., S.E.37.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
“EKCO” Power Supply Units completely do away with batteries and accumulators. All who use these troublesome accessories know how costly they are to renew and to keep charged. “EKCO’S” first cost is practically the last. The same “EKCO” Unit serves on for ever at a negligible cost of upkeep. If you average three hours use of your set a day, “EKCO” in one year will definitely save you pounds. Buy “EKCO” and save money!

SAVE MONEY!

SAVE TIME!

“EKCO” Units are easily and quickly fitted in three minutes and then forgotten for ever. Compare these with the hours spent on fiddlesome, messy, acid-staining accumulators with their constant shop renewals. Once an “EKCO” Unit is fitted, all you have to do is plug the “EKCO” adaptor into any electric light or power socket and then switch on — that’s all! Buy “EKCO” and save time.

SAVE AS THEY SERVE

SAVE TROUBLE!

“EKCO” Units assure smooth CONTINUOUS reception with a constant voltage. No need now to worry as to whether you will hear all the programme. “EKCO” guarantees silent, HUM-FREE reception with INCREASED VOLUME. Buy “EKCO” and save trouble.

There are also “EKCO” All-Electric Receivers, radio’s supreme two and three valve sets, and “EKCO” H.T. Units, eliminating all batteries.

Plug-in-

That’s all!

ELECTRIC ALL POWER UNITS

All-Power Unit Model A.C.C2.A.

(Shown above) Provides:

(a) H.T. 3 Tappings of: S.G. for the H.T. supply to S.G. Valves: 60 and 120/150. Output 20 m/af.
(b) L.T. 2—6 volts from .2 amp. minimum to .5 amp. maximum, so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed .2 amp. e.g.: up to 5 — .1 amp. valves, or 2 — .1 amp. valves and 1 — .25 amp. power valve, or 3 — .1 amp. valves and 1 — .15 amp. power valve etc., may be used.
(c) G.B. 5 Tappings up to 12 volts.

Price £10 . 17 . 6

All-Power Unit Model A.C.C1.A.

(Shown on left) Provides:

(a) H.T. 4 Voltage Tappings of: S.G. for the H.T. supply to S.G. Valves: 0—120 var., 120/150 and POWER. Output 60 m/af.
(b) L.T. 2—6 volts from .3 amp. minimum to 1 amp. maximum, so being suitable for any combination of valves of the same filament voltage, provided that the sum total of current consumed by the filaments does not exceed 1 amp. e.g.: up to 10 — .1 amp. valves, or 2 — .1 amp. valves and 1 — .8 amp. super-power valve or up to 5 — .1 amp. valves and 2 — .25 amp. power valves, or 4 — .25 amp. valves, etc., may be used.
(c) G.B. 7 Tappings up to 21 volts.

Price £17 . 15 . 0

ULTRA

"THE SWITCHBOARD TO EUROPE"

ULTRA ELECTRIC, LIMITED,
661-3, Harrow Road, London, N.W.10

For better Music in the Home!

Fit the B T-H Electric Gramophone Motor

SENSATIONAL POWER
BRILLIANT TONE
WONDERFUL VOLUME


ULTRA ELECTRIC, LIMITED,
661-3, Harrow Road, London, N.W.10

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Here is an entirely new conception of radio value—delightful, eloquent broadcast reception from the new GECophone All-electric Three-Valve Receiver for A.C. Mains—a set priced so low that all previous standards of value are swept aside! Here is the last word in trouble-free radio-from-the-mains—a set that will give you long range and sensitive, selective reception with surprising volume and purity—all for £18 o 0 including OSRAM VALVES. Indeed a set to be proud of—in its handsome case of black relieved with old gold.

Sold by all Wireless Dealers.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
When buying Valves—Remember!

The Whaling Fleets at sea for months on end keep in touch with the world through radio. They use Marconi Valves because of their unfailing dependability.

* Imperial Airways, The B.B.C., Empire Wireless Communications, Trinity House Lightships and Beacon Stations, Croydon Control Tower, the great passenger liners, etc., etc., all

USE
MARCONI
VALVES

★ Buy the Valves the experts use!

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

ELSEWHERE in this issue we review the Olympia Radio Show as a whole, and endeavour to indicate by description and illustration what is the general trend of technical progress in the design of receivers and associated apparatus. The detailed description of technical improvements we will therefore leave to those pages set aside for that purpose, but there are other points in connection with the Show which are deserving of comment. Every Show provides its lessons, and it is largely as a result of the lessons learned at the annual Show that the industry is able to progress as it does, the Show providing the greatest opportunity which the manufacturers have for assessing the requirements of the public.

We sometimes wonder whether the standholders make sufficient use of this valuable opportunity. There is too often the tendency to take on a temporary staff with little knowledge of the apparatus displayed, and still less interest in recording the innumerable expressions of opinion passed by the visiting public which, if collected and brought to the attention of a responsible head of the firm or the designer of the apparatus, might be of great value to the firm in their future activities.

A remarkably strong impression gained as the result of repeated visits and tours round the Exhibition was that the general public are extraordinarily discriminating. In days gone by one generally found that attention was more or less equally divided between all stands, presumably because the public were not sufficiently discriminating in those days to separate the sheep from the goats; but this year the contrast between a well-patronised stand and a neglected one was so well defined that we took the trouble to investigate the reasons, and had not far to look to discover them. The neglected stands were those where apparatus was displayed which had not kept pace with modern progress. The fact that components and sets were cheap was not in itself sufficient to attract the public; the apparatus had to be modern and show evidence of careful design, and we can only think that this discriminating attitude on the part of the prospective buyer has been acquired as a result of bitter experience and disappointment in the performance of second-rate products. It is very pleasing to note this attitude, because it leads us to believe that radio of the future will be comparatively trouble-free; it is better to pay a slightly higher price for well-designed and carefully finished apparatus which will not be subject to breakdowns rather than that the listening public should be disappointed in radio and lose confidence as a result of repeated failures and frequent necessity for service arising from the use of inferior products.

Public interest in radio-gramophones has increased to a marked extent this year, whilst another indication of the Exhibition is a boom in the interest in up-to-date components, suggesting that many listeners who made their own sets a year or two back have now realised that the time has come for a complete overhaul or the construction of a new receiver on modern lines. No doubt the need for increased selectivity is one of the contributory causes of renewed activity in home set building.
THE ultimate aim of wireless reproduction of sound is that the vibrations of air which reach the ears of the listener should be indistinguishable from those which fall upon the transmitting microphone, so that speech and music may seem to have entered the home by a magical invasion with their quality and beauty unmarred by the long chain of transformations which they have undergone.

Such perfection is almost within our grasp at the present day; but its price is one which we cannot afford. For example, the reproduction of an orchestra is imperfect, because it seems to come from a point, whereas the instruments are actually grouped over a considerable area. The illusion could be improved by using two microphones, two channels of communication, two receiving sets and two loud speakers, but such a system would obviously be commercially impracticable.

A refinement of this kind is one which we have to learn to do without, just as we are accustomed to put up with flat photographs, pictures and cinema shows because the stereoscopic production of these things involves too much bother and expense.

Range of the Human Ear.
The ear has a range of ten octaves extending from 20 to 20,000 cycles per second, but it is seldom called upon to listen in the lowest or highest octave of this range. The highest octave, from 10,000 to 20,000, is not considered to have any musical value, and, indeed, it would be difficult to construct a musical instrument which would give appreciable intensity in this region. Some insect noises lie in this compass, such as the call of the grasshopper, and for all we know some may lie above it and be for ever inaudible to our ears. The lowest octave, from 20 cycles to 40 cycles, is reached by the deepest notes of the organ and piano, but not by any sounds in Nature save, perhaps, the roll of thunder. No voice of beast enters this region; even the lion cannot get below 50 cycles, but it may be that some great reptile in a far-distant age roared on a note deep enough to tax the lower limit of hearing of the mammalian ear. However that may be, there seems to be no survivor value to-day in a capacity to hear in the range between 20 cycles and 40 cycles, or between 10,000 cycles and 20,000 cycles; probably Nature has declined to devise a sharp cut-off in these ranges, and the imperfect sensitiveness found in them is the result of an extension of efficient hearing to the range from 40 to 10,000.

This latter range, then, is the one which is of importance in the interpretation of sounds, and we should endeavour to preserve it in the chain of apparatus used in wireless communication of speech and music. It is true that music is not scored for frequencies higher than 3,400 cycles, the highest note of the piccolo, but the overtones which accompany the fundamental note, and which are necessary for the preservation of the quality peculiar to each instrument, carry the limit to 10,000.

Sustained Notes.
When a sustained note of instrument or voice is sounded, a series of pressure waves is set up in the air, and if these are recorded as they pass any point, a series of curves of pressure variation can be drawn. The number of complete curves recorded per second, or the frequency with which the pattern repeats itself, is equal to the frequency at which the note is produced, but the curves are not
Quality Reception.—

pure sine waves, but are wrinkled by secondary ripples and indentations. Such curves can, however, be built up from pure sine curves whose frequencies are one, two, three, etc., times the fundamental frequency at which the note is played, and whose amplitudes and phases with respect to the fundamental are properly chosen. A sustained note may accordingly be represented as in Fig. 3 by a number of vertical lines, each of which represents a pure tone of a frequency which is some multiple of that of the fundamental, whose height represents the amplitude or maximum pressure variation, and which has a definite phase relation to the fundamental.

When we say that the sound of the vowel "Ah" can be analysed as in Fig. 3, we mean that if eleven pure tones are produced (by electrically driven tuning forks, for example) and their intensities so adjusted at any point the maximum pressure variation due to each fork alone is proportional to the height of the corresponding line in Fig. 3, then, provided the relative phases are also correctly arranged, the resultant pressure wave will be identical with that due to the sung vowel, and the effect on the ear will also be identical.

In reply to the question whether the overtones have any physical existence we can say that with a little practice the ear can distinguish at least some of them in addition to the fundamental, and that they can be reinforced by resonators. A resonator is a hollow spherical or cylindrical metal vessel furnished with a small opening, which is applied to the ear, and a larger one which admits the sound waves. The larger the resonator, the deeper is the note which it intensifies.

Overtones Necessary for Good Reproduction.

The quality or colour of tone which distinguishes one instrument from another is due to the number and strength of overtones; thus, the clarinet owes its sharp brilliant tone to the presence of strong 7th, 8th, 9th and 10th harmonics, while the mild and mellow flute gives almost a single pure tone. Some remarkable gramophone records have been produced by the Bell Telephone laboratories in which low-pass filters have been used to remove any desired number of overtones. For example, when the same note is sounded in succession by a piano, 'cello and French horn, and all overtones are removed, leaving the fundamental only, the three instruments sound alike, as might be expected, the quality being similar to that of a tuning-fork. The admission of the first overtone, in addition to the fundamental, makes it possible to identify each instrument, and the identification becomes more certain as further overtones are admitted. The absence of high overtones, such as those above the 8th, is perceptible in piano notes, reducing the brilliance and richness of the sound.

Phase Changes are Immaterial.

It is evident, then, that when a note of frequency 500 is played on a piano, higher frequencies up to at least 500 \times 8 = 4,000 should be allowed transmission.

It has been pointed out that when a complex wave is analysed into its component frequencies, due regard must be paid to the phases of the components; alterations in relative phase may profoundly affect the resultant waveform. Changes of this kind must inevitably take place in valve circuits, for alternating currents are retarded when traversing coils to an extent which increases with the frequency, and advanced in passing across condensers in a similar way, so that the shape of a complex wave may be greatly altered in passing through an amplifier.

It is, indeed, a fortunate as well as a curious circumstance that the ear takes no notice of such changes in phase. Many experiments have confirmed this statement, and perhaps the most striking is one due to Dr. Van der Pol, who has invented an instrument which he calls a wave shifter. The wave shifter is a valve

1 A resonator is a hollow spherical or cylindrical metal vessel furnished with a small opening, which is applied to the ear, and a larger one which admits the sound waves. The larger the resonator, the deeper is the note which it intensifies.

2 Phil. Mag., May 7th, 1929, p. 477.
Quality Reception.—
circuit which retards high frequencies relatively to low ones while leaving intensities unaltered; it can be inserted between the output valve and the loud speaker, resulting in a lack of information as to phase relations. It is as if trains arrived punctually at half-hourly intervals at each platform of a terminus without any passenger ever being able to find out whether his train would arrive before or after its neighbours at adjoining platforms.

A Frequency Chart.

The chart shown in Fig. 5 gives the ranges of most of the instruments employed in music. The highest notes are given by the piccolo, violin and piano, followed by the flute, clarinet and oboe. These notes are the fundamental notes, and the accompanying overtones actually carry the upper limits higher by an amount not shown on the chart or on any orchestral score.

We cannot combine Figs. 3 and 5 to discover how high our range of wireless hearing should extend in order to include the more important overtones of any instrument, for the analyses in Fig. 3 have only been carried out for fundamental tones near middle C, and the distribution of overtones may be quite different for high tones. But we know that as a minimum requirement the fundamental and the first overtone must be present if an instrument is to be recognised.

If, then, we take 5,000 cycles as the upper limit of reproduction by a high-class receiving set, it is evident that no fundamental higher than 2,500 cycles will retain and is operated by a single condenser dial.

When the dial is rotated, the quality of speech or music is found to be entirely unaffected, though a relative phase shift of 180° may have been produced.

We conclude that in the reproduction of sustained notes it is necessary to transmit the tones and overtones without alteration in relative strength, and that the phase relations can be left to take care of themselves.

A strange phenomenon is this indifference of the ear to phase relations. On the resonance theory of hearing the sound is analysed by tuned ear strings, each of which is connected to the brain by a single nerve. Where these nerves end in the brain there would seem to be a lack of cross-connection re-
Quality Reception.

...anything of its characteristic quality. Fig. 5 shows that at 2,500 cycles the only instruments interfered with are the piccolo, violin and piano, and that the latter two have their upper limits shortened only by three whole tones.

Reproduction from 50 Cycles to 5,000 Cycles.

The frequency of the lowest note on the piano is 27 cycles, and it may seem at first sight that the reproducing apparatus should transmit down to this frequency. But, in fact, such low notes contain very little energy in the fundamental, or even the first overtone. They are heard almost entirely on higher overtones, and can be reproduced perfectly by suitable combinations of pure tones, none of which has its frequency below 50 cycles. The chief reason for the absence of these tones is that the piano frame cannot vibrate at a frequency low enough to reinforce them. The same lack of fundamental power occurs in deep organ tones, though in this case the explanation is not so simple.

The lower limit of reproduction can accordingly be raised to 50 cycles with perfect safety; indeed, it can be raised much higher owing to a peculiarity of the ear, which is the salvation of many a wireless constructor.

The ear, owing to certain dissymmetries in its construction, acts as a rectifier, and, like a rectifying valve, gives rise to beat tones between the frequencies which fall upon it. Even if the fundamental and a few overtones are absent, it can reproduce them by beat tones between the remaining overtones to such an extent that the fundamental pitch of the note is clearly heard. When a filter is used to cut out the fundamental component of a bass voice singing "Ah" on middle C (256), no alteration in pitch or quality can be detected, but as the cut-out frequency is raised the quality gradually changes to that of a soprano trying to force her voice down to middle C.

In brief, we may say that unimpaired reproduction from 50 to 5,000 gives excellent, well-nigh perfect, results. As the upper limit recedes to 4,000, treble notes become thin and colourless, like boys' voices accompanied by flutes. As the lower limit rises to 200, low notes, though still of considerable intensity, are strangely altered, emasculated and reedy. It is estimated that half the wireless sets in use to-day transmit only between 250 and 3,500; their owners are probably satisfied with this performance once their ears have become accustomed to it.

Therein lies a great public danger. Since speech and music tend increasingly to reach our ears by mechanical channels rather than directly, there is a prospect that toleration of imperfect reproduction may lead to decay in the standard of pronunciation and lack of appreciation of musical quality. If any reader doubts this statement, let him reckon up the number of minutes each day during which he hears speech and music directly and free from a noisy background, and compare it with the period spent in listening to the telephone, loud speaker, gramophone and talkies.

Transients.

Many discussions of the design of receiving sets assume that the only problem is that of reproducing sustained sounds which change by a slow melting of one note into another without any abrupt or explosive transition. But such abrupt effects or transients are common, and form an essential part of speech and music. The consonants "p," "t," "k," are produced by the emission of a single puff of air accompanied by a train of highly damped waves of high frequencies. The wave-fronts of these disturbances are steep, and it will presently appear that there are three points in a receiving set where distortion is likely to occur. These consonants are notoriously difficult to convey over a telephone system.

Again, in emotional music, such as Liszt's "Hungarian Rhapsody," and in Wagner's operas, we meet with transients in abundance. Percussion instruments, like drums, cymbals and bells, the sounds of pistols and hand-claps, popping of corks, and splashing of water, give further illustrations. The first place in which transients may suffer mutilation is the tuned high-frequency circuit. When reaction is used, the damping of this circuit is greatly reduced and an appreciable time is taken to build up the full response to incoming waves, or to annul the response when the stimulus has ceased. Accordingly, the use of reaction is liable to alter or even to obliterate transients by...
Quality Reception.—

making the H.F. tuned circuit the analogue of a heavy flywheel which cannot respond to rapid changes.

In the second place, the use of chokes and voltage transformers in the audio-frequency amplifier leads to distortion of transients, for since these items produce a back E.M.F. proportional to the rate of change of the current, they can only give faithful reproduction when the exciting E.M.F. is a sine wave or is capable of being analysed into a series of sine waves. With any other shape of wave distortion must necessarily occur; thus, in the extreme case of a flat-topped incident wave shown by the full line in Fig. 6, the current produced in the coil takes the course of the dotted curve, so that the sharpness of the transient is reduced.

This kind of distortion is practically absent in resistance-capacity-coupled amplifiers, and the point is one to keep in mind when comparing the merits of these with transformer-coupled amplifiers. Fig. 7 shows the degree of success obtained by Dr. Crandall \(^1\) in reproducing flat-topped waves using six stages of resistance-capacity amplification and a recording oscillograph which was without inductance.

Finally, the loud speaker must be considered both because it contains inductance, giving rise to the kind of distortion shown in Fig. 6, and on account of the natural resonances of the diaphragm. When the diaphragm is displaced by a sudden impulse it oscillates in its natural frequencies in the process of returning to rest, and so adds an unnatural and metallic colour to transients of all kinds. A train of highly damped waves acts in a similar way, for, as is evident from Fig. 8, such a train leaves the diaphragm in a displaced position just as a single impulse does.

*(To be continued.)*

\(^{1}\) Bell System Tech. J., October, 1925.

---

**THE SIMPLEST ANTI-FADING DEVICE.**

The Use of Reversed Reaction.

The idea described looks too simple to be effective. Nevertheless, as far as can be judged from aural observations, it seems to work. Like all anti-fading systems, it is useless, except for strong signals; hence as fading does not trouble the reception of local stations, good high-frequency amplification is presupposed.

Swinging Coil or Condenser-controlled Reaction.

Fading is at its worst in a receiver where reaction follows a tuned anode (or tuned grid) high-frequency amplifier, since the decrease in carrier current then acts doubly, not only directly reducing the signals but also reducing the reaction effect and hence increasing the effective resistance in the tuned circuit, which, in turn, decreases the amplification.

If, however, signals are so strong that it is possible to use reversed reaction—for example, with the old-fashioned swinging coil by turning it through \(180^\circ\) from its point of greatest effect—a decrease in carrier current will tend to increase the amplification, since the effective resistance of the tuned circuit will now decrease with the decrease in counter-reaction; and this increase in amplification will tend to make up for the decrease in the signals arriving at the antenna. (Actually, of course, it is more complicated, since the decrease in carrier-current will decrease the counter-reaction, which will increase the amplified carrier-current; but this increase will increase the counter-reaction until a balance is attained. However, the tendency is there.)

With the swinging coil the idea is quickly tested; with the modern condenser-controlled reaction it would be necessary to wind an auxiliary reaction coil, in the reversed direction to the normal coil (Fig. 1).

The Case of the Screen-grid Valve.

There is, however, one case where the device is of special interest, and this is where the high-frequency amplifier is inherently unstable. It is where the amplification obtained is too great for the internal capacity of even a screen-grid valve. In such cases it seems worth while “quieting down” the amplifier by means of reversed reaction rather than by reducing the overall amplification or by neutralising; in such a case the reaction coil would, of course, be wound in the reverse direction to normal, and no “normal” reaction coil would be used—the handling of the set is quite normal, except that an increase in the reaction condenser tends to stop oscillations instead of starting them. In this case the anti-fading tendency of the reversed reaction can be taken advantage of without difficulty, and without in any way complicating the construction or handling of the receiver.

R. R. H.
ALL ROADS LED TO OLYMPIA.

All attendance records for previous wireless exhibitions have been smashed this year at Olympia. In the first six days more than 170,000 visitors passed through the turnstiles. The daily average exceeded that of 1920 by nearly 6,000.

GOOD BUSINESS.

The Exhibition helped to prove that the radio industry is one of the most prosperous in the country at the present moment. Orders were taken which will keep some firms busy until the spring.

CHIEF OF PAPAL BROADCASTING STATION.

The Observatore Romano announces that the Pope has appointed as president of the new Vatican broadcasting station the Rev. Giuseppe Guafranceschi, S.J., of the Pontifical Academy of Sciences. The station, which has been built by the Marconi Company, will be formally opened within the next fortnight.

"BY COURTESY OF PORK PACKERS, INC."

The opening of the first course in broadcast salesmanship is announced by the College of the City of New York. It is stated that Mr. F. Arnold, the instructor, has travelled 100,000 miles studying "listener reaction," and is an expert in making the programme fit the product.

MEDAL FOR A HERO.

Mr. Frank Davidson, the wireless operator of the British liner Toti, which sank in mid-Pacific after the rescue of her passengers and crew by the American liner Pentreux, has been awarded a gold medal by the Veteran Wireless Operators' Association.

A SECOND MOSES?

"An eminent British scientist may be the Moses who will lead North America and the rest of the world out of the wilderness of radio congestion."

The opening of the first course in broadcast salesmanship is announced by the College of the City of New York. It is stated that Mr. F. Arnold, the instructor, has travelled 100,000 miles studying "listener reaction," and is an expert in making the programme fit the product.

A SECOND MOSES?

"An eminent British scientist may be the Moses who will lead North America and the rest of the world out of the wilderness of radio congestion."

The exhibition helped to prove that the radio industry is one of the most prosperous in the country at the present moment. Orders were taken which will keep some firms busy until the spring.

CHIEF OF PAPAL BROADCASTING STATION.

The Observatore Romano announces that the Pope has appointed as president of the new Vatican broadcasting station the Rev. Giuseppe Guafranceschi, S.J., of the Pontifical Academy of Sciences. The station, which has been built by the Marconi Company, will be formally opened within the next fortnight.

"BY COURTESY OF PORK PACKERS, INC."

The opening of the first course in broadcast salesmanship is announced by the College of the City of New York. It is stated that Mr. F. Arnold, the instructor, has travelled 100,000 miles studying "listener reaction," and is an expert in making the programme fit the product.

MEDAL FOR A HERO.

Mr. Frank Davidson, the wireless operator of the British liner Toti, which sank in mid-Pacific after the rescue of her passengers and crew by the American liner Pentreux, has been awarded a gold medal by the Veteran Wireless Operators' Association.

A SECOND MOSES?

"An eminent British scientist may be the Moses who will lead North America and the rest of the world out of the wilderness of radio congestion."

The opening of the first course in broadcast salesmanship is announced by the College of the City of New York. It is stated that Mr. F. Arnold, the instructor, has travelled 100,000 miles studying "listener reaction," and is an expert in making the programme fit the product.

MEDAL FOR A HERO.

Mr. Frank Davidson, the wireless operator of the British liner Toti, which sank in mid-Pacific after the rescue of her passengers and crew by the American liner Pentreux, has been awarded a gold medal by the Veteran Wireless Operators' Association.

A SECOND MOSES?

"An eminent British scientist may be the Moses who will lead North America and the rest of the world out of the wilderness of radio congestion."

The opening of the first course in broadcast salesmanship is announced by the College of the City of New York. It is stated that Mr. F. Arnold, the instructor, has travelled 100,000 miles studying "listener reaction," and is an expert in making the programme fit the product.

MEDAL FOR A HERO.

Mr. Frank Davidson, the wireless operator of the British liner Toti, which sank in mid-Pacific after the rescue of her passengers and crew by the American liner Pentreux, has been awarded a gold medal by the Veteran Wireless Operators' Association.

A SECOND MOSES?

"An eminent British scientist may be the Moses who will lead North America and the rest of the world out of the wilderness of radio congestion."

We Want Your Vote

With the appearance of this, our third Show Number, readers are reminded that entry forms for THE WIRELESS WORLD Olympia Show Competition are due to be sent in to reach THE WIRELESS WORLD office not later than Monday, October 6th.

We do not anticipate that it will be possible to canvass approaches for two or three weeks, owing to the time required to sort out the votes and ascertain the winners in each class. The entry form is again included in the advertisement pages of this issue, and we hope that every reader is participating in the ballot and will forward his completed form by the date specified.

HAVE YOU MET THEM?

Non-paying listeners who escape the charge of piracy have a few honeyed words to themselves in the current number of the Indian Radio Times. Says the writer: "A number of our Patrons, we find however, are not actually Licensees holders. They listen-in at the residences of their friends... This is all very nice... We must impress upon them, however, that it would be to their greater interest if they put their appreciations into action by investing in RADIO SETS. The TIMWFOU Fee is a paltry sum."

EARLIER BELGIAN SHOW.

The annual Brussels Radio Show is to be held earlier than usual this year, the dates being October 18th to 27th. The venue will be the Place du Cinquantenaire.

ARE U.S. CHURCHES SELLING RADIO LICENCES?

"Traficking" in radio transmission licences is strongly suspected by the American Federal Radio Commission as a result of the unusually large number of recent applications for changes in the ownership of broadcasting stations, writes our Washington correspondent. Since the wavelength band is congested already, the commission is disposed to eliminate stations of doubtful status and scrutinise carefully the financial repute of the proposed new owners.

The Commission enforces asylance the trend of church and educational stations towards new commercial owners. In the last year at least a dozen church stations have gone commercial.

BRITISH GEAR FOR EUROPE'S BIGGEST BROADCASTER.

The most powerful broadcasting installation in Europe is now undergoing its final test at the Marconi works at Chelmsford. This is the long-wave 150,000 kW. transmitter, which is shortly to be erected for the Polish Broadcasting Company at Resin, some 20 kilometres from Warsaw.

The aerial at Resin will be of the half-wave type terminating in a feeder house, the two masts, 600 feet high and 750 feet apart, will be the highest in use at any European broadcasting station.

TELEVISION AND THE THEATRE.

What is regarded as marking the definite recognition of television by American theatre interests is the decision to erect a television broadcasting station on the roof of the New Amsterdam Theatre, West 42nd street, New York, the work to be undertaken by the Radio Corporation of America.

THE NOVOTONE.

In our issue of September 24th we reported information given by the manufacturers that the original type Novotone has a voltage step-up of 1 to 2.5. This we are now informed should be 1 to 2 at 250 cycles.
UNBIASED.

By

FREE GRID.

That Outstanding Exhibit.

I SUPPOSE as a temporary (depends more on the Editor than on me) contributor, I am officially precluded from participating in The Wireless World Ballot Competition, but nevertheless I have very carefully filled in an entry form for my own edification, and it will be interesting to see how far adrift I am in my prognostications when the results are published. I think that readers will have little difficulty in agreeing with me as to what is the single outstanding exhibit of the Show, which comes under Class No. 8 in the competition.

Strange?

In spite of the fact that the Show is really all British this year, or at any rate supposed to be so, I could not help noticing that on one or two of the wholesalers' stands apparatus had crept in which must surely have been manufactured over the water.

Advice Wasted.

If I have a bee in my bonnet, it is on the subject of gramophone motors. What interested me exceedingly was a special electric-cum-clockwork movement which was being exhibited. Briefly, a clockwork motor is used to drive the gramophone—so eliminating any possibility of electrical interference—and an electric motor is used to wind it up. The whole action is automatic, the winding motor being switched on at the conclusion of the record and being switched off again immediately the motor is fully wound.

This series of operations is controlled by a low voltage and low current relay operated from an ordinary flash-lamp battery. The presence of this latter component on an otherwise "all-mains" arrangement immediately aroused my ire, batteries of any description in an all-mains arrangement being one of my pet aversions. Seizing the nearest pamphlet I immediately began to draw diagrams on the back of it in order to explain to the politely bored demonstrator how the relay might be operated from the mains at relatively little cost and with absolute safety and reliability. I also suggested that an emergency winding handle might be provided in case the electrical part of the apparatus refused to function at any time, or in case the owner of it moved to a non-electrical district. But, alas! my enthusiasm carried me too far, and my good advice fell on stony ground, since, as I moved away, I surreptitiously observed my victim drop my diagram into a convenient receptacle, and I must say that on second thoughts I don't blame him, as I daresay that at the end of a day's work many stand people must get truly sick of ill-considered advice, to say nothing of fool questions.

Talking of questions reminds me of an interesting experience I had when I sought the neighbourhood of The Wireless World stand for a rest from my peregrinations. I took up a position near where a representative of the technical staff was endeavouring to satisfy the thirst for information of what appeared to be a veritable horde of budding Einsteins out in front. Seriously, though, I was considerably astounded at the high order of technical knowledge commanded by those propounding the questions and at the intelligence displayed in the supplementary queries which usually followed the answer. It was a veritable eye-opener—at any rate to me. There were, naturally enough, the inevitable exceptions.

Perhaps I might mention one particular interrogator, whom I recognised as a well-known figure in the motor- ing world and one whose name—to use a hackneyed but useful expression—is one to conjure with in matters concerning the technicalities of the motor car. Briefly put, his question was that his all-mains set, which had (he said) been built to a Wireless World design, would not work. Why? The presiding Solomon immediately proceeded to cross-examine him as to whether he had followed the specifications; had he tested this and tried that? Apparently he had done all this and more also, for, not only had he thoroughly "vetted" everything with a family of meters, but he had gone to the length of calling in two well-known wireless experts who had declared that there was nothing wrong with the set!

"Then surely if there is nothing wrong with the set it must work perfectly," interjected one of the rather impatient crowd surrounding the stand. This—to me—unanswerable piece of logic did not satisfy our friend, however, who began to wax wrath and demanded what The Wireless World was going to do about it. Fortunately for the reputation of the set "up spoke a brave Horatius" in the crowd who had built the set in question.

In the discussion which ensued, The Wireless World technical man with commendable tact lent his ear to a clamorous Caledonian who wanted to know all about oscillating crystal circuits, presumably being under the impression that they were economical. Meanwhile, I
Unbiased.—
continued to listen to the discussion anted the all-mains set, and eventually it turned out that (a) the motoring expert lived in the country outside the reach of electric light mains, and so presumably his question was "fictitious"; (b) the set he had built was not a Wireless World design anyhow. Now, the intricacies of the internal-combustion engine are as a sealed book to me, but I really think that if I had a question to ask him on his pet subject I would at least contrive to make sure of the make of car I had purchased!!! Apart from this extreme instance, other somewhat similar "cases" presented themselves for diagnosis, and it struck one that the hardest type of question to answer is: "Why won't my set work?" It appeared to me—at any rate—that, in order to answer all-comers without giving offence, it needed the Wisdom of Solomon combined with the Caution of an Agag with perhaps a dash of Datas thrown in.

Yet another class of questioner who interested me was the youth with the cricket-match moustache, who commenced his question by stating that he had been a reader of The Wireless World from the first number. Instinctively my mind flew back over the years to April, 1913, before wireless had turned my hair grey, and I saw the youth, in my mind's eye, chortling gleefully as he assimilated nourishment for the body from a bottle and nourishment for the soul from Vol. 1 No. 1 of this venerable journal.

The Trek to the North.
It is only a few more days before the Manchester Show opens, and I shall be wending my way northward to see what good things are in store for us at the rainy city. The Manchester Show is, in my opinion, always very interesting, and in some respects it is more instructive than Olympia itself. The organisers might, however, find a more inviting-looking building in which to hold it.

By the way, I have been threatened by Mrs. Free Grid that she intends to visit the Manchester Exhibition next week with the avowed object of purchasing a set and of presenting me the bill, owing to the fact that as a result of my experimental work the "Old Homestead Three" is being constantly disembowelled. I am half tempted to let her get on with it, as there were several very tempting receivers on show this year at Olympia, and they will, of course, be all seen again, together with some additional ones, in the Northern Exhibition.

A Novel Explanation.—
I made a very interesting tour of the various centrally heated demonstration theatres where for the most part radiograms were being demonstrated. What struck me very forcibly was the amount of noise picked up by the almost universal electrically driven motor, nor was this confined solely to the cheaper instruments. I proved this in one particular case by the simple expedient of stretching forth an impious hand and lifting the pick-up from the record. At this perhaps rather high-handed act of mine the onlookers gave horrified gasps, evidently expecting me to share the fate of Uzzah, while the young man in charge nearly swooned. I having, unfortunately, scratched the record slightly in replacing the needle. Another remarkable example of somebody having missed their vocation was vouchsafed to me here, for, in reply to my criticisms of commutator interference, I was told that I was quite mistaken, as the distressing noise was due to the battery eliminator!!! It so happened that later in the evening I came across one of these particular radiograms, as they now appear to be called, with its "inards" exposed, and at once saw the cause of the trouble, which was the use of a superannuated motor of foreign origin in which no attempt had been made either by screening or otherwise to eliminate the interference. This, mark you, in a radiogram costing a few shillings less than £50.

In fairness to the foreigners concerned, it should be said that the model has been obsolete for the best part of a year, having been replaced by one in which special screening arrangements are made to reduce commutator noise to vanishing point. It must be admitted that the case I have quoted is an extreme one, but, nevertheless, I found that motor interference was far too prevalent in certain models; at the same time I must give credit where credit is due and place on record the fact that there were a very large number of motors on show in which the whole of the electrical portion, including, of course, the all-important commutator, was totally enclosed in a metal box, a terminal being provided for the purpose of "earthing" this to the cathode or common negative connection of the amplifier in a radiogram.

It is evident that the B.B.C. are still dubious about employment of an electric motor, however, since I noticed that they were using an ordinary clockwork instrument for supplying music to the 200-odd loud speakers distributed about the various stands. Incidentally, the particular make of pick-up which they used was plainly visible and easily recognisable, although, of course, this would convey nothing new to regular readers, as I have already seen the name of the particular instrument favoured by the B.B.C. disclosed in W.W.
Foreign Relays: Who Wants Them?
Do listeners want foreign relays? This innocent-looking question is arousing genuine concern at Savoy Hill, principally because so few individuals have troubled to write letters in appreciation of the B.B.C.'s recent efforts to give us the best from the Continent as well as from America.

Unspoken Desires?
The costly business of chartering wires half-way across Europe, as in the case of the recent Salzburg festival, can only be justified if thousands of home folk desire to hear the best music imperfectly reproduced in preference to the next best perfectly reproduced. In my experience, only one class of listener would confess anything of the sort, and he is the man who listens direct to distant stations on his own set.

Too Late
If the B.B.C. could have staged these elaborate relays six years ago there might have been a demand for them, but it is doubtful whether receivers and landlines were equal to the task. The irony of the present situation lies in the fact that the improvement in Continental landlines and repeater methods comes too late. The majority of listeners interested in Continental programmes can pick them up direct.

A New Policy?
Many observers would not be surprised if the B.B.C. were shortly to alter their foreign relays policy, deciding to use the Continental landlines only for events of exceptional importance, such as the sessions of the League of Nations. All efforts to relay music will probably be abandoned.

The Prince to Broadcast
The Prince of Wales's speech at the League of Nations dinner on October 30th will be one of several to be relayed from the Guildhall in the National programme.

Sad Thoughts.
Sentimental rumours have gone the rounds to the effect that the B.B.C. hates this idea of leaving the old premises on Savoy Hill. It is said that even when Broadcasting House is ready for occupation some of the staff will remain, Casabianca-like, on the old decks.
I can discover no truth in the suggestion.

Make-shifts.
Opinion among the staff at Savoy Hill is all the other way. The present head-quarters are a make-shift, as full of improvisations as the piano interlude. One of the talks studios is a converted scullery.

Overflowing Departments.
Uncertainty exists as to whether Broadcasting House will be able to absorb all the London departments of the B.B.C., for some of these have already moved to the outskirts of the London conurbation.

The Director of Music.
Mr. Adrian Boult will make his first appearance as conductor for the B.B.C. at the inaugural winter symphony concert to be broadcast from the Queen's Hall on October 22nd. Madame Suggia, the eminent cellist, will take the solo part in Saint-Saëns Concerto in A minor for violincello and orchestra.

Conductors and the Orchestra.
In order that the new orchestra of 114 players shall give the best possible account of itself, conductors who are participating during the season have each been invited to take control of the orchestra for a period in advance, in most cases of three weeks.

Features of the Programme.
The chief choral works to be performed during the season include Handel's "Israel in Egypt," Beethoven's "Missa Solemnis," and Vaughan Williams' "Sea Symphony." The important orchestral items include the Brandenburg Concertos of Bach, many of the Beethoven symphonies, and works by Brahms, Schubert, Schumann, Berlioz, and Tchaikowsky. Lovers of modern music should find gratification in compositions by Schoenberg, Stravinsky, and Bartok.

Lord Beaverbrook at the Microphone.
Lord Beaverbrook may be expected to agitate the ether on October 16th, when he inaugurates a series of talks under the title "Trade Within the Empire." Other speakers in the series will be Sir Basil Blackett, Sir Arthur Salter, and Mr. Frank Livett MacDougall.

Drums in Lifts.
"R.E.R.," which was broadcast so successfully last week, had a prologue which listeners did not hear. It might have been called "The Episode of the Big Drum." To produce the sounds of gunfire from a battleship, it was decided that something larger than the ordinary orchestral drum should be used. No difficulty was met with in obtaining an outsized in drums, until the instrument was brought to the Savoy Hill lift. Apparently no one could be found who specialised in the art of inserting extra large drums in medium-sized lifts, and it was only after a hard struggle that the feat was accomplished. The lift attendant was inserted afterwards.
Radio technicians know that it is useless to expect a substantial stage gain from any Screened Grid Valve—however good its other characteristics—which has a high inter-electrode capacity. Cossor engineers have been striving for months past to reduce the self-capacity of Cossor Screened Grid Valves to a negligible figure. So successful have they been in their efforts that the new Cossor 215 S.G. has an inter-electrode capacity of the order of 0.001 micro-microfarads—lower than that of any other Screened Grid Valve on the market. As a result, this new Cossor Valve permits a degree of effective amplification which a year-ago would have been considered utterly impracticable. The use of this Valve will considerably increase the efficiency of your Receiver.
Convert your set to A.C. Mains

The Six-Sixty A.C. All-Mains Conversion Equipment is suitable for practically any battery operated receiver.

No internal wiring alterations, Equipment includes specially selected Six-Sixty A.C. Valves—and Six-Sixty 5/4 pin valve holder adaptors.

Specially designed to co-operate with selected Six-Sixty A.C. valves, this complete mains conversion equipment forms the ideal practical all-electric unit. No wiring alterations, no wasted components—once fitted, fitted for all time.

A valve-maker makes it, knowing the special features of the valves it works with. Valves that have made a name for themselves by their tonal purity, by their intense sensitivity to distant signals—valves with the name Six-Sixty. Rigid in construction, shock-insulated filament, full pressure emission.

They get more; they make more of what they get—that is why you should

Say SIX-SIXTY

Isn't that what you've been waiting for? Of course it is—but why wait any longer?

Power Unit (H.T., L.T. and G.B.) only £6 6 0

PRICE, Complete A.C. Mains Conversion Equipment, from £8 5 0

Write for latest Six-Sixty Literature giving particulars of the complete range of Six-Sixty Valves, Mains Conversion Equipment, Valve Adaptors, Valve and Set Tester, Cone Speaker Unit and Cone Speaker Assembly, Cone Speaker Paper, Turntable, Grid-Leaks, and Gramophone Pick-up Attachments.

SIX-SIXTY A.C. VALVE ADAPTORS

SIX-SIXTY A.C. ALL MAINS CONVERSION EQUIPMENT

SAY SIX-SIXTY

(S.V.A. Radio Valves and Equipment.)


Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
OCTOBER 1st, 1930.

A Review of Points of Novelty Illustrated by Typical Examples.

To say that the National Radio Exhibition of 1930 has brought forth nothing that is radically new, and to let this bald statement stand as an implied reproof, would be cruelly unfair to the hard-working research and development staffs of the manufacturing firms concerned. True, there were no startling innovations, but mere novelty for novelty's sake is even less worth while in the wireless art than in the majority of others. There was abundant evidence to show that infinite pains have been taken to ensure that the average new set may be much better in every way than its predecessors. After all, results are the deciding factor, and, in the matter of performance in the ordinary user's hands, the set of 1930, being essentially practical, should show a greater advance, as compared with that of 1929, than has been made in any other single year. If this opinion be true—and it is not made without due consideration—the Olympia Show just ended must be admitted to have been a complete success from the technical point of view.

It was most gratifying to find a definite tendency to divide receivers into distinct categories with regard to their sensitivity; exaggerated claims were seldom made, and sets were frankly offered as being intended for medium- or even for short-range work only. The purely local-station outfit has made its appearance, and is likely to appeal to an increasing number of listeners as the Regional scheme of twin-station transmitters is extended. Indicative of this tendency was the new Ferranti receiver, with a switch change-over between two pre-determined wavelengths. This is a two-detector-L.F. combination, with two distinct tuned circuits and four semi-variable condensers, so arranged that the circuit out of use for tuning purposes is converted into an absorption wave-trap operative on the frequency of the unwanted station. A new Columbia "Twin Station" receiver, available in models for A.C. or D.C. supply, is similarly arranged for alternative programme reception, and has a built-in loud speaker. Due partly to changes in the patent situation, and to the adoption of mass-production methods, certain manufacturers have been able to produce simple detector-L.F. sets at extraordinarily low prices—in the neighbourhood of £3.
These receivers seem likely to satisfy the none-too-exacting needs of a large but hitherto unexploited section of potential listeners, and so their introduction must be welcomed. It would be invidious to attempt to single out any particular product in this category as being definitely in the lead; almost all the sets embody up-to-date refinements that have been proved to be worth while from the user’s point of view. Thanks largely to continued improvement in valve technique, the sensitivity of these sets shows a considerable improvement, so their range should be sufficient for all except the most exacting requirements or the most difficult conditions. In the matter of volume, the single L.F. stage, which, of course, is an essential part of the circuit, can now be made to provide sufficient power output for all ordinary needs.

There has been a well-marked increase in the number of mains-operated receivers, and it is now certain that the listener with access to an electric supply is better catered for than those who must depend on batteries. Possibly this is accountable to the fact that many sets are sold on the hire-purchase system, and that the trader, knowing human nature, prefers to sell something that is unlikely to require any renewals during the period in which payment is being made. A.C. receivers are in the majority, but many makers have faced the rather difficult task of designing satisfactory apparatus for operation on D.C. supplies; among others, the new Ekco set has many points of interest.

Direct calibration in wavelength has now become a feature of relatively inexpensive sets, and is adopted much more generally than formerly. It is clearly a great convenience to the ordinary listener who requires no very wide choice of programmes, but, for the long-distance enthusiast, is perhaps slightly less susceptible to accurate recording of station settings than is a dial.
The Trend of Progress.—

marked off with an arbitrary scale.

Single-knob control of tuning condensers is certainly one of the most important advances to be placed on record. The word "advance" is used advisedly, as there can be no doubt that the unskilled listener regards this feature as of paramount importance. Even the knowledgeable enthusiast (as we know from our correspondence from readers) considers it to be desirable, providing that its inclusion does not entail a sacrifice of sensitivity and selectivity.

Development in this direction has proceeded, in the main, on lines of accepted practice. In most cases a trimming condenser is fitted for the aerial input circuit, or, alternatively, provision is made for rocking the rotor of the first variable condenser through a few degrees. It is sometimes found that the range of variation as provided is unnecessarily great; this is rather likely to lead to difficulty in operation. One of the best examples of a gang-controlled receiver is the new Marconiphone Console model, Type No. 560, in which the tuning of all three circuits is controlled by a single dial.

When it is realised that a signal voltage of perhaps as much as 10 volts (peak) may easily be developed across an efficient aerial input circuit at quite a number of miles distance from a powerful transmitters, it will be appreciated that some form of input volume control is becoming essential, particularly as the average screen-grid valve is capable of dealing faithfully only with a fraction of a volt. It is extremely difficult to devise a method of regulating signal voltage to the first valve in such a way that the tuning of its grid circuit shall not be affected, and many ingenious schemes have been devised to overcome this trouble.

Probably the most interesting is that adopted in the new McMichael three-valve H.F.-det.-L.F. set, where control is effected by operation of a variable series aerial condenser; the inevitable changes in effective grid circuit capacity that would otherwise be brought about by alterations of its setting is compensated for by linking it mechanically with the input tuning condenser. Another plan is adopted in the new Burnddept set, where a differential condenser is arranged to replace capacity taken from the aerial circuit and so to preserve a balance. Some similar precautions against alterations of tuning are taken in the Columbia receiver.

Volume control arrangements of this kind all have the additional advantage that reductions of intensity are accompanied by an improvement in selectivity; consequently, they are particularly useful in the immediate neighbourhood of a powerful station. This is also a property of the simple series aerial condenser, which is to be found in many sets, and of the system of variable magnetic aerial coupling, as adopted by the Ekco firm.

Another favourite method of controlling detector input is to fit a potentiometer for regulating screen-
The Trend of Progress.—

ing grid voltage of the H.F. valve—or valves; this plan seems to be most popular with those responsible for the design of H.F. amplifiers with more than one stage. By making provision for a sufficiently wide voltage variation, it is possible so to arrange matters that a certain amount of regeneration is provided; where this is done the volume control knob can be used either in the ordinary way to reduce intensity below the normal level or to increase sensitivity in the same way as a reaction control. This arrangement is adopted in the Marconiophone four-valve set, in which the voltage-regulating potentiometer is mounted on the same shaft as the post-detection volume control.

Regulating the volume at the L.F. end of the receiver, no special innovations were noticed except in the R.G.D. radiogramophone, in which a tapped potentiometer, with a single operating knob, controls intensity of both gramophone and radio L.F. input, and acts also as change-over switch from one method of reproduction to the other in such a way that either may be faded in or out at will without abrupt breaks.

Last year almost every receiver included adjustable reaction, but now there are many without it. In this one sees the effect of better circuit design and more effective screening, which gives greater H.F. stage gains. Even when reaction is fitted, it is often pointed out that it need seldom be used, again implying that the H.F. amplifier is capable of doing its work without adventitious aids.

With regard to actual methods of applying reaction, a rather unusual scheme is embodied in the Marconiophone set; here the reaction winding (which is common to both medium- and long-wave grid coils) is shunted by a variable damping resistance, wound in such a way that equal angular displacements of its control knob throughout the scale do not bring about equal resistance changes. This is done in order that the range of effective control may be more evenly distributed and a critical control obtained at all settings.

Differential reaction condensers are now widely used, mainly because they allow a suitable value of capacity to be maintained between anode and filament of the detector valve, thus ensuring that anti-reaction feed-back shall be kept within reasonable bounds even when the reaction control is set at "minimum." This is probably one of the reasons why the new sets are less dependent on reaction.

A revival of variable magnetic reaction was observed in the Ferranti
The Trend of Progress.—

three-valve sets, where provision is made for reversing the sense of coupling, mainly in order that excessively sharp tuning with consequent loss of sidebands may be avoided at the lower end of the tuning scale, where regenerative effects in the H.F. stage are naturally most marked.

It is rather disappointing to have to record that no very determined effort seems to have been made to get to the root of the interference problem, although in the matter of selectivity sets are better than they were, if only because their coils are better; probably the average dynamic resistance of tuned circuits has increased in the year by as much as 25 per cent. Admittedly, almost every set shown should be capable of separating a pair of Regional transmissions, even at short range, when properly operated, but this is not enough. Receivers with pretensions as to range should be able not only to separate the local stations but also to receive others free from interference; this is just what a number of those shown are incapable of doing, as much of the selectivity they may have is obtained by sacrificing signal strength. This does not apply to some of the new frame-aerial sets, and those with two H.F. stages, which should have a good enough performance in this respect for almost any condition, mainly because their signal pick-up is small or because very weak aerial coupling is provided.

The Ediswan "Power Pentode Two" is one of the few receivers with tuning arrangement possessing more real inherent selectivity than the average. This is a detector-L.F. set, with a two-circuit aerial tuner and ganged control of its two tuning condensers. It is thus no more difficult to operate than ordinary sets of the same type. Inter-circuit coupling is magnetic, one of the coil assemblies being mounted in such a way that it may be moved with respect to the other. When once fixed to suit local conditions, it is intended that this coupling should not be subsequently adjusted, as, to make it, the back cover of the set must be removed. As this set makes use of a super-power pentode output valve, its capabilities in the matter of volume are considerable, but one could wish that this promising input tuning system had been included in a set with greater pretensions as to range, where its selectivity would have been of greater advantage.

Another real selectivity device was found in the R.G.D. radiogramophone, which employs a capacity-coupled band pass filter, followed by two cascade H.F. amplifiers. Again, no extra operating complications are introduced, as all four tuning condensers are mechanically linked together and controlled by a single knob.

Portable sets have undergone little change, with the notable ex-
The Trend of Progress.

The exception of the new Pye productions. These sets include a high-efficiency two-stage tuned H.F. amplifier, ganged condensers, and no direct reaction, although regenerative effects may be produced by adjustment of screening grid voltage. Anode-bend detection is included in the battery model, while the A.C., portable with regard to anode current, liberal power outputs are available, and in at least one three-valve receiver—the "Enemains" transportable—a moving coil loud speaker is fitted.

High-frequency amplifiers with two H.F. stages are gaining ground; with regard to inter-stage couplings the double-wound transformer and the tuned-grid system are both popular, the latter being preferred in sets with ganged control. The tuned anode method is rather a bad third, but it seems now to be generally agreed that, properly used, each type of coupling has its uses.

The anode-bend detector has suffered a definite setback, probably due partly to increasing depth of modulation at the transmitting end and to secessions to the new system of power grid detection, which has been widely adopted.

Single L.F. stages are to be found in a very large number—perhaps in the majority—of the new receivers. Increasing efficiency of modern valves, and in particular the recent introduction of super-power pentodes, is responsible for this state of affairs; two modern stages give an almost embarrassingly high overall magnification which is excessive for most ordinary requirements, particularly when a good deal of amplification is done prior to the process of detection. Pentodes are more popular than ever.

With regard to L.F. couplings, the transformer has now established a clear lead, as is to be expected when so many single-stage amplifiers are in use. Push-pull amplification has hardly gained any ground, probably on account of the patent position, and the tendency is to use a single output valve of the required rating rather than to connect valves in parallel.

Passing from stand to stand around the Show one cannot fail to notice that sets have adopted new forms of construction. The simple baseboard with screwed-down components and ver-

![Pye A.C. Transportable set and chassis. The top compartment contains the tuning apparatus with an intermediate section enclosing the valves. In the base is the eliminator. A remarkable example of an all-metal chassis design applied to transportable set construction.]

version, which may be described as a mains transportable, has power grid rectification. These sets, by the way, are not sold as "boxes of mystery"; full data as to measured selectivity, frequency response, and overall amplification was made available on the stand.

The Murphy Radio Portable is another instrument bearing the hallmark of scientific modern design; it has an H.F.-det.-2-L.F. circuit, and its tuning controls are completely ganged.

Mains transportables, of which only one or two examples were available last year, were shown in greatly increased numbers; their circuit arrangement is, as a rule, on conventional lines, and either frames or very short aerials seem to be preferred as collectors for these self-contained sets. As these sets are not limited in the same way as a battery...
The Trend of Progress.—

tical front panel and screening barriers has gone for ever. In its place are metal pressings stiffened by bending combined with the use of bakelite mouldings.

Progress is not well demonstrated by reference to the simple sets, but here one does find reliable make-up in that the manufacturer has not hesitated to incur the cost of tools for pressings and mouldings. As a result, the public gets a set giving a satisfactory performance at a price which, owing to competition, is exceptionally low. The sets of Burton and Red Star are examples, the former being enclosed in a moulded container.

Only by turning to the larger sets can conspicuous examples of progress be recorded. Most generally adopted is the design consisting of hollow baseplate, housing the decoupling and distributing equipment, and above the base the valves and tuned circuits. There are many examples of this form of construction which is adopted by Marconiphone, G.E.C., Kolster-Brandes, R.G.D., Regentone, Burne-Jones, and others. It is a good arrangement, lending itself to a convenient layout of components, effective screening, straightforward and concealed wiring. In every case this type of set has two screen-grid stages, detector and one L.F. stage, and is all-mains operated. This class of receiver has suddenly come to the front, and all of the sets have many points in common.

We find, for the first time, coils under screening containers, ganged condensers giving single-dial control, ganged switches for wave-changing, and complete metal screening around the valves. These details are all to be found in this entirely new type of receiver, of which there was no example at last year’s show. It would seem that the manufacturers have caught up with the arrangement of the separately screened coil with its ganged switch control combined with the one-shaft tuning condenser, which has already firmly established itself in amateur set construction. Complete screening around the coils and usually the coil switches also, and earthed capacity barriers between the fixed plates of the tuning condensers, are the essentials of the arrangement. High-efficiency coils are by no means desirable in these circumstances, and with such complete screening and a small degree of valve reaction pulling its weight, high amplification results, with stability over the entire tuning scale on both wave ranges.

Decoupling equipment right up to the point of distribution to the tuned circuits is an advantage brought about by underbase wiring, and, providing the bridging condensers are not of large dimensions, there is ample space for the most generous of feed circuits and voltage regulating components. This is particularly well revealed in the G.E.C. and Marconiphone sets, and the chassis interiors shown on the stands have been two of the outstanding exhibits of the Show.

Examination of the ganged condenser units reveals, hidden away, small parallel condensers used for
Wireless World

The Trend of Progress.

Bringing the circuit capacities up to a uniform value. They are used on wiring, voltage feeds and stray capacities thrown on to the circuits by the valves, in the tuned circuits are identical, and their purpose is merely that of compensating for what is considered inevitable differences in the stray capacities. It can be predicted, however, that the use of these trimmers which may have a limiting effect on the tuning range of the circuits will eventually go, and that all the stray capacities can be carefully determined and taken into account. It was good to see that no provision is made in these gang-controlled sets for slip ganging the moving plates, as this would mean that a correction at one end of the scale would be widely out at the other owing to the use of logarithmic scale plates. We know, however, that by displacing the plates of logarithmic condensers discrepancies in the inductance of the various circuits may be corrected. This is a contingency which one need not guard against. It is perhaps possible, therefore, that a reversion may be made to the use of the semicircular straight-line capacity plate where a small change of capacity can be compensated for by "un-ganging." Thus the small correcting difference of capacity will remain uniform across the scale, and the use of auxiliary trimmers will prove unnecessary. Uniform separation of stations across the tuning scale is of little importance when operating through a reduction gearing. Two forms of condenser drive are establishing themselves for this class of set. When the operating control is on the front of the set we find a positive cord drive to the indicating dial, as is the case in the Marconiphone receiver. Alternatively the condensers, which usually run along with their common spindle parallel to the front of the set, may be operated from the end, so that the control appears on the side of the cabinet, such as in the Geco and Regentone sets. This results in a particularly comfortable operating position. Mains equipment in sets of this class is found housed sometimes above and sometimes beneath the hollow base, or is built as a separate unit.

There is, perhaps, a decline this year in the number of three-valve sets. Their general construction is varied, and most of them follow the simple form of make-up, involving two tuning dials. Exceptions are the "threes" of Ferranti, McMichael and Ekco, in which we find gang tuning giving single-knob control. This is a marked development from last year when the three-valve receivers of each of these manufacturers were still designed for two-dial operation.

Mechanically, the McMichael set is unique. First, the wheel on the shaft of the condensers which provide for reduction gearing operates a travelling indicator by means of a cord running in a groove on its rim. The pointer travels horizontally across a scale, and indicates the wavelength calibration. Next, a piston-like device at the rear of the chassis is a pre-H.F. volume control operating by change of capacity in the aerial lead. The particular form of construction is adopted in order that calibration may hold good with change of the volume adjustment, and it is probably more, therefore, than merely a differential aerial condenser. In the Ekco three-valve receiver we find two important developments relating to manufactur- ing tendencies. In the first place, the entire chassis is an exceedingly well-finished moulding, and next the use of comparatively heavy pressed-out ironwork as a frame for the chassis. On its structural side this set can be taken as a fine example of a carefully tooled-out mass-production job which should give durable service. This year marks definitely the passing of the five-valve portable, and but a few examples remain, these being offered at very low prices, and therefore representing good value. In their place we find the single-screen grid stage, and maybe next year, if the portable persists, we shall find gang-controlled, two-screen grid sets following very much the principle of the four-valve mains sets which have been a feature of this Exhibition. A forerunner, however, is the Pye Twintriple, which with its single dial control and two H.F. stages is an outstanding example of a chassis-built portable.

Among the portables, in general, however, there is nothing radically new except, perhaps, the more extensive use of screening. Any portable is now supplied as a mains-operated set, for the reason that there are at least half a dozen combined H.T. and L.T. eliminators, such as R.I., Regentone, Ekco Junit, Atlas and Godwinex, which, being of the same overall dimensions as an H.T. battery, provide an easy conversion. All these units make use of the Westinghouse metal rectifier, and deliver charging current to the L.T. accumulator.

Under the heading of battery eliminators no novelty was to be found. Eliminators of modest output are mostly fitted with metal rectifiers, and the more generous models invariably use valves. This observation likewise applies to the eliminators in the sets, and where a generous power valve is fitted valve rectification is generally adopted, although there were exceptions. A.C. and D.C. mains units have, in certain cases, been developed by portable set manufacturers, as, for example, one of the sets of the Loud Speaker Company is arranged by means of an interchangeable unit to provide the complicated conversion from D.C. to A.C. mains operation.
NOWADAYS the loud speaker must be regarded not only as an accessory but also as a component, for it is incorporated permanently in many receivers and radio gramophones.

One of the most important developments since last year’s Show has been the marked increase in the number of moving-coil loud speakers with permanent field magnets. As the result of combined efforts on the part of the Sheffield steel makers and designers of loud speakers, permanent magnets this year have been placed on the same footing as mains-energised electro-magnets so far, as the flux density in the gap is concerned.

As evidence of the improvement achieved during the year, it is interesting to compare the magnets on the stand of Messrs. Swift, Levick and Sons, Ltd., with those exhibited by the same firm last year. By careful proportioning of the length and cross-section and by making use of soft-iron pole pieces, working flux densities of 6,000 to 8,500 lines per square centimetre are now obtained in a 1.5 mm. gap with 9 per cent. cobalt steel where only 3,500 to 6,500 was obtained before with 35 per cent. steel. In a 1 mm. gap, which is quite practicable with accurate centring, densities as high as 11,000 to 14,000 lines are possible.

Incidentally, it is gratifying to find that all makers of repute now give only the useful working flux density. Hitherto it was customary to take readings by removing the fluxmeter search coil from the gap and dividing the total flux density indicated by the area of the gap. The leakage fringe outside the gap was thus included and gave a spuriously high reading. Now the movement of the search coil is limited to the normal travel of the speech current coil in the complete loud speaker, so that the designer gets credit for any of the leakage lines which he may succeed in persuading to remain in the gap.

In the Ferranti “Magno Dynamic” loud speaker a 3in. movement of the fluxmeter coil indicates a flux density of 8,900 lines per square centimetre. The active portion of the pot is a 33 per cent. cobalt steel cylinder, soft iron being employed for the end plates and centre core. Experience has shown that a better flux density is obtained with this form of construction than with a centre core of cobalt steel cast integral with the outer shell. Specimens of the type of magnet finally adopted have been subjected to systematic maltreatment without producing any reduction in the flux density. Incidentally, a freer cone suspension has been adopted, and the bass resonance is now well below 50 cycles.

Another interesting unit is the new Celestion D.100 permanent magnet moving coil. The magnet consists of a 15 per cent. cobalt steel shell with mild steel end plates and centre core. The total flux is 120,000 lines, giving a working flux in the 0.05in. gap of over 8,000 lines. By making use of the well-known Celestion method of reinforcing it has been found possible to employ an unusually shallow angle for the cone without losing the requisite degree of stiffness for low note reproduction. The advantage of a shallow angle is that focusing of the high frequencies along the axis is reduced.

A system of tangential cords is used for centring the moving coil, and the cords are mounted on adjustable phosphor bronze springs which effectively prevent damage should the diaphragm exceed its normal travel under the influence of any shock.
The Trend of Progress.—

such as an atmospheric. The attachment of the magnet to the cone ring and spider has been so arranged that it is easily removable for cleaning the air gap without upsetting the adjustment.

Among cone loud speaker movements of the moving-iron type undoubtedly the most important development is the introduction of the "inductor" principle of construction. For some years past the balanced armature principle has remained unchallenged, and although superior to the older single-acting reed it is not entirely free from amplitude distortion. If it were practicable to employ a wide gap between the pole pieces the balanced armature movement would produce, for all intents and purposes, a differential change of flux, but the necessity for achieving a reasonable degree of sensitivity precludes the use of too wide a gap. A small gap not only results in amplitude distortion but requires a fairly considerable restoring force to hold the armature in a central position and prevent it from sticking to the pole faces on either side. Consequently, the armature system resonates—generally at a frequency in the middle or upper middle register. All these difficulties are overcome by the inductor principle of construction. In this the armature system moves in a plane parallel to the pole faces and cannot chatter, no matter how great the amplitude. For all normal displacements the total flux in the magnetic circuit remains constant; in other words, the movement is strictly differential. Further, the armature system is self-centring, and naturally takes up its normal position under the influence of the magnetic flux. Consequently, no mechanical restoring force is necessary, and the spring strips used to suspend the armature can be made extremely light (in practice about 0.008 in. thickness). In this way the mechanical resonance can be reduced to about 60 cycles.

The principle of operation is best explained by reference to the accompanying diagram. The armature system is suspended in the air gap between two magnets by vertical flat spring strips and is free to move in a horizontal plane parallel to the pole pieces. The movement transmitted to the apex of the cone is therefore linear, and does not contain a lateral component as is the case with many balanced armature movements. The laminated pole pieces of the permanent magnets are specially shaped to reduce leakage flux, and two diagonally opposite poles out of the four are surrounded by speech current coils connected in series. The pole faces are the same width as the armature bars, which are so spaced apart that their inside edges coincide with imaginary lines between the centres of opposing pole faces. With no current flowing through the coils, the magnetic flux, seeking to follow the path of least reluctance, tends to pull the armatures inwards towards one another; but, being linked together, the armature system takes up a position of equilibrium as shown at (a). A current flowing through the speech coils in the direction indicated at (b) produces an additional flux shown by the dotted arrow, which increases the total flux (indicated by thick arrows) between the left-hand pair of poles and reduces the flux between those on the right. The inward pull on the left-hand bar is thereby increased, while that on the right-hand bar is decreased, with the result that the system moves to the right and would take up a new position of equilibrium for a steady current. A fluctuating current produces cor-
The Trend of Progress.—

responding fluctuations in the movement of the armature system. Provided the overall movement does not exceed the width of the pole pieces or armature bars, it is obvious that the total area of overlap is constant. Hence, assuming that leakage is negligible in relation to the flux in the gap, the total flux remains constant and the magnetic system is truly differential. It follows that sensitivity can be improved by reducing the air gap to the limit dictated by manufacturing difficulties without affecting the characteristic in any way.

Obviously a steady current in the loud speaker windings would permanently displace the armature system, and it is therefore necessary to use a transformer or filter feed circuit for coupling to the anode circuit of the output valve. Following a push-pull amplifier, however, the transformer may be dispensed with. A centre tapping between the two coils is provided, and the two components of the anode current cancel each other as far as the armature is concerned, but tend to increase the field of the permanent magnet system.

Inductor loud speakers seem to be more sensitive to changes in the impedance of the output valves with which they are associated than those of the balanced armature type, and care in the choice of a suitable valve is essential if the full benefits of the new principle are to be derived. Under favourable conditions, however, the results are remarkably good—particularly in the bass, where the amplitudes developed justify comparison with loud speakers of the moving-coil type.

Two examples—the Lamplugh "Silver Ghost" and the G.E.C. "Inductor Dynamic"—are being manufactured in this country under the original Farrand patents. The Celestion D.50 also works on the inductor principle, though the method of construction is different. A single armature bar is situated between an arrangement of three pole pieces, and takes up a position of rest at the magnetic centre. The speech coils are mounted on adjacent pole pieces, and it is claimed that this gives an improved magnetic circuit. The armature is coupled to the apex of the cone through a stirrup, and lateral motion is restricted by a thin locating strip.

Gramophone pick-up design has advanced along the lines indicated by theory. Many manufacturers have redesigned their units with a lighter armature and freer damping, with the result that their products have in many cases risen from mediocrity to distinction. It is gratifying to note that yet another firm now publishes a measured
The Trend of Progress.—

of contact between the retaining spring and the needle, so that friction at this point is negligible. The pick-up coils are unusually large, and the laminated poles are designed to reduce magnetic leakage. The air gap is wider than usual, and this has two important consequences. The first is of fundamental importance, and is likely to be the sub-

ject of much controversy among pick-up designers. It is well known that frequencies below 250 on the average record are restricted in amplitude and require correction, also that the usual method of achieving this is to introduce amplitude distortion by closing up the air gap. The Celestion designers refuse to do this for the following reason. Imagine part of an orchestral record in which two notes are being played simultaneously, one of, say, 50 cycles, and the other 3,000 cycles. The 50-cycle note having the greater amplitude will bring the armature near to the pole pieces at the limits of its travel; but the armature is also carrying at all positions the smaller vibrations of 3,000 cycles. The latter will, therefore, produce a greater E.M.F. in the pick-up coils during the peaks of the 50-cycle note, when the armature is near the pole pieces, than during the passage of the armature through the zero position. In other words, 50-cycle variations of amplitude are superimposed on the 3,000-cycle note. For this reason amplitude distortion at the lower frequencies has been avoided, and the characteristic does not show the customary steep rise below 250 cycles. In the view of the Celestion engineers any correction for low-note loss should be made elsewhere than in the pick-up itself.

The second point concerns the impedance of the pick-up. A wide air gap cannot be used without sacrificing efficiency, and this must be made up by increasing the turns in the pick-up coils, resulting in a high-impedance winding. Now, high-impedance pick-ups are sensitive to loading, and the upper frequencies are easily lost unless tone-correction devices are intelligently applied. Further, volume-control potentiometers should have a total resistance of not less than 250,000 ohms.

The Edison Bell “Volume Control” pick-up is worthy of comment for the ingenious method of varying the general level of the output. The Harlie constant-speed synchronous induction motor.

permanent magnet is not attached to the pole pieces, but slides in guides and its position is adjusted by a quick-thread screw. This has the effect of varying the steady flux between the pole pieces, and so reduces the voltage developed without materially affecting the form of the characteristic.

Another pick-up of interest is the new Brown No. 4, which is entirely free from rubber damping and should retain its characteristics indefinitely. The armature, which is of small dimensions, is mounted on a thin spring strip which permits longitudinal as well as lateral movement. It is claimed that this tends to reduce needle scratch. Parasitic vibration of the suspension strip is damped out by two small lead pellets attached to the spring between the armature and the supporting posts.

The number of electric gramophone motors shows an increase, particularly in the inductor class. An interesting example is the Harlie constant-speed motor, which is of the synchronous type and does not require a governor. Variations in speed are effected by means of a variable V-pulley on the motor shaft, the drive being transmitted through an endless round rubber belt.

Interference from sparking at the commutator is overcome indirectly in the Henderson A.E.D. self-winding motor. The turntable is driven by clockwork, which is electrically wound in the intervals of playing. The application of scientific principles to the design of gramophone motors is exemplified in the Garrard range of motors. A new type of governor has been fitted as a result of work with constant-frequency records. This has inverted weights and overcomes all the many distinct types of speed fluctuation known to the gramophone motor manufacturer. The new Garrard induction motor is
The Trend of Progress.—
a beautiful piece of mechanism, the rotor having a laminated iron ring and poles cased in aluminium. The stator windings have series-parallel connections for 100-130 volts or 200-250 volts at 40 to 60 cycles. Maximum speed is reached in three revolutions from the time of switching on. The power absorbed is 17.6 watts at 200 volts, and 23.6 watts at 230 volts, while the temperature rise of the frame is only 12.5° C. after three hours' working. In the universal motors unusual attention has been given to the commutator design. A special locking ring is fitted which enables all the shellac to be squeezed out of the micanite separators under heat treatment, and loose segments are unknown. Special attention has been given to the bedding down of brushes, and a machine has been evolved for carrying out this operation. All armatures are dynamically balanced to eliminate vibration.

HAVE YOU VOTED?
See page 373.

Among components, one of the most important developments is the production of a variety of triple-gang condenser units, complete with built-in trimming condensers. Modern H.F. amplification requires very complete screening, not only of coils but of individual groups of condenser vanes. Consequently we find that the majority of gang condenser units are housed in partitioned screening boxes. Notable examples are to be found in the Formo ganged condenser, the J.B. "Chassimount"—which is extensible up to six sections—and the Polar "Tub" condenser with cast aluminium frame. Slow-motion devices consisting of cord- and chain-drive mechanisms are new adaptations of an old principle which give smooth control without backlash in the Cylcon drum dial and the Utility drum dial. The latter has a 2:1 reduction ratio, which is useful in operating filter circuits.

Paper-dielectric fixed condensers of the non-inductive type have frequently been advocated in this journal for by-passing in screen-grid H.F. circuits. It is gratifying to record that it is now unnecessary to look to foreign manufacturers for condensers of this type; a full range of capacities is now made in this country by T.C.C.

Intervalve transformers of the nickel-iron type were a feature of last year's show, and the "Permacore," "Ni-core," and "Hypermu," etc., are already well known. The useful properties of these special alloys have now been made use of in the construction of smoothing chokes and output chokes with great success. Not only does the nickel-iron core effect a considerable saving in the weight and dimensions of chokes for a given inductance and current-carrying capacity, but the reduction in the quantity of copper required for a given inductance results in a reduction of D.C. resistance, which is a factor of considerable importance in both anode and smoothing chokes.
THE valve manufacturers' objective this season is undoubtedly consistency of characteristic and improved performance rather than the addition of valves to the large number of types already existing. Progress in valve technique has outstripped the progress in application, and it is particularly interesting to see that the valve makers, especially the Marcon and Osram companies, are issuing catalogues with valuable hints on circuit design. We welcome the publication by these two companies of anode volts/anode current curves, without which it is almost impossible to make intelligent use of output valves. The Wireless World has consistently advocated this policy. It was shown in this journal just over a year ago that the anode-grid inter-electrode capacity of a screen-grid valve was almost its most important constant, but, with the exception of two firms, no information was available at that date. It is, therefore, pleasing to note that practically every valve manufacturer to-day includes this characteristic in his valve catalogue, and the calculation of maximum stage gain before instability sets in becomes possible.

It will be as well to examine typical valves now on the market for H.F. amplification, detection and power output—in that order.

This season's screen-grid valves not only have improved mutual conductances but all the A.C. and a number of the battery models have residual capacities of the same low order, namely, 0.001 µF to 0.004 µF. A point has now been reached when it can safely be said that so long as external screening is carried out with the greatest care the valve's internal screening is likely to prove perfect enough to prevent self-oscillation with coils of the highest efficiency. Stage gains of 200 or more—of laboratory interest a year or two ago—now become commonplace. The Cossor 215 S.G. and 220 S.G., sectional drawings of one of which were shown in the stand to stand report, are interesting new valves. The electrodes are mica-locked at top and bottom, and the grid is in the form of a box. The dielectric properties of the material used in the base of the valve are particularly good and the losses are negligible.

Another battery S.G. valve of which mention should be made is one manufactured by the pioneers of valves with low interelectrode capacity, namely, the Mazda 215 S.G. It has two screening grids in cascade and a mutual conductance of 1.1 mA per volt is maintained under working conditions. With regard to the indirectly heated type of screen-grid valve, the new Mullard S4VA and S4VB are worthy of particular note. These valves are low-impedance counterparts of the S4V, in which the residual capacity has been lowered to what appears to be the irreducible minimum of about 0.0025 µF. A test in The Wireless World laboratories showed that a stage gain of 400 to 500 was possible with the S4VA. The S4VB has a nominal A.C. resistance of 250,000 ohms and can be used in cases where the A.C. resistance of the S4V is too high. The Marconi and Osram M.S4 valve has a cross-meshed screening grid and a residual capacity of about 0.0025 µF. Last, but not least, we have an improved Mazda AC/SG. It will be remembered that this valve in its earlier form set the pace in efficient H.F. amplifier design.

Let us take stock of the conditions obtaining in a modern S.G. high-frequency amplifier. As with all other valves nothing of interest can be learnt from the conventional grid volts/anode current curves. Reference must be made to the less well-known anode volts/anode current curves now published, a typical example of which is given in Fig. 1. Every valve in a receiver has some impedance or load connected in its anode circuit which can be represented by a "load line" which traces the grid swing from zero grid volts to a value of grid potential which is twice the bias voltage. At the same time, the "line" must show the actual anode voltage and current reached during the working cycle. This method of investigating the dynamic characteristic is also
OCTOBER 1st, 1930.

The Trend of Progress.—

essential when calculating the amount of distortion and power output from a loud speaker of known impedance coupled to an output valve.

The load line in the case of a screened valve is the dynamic resistance of the inter-valve tuned circuit at resonance. If a plug-in coil of, say, 40,000 ohms dynamic resistance were used, the load line would be represented by AB in Fig. 1. In this case the A.C. resistance of the valve is maintained at its normal figure of about 200,000 ohms both at the end of the cycle representing maximum current (Imax) and at the mean operating point (O.P.). If now we replace the plug-in coil with a highly efficient inductance of about 250,000 ohms dynamic resistance, the load line is given by CD where the valve's A.C. resistance is normal at O.P., but drops to the comparatively low figure of about 30,000 ohms at Imax.

The importance of the A.C. resistance at Imax has already been pointed out in Experimental Wireless, and there is reason to believe that its low value in the circumstances mentioned provides at least a partial explanation of the inordinate lack of selectivity experienced when a "good" H.F. transformer of optimum ratio is used after a screen-grid valve. Another important point which emerges from load-line analysis is that the better the coil used the greater the inequality of the intercepts between equal grid voltage curves (see CD in Fig. 1). This means that as soon as we design the inter-valve circuit to have the lowest possible losses we at once reduce the available grid swing before rectification and cross modulation begin.

With the majority of S.G. valves on the market the safe input grid swing with a good anode coil is a small fraction of a volt.

In view of the foregoing, it would seem that progress in H.F. amplifier design will lie in the direction of using quite "poor" inter-valve coils to give a good input grid swing, to increase the number of stages and gang them, and at all costs to provide a volume control in the aerial input circuit to prevent cross-modulation. Furthermore, because of the input limitations of the S.G. valve, selectivity should not be relied upon after the first valve, but be obtained by pre-selection, preferably with a band pass filter.

With regard to new special detector valves, mention should be made of the Marconi and Osram H.2. The electrodes are sturdily supported, rendering the valve non-microphonic, and the A.C. resistance of 35,000 ohms suggests efficient leaky grid detection. The Cossor 210 Det. is a new detector, the electrode construction of which is illustrated here-with. By virtue of the five-point filament suspension it is entirely non-microphonic and the electrode disposition ensures a marked bend in the grid current curve. To The Wireless World readers the Mazda AC/HL and the Marconi and Osram MH4 and MHL4 will be particularly interesting, as they are recommended by their makers for power grid detection.

Indirectly heated valves have undergone great improvement. It is now possible to state with confidence that the bugbear of grid emission has vanished, and there is not any danger, at any rate, in the case of the Marconi and Osram valves of this series, in applying a difference of potential of 100 volts between emitter and heater. There are practically no new indirectly heated triodes, but last year's models all have higher mutual conductances.

To the large range of output valves have been added the remarkably efficient Mazda F.220A and the Marconi P.2—both 2-volt battery valves. The Marconi and Osram PX4 has been considerably improved, and there is a new Mullard output valve—the PM256A, capable of some 700 to 800 milliwatts undistorted output.

For raw A.C. filament supply the Mullard AC064, AC104 and AC044, with 4-volt 1 amp. directly heated filaments, form a new series in the output class. An indirectly heated filament is unnecessary where there is no subsequent amplification, and an "automatic" grid bias circuit can be more completely decoupled where emitter and heater are not separate.

And what of the pentode? This valve, soon after it was introduced, came to be regarded as a means of
An indirectly-heated pentode—the Mazda AQPEN.

Mazda 215 S.G. valve.

The Trend of Progress.

Economising in L.F. stages at the expense of quality. In portable sets, where the exigencies of space demand a small consumption of anode current, its comparatively large output for a small battery wattage is a valuable feature. The present exhibition reveals a great increase in the use of the pentode, not only because of its efficiency measured in terms of power output for a given input, but also because, in the light of a better knowledge of the valve's behaviour under working conditions, it can be shown that the quality of reproduction can be just as good as that of a triode. This is especially true with the larger pentodes for all-mains operation, which have lately found their way on to the market—such models as the Mullard PM.24A, PM.24B, Marconi and Osram PT.625, and the Mazda AC/PEN. These valves, when properly operated, have outputs between one and two watts—enough, with a moving-coil loud speaker, for a small hall, and more than enough for domestic purposes.

It has been brought to light during the last year that the average working impedance of the pentode is only a few thousand ohms; rather different from the makers' official figure of, say, 60,000 ohms! The load into which the pentode must work—that is, the speaker impedance—must not exceed 8,000 to 10,000 ohms. Unfortunately, directly a deviation from this condition is made the quality of music and speech rapidly becomes shrill, and high notes are over-pronounced. With a large degree of mismatching of speaker and valve will not give audible distortion.

It is because of this hitherto little understood property of the pentode that disappointing results have been sometimes obtained. If a moving-coil speaker with an impedance which remains constantly high over the frequency band is used, the results leave nothing to be desired. On the other hand, if a reed-driven cone speaker is employed in which the impedance usually rises rapidly with frequency, and in which the load at, say, 250 cycles has been designed to match that of a triode of 2,000 ohms, without a pentode of an impedance which is essentially lower there will be a distortion.

Furthermore, it has been shown that the anode of a pentode is that it lends itself well to the development of heavy-duty rectifiers, with exactly the properties of high efficiency and high overload capacity. The rectifiers of this type are invaluable, for they do not require the use of a transformer, and yet will not be ruined by the heavy overload capacity which they are able to develop.

The present exhibition reveals a great increase in the use of the pentode, not only because of its efficiency measured in terms of power output for a given input, but also because, in the light of a better knowledge of the valve's behaviour under working conditions, it can be shown that the quality of reproduction can be just as good as that of a triode. This is especially true with the larger pentodes for all-mains operation, which have lately found their way on to the market—such models as the Mullard PM.24A, PM.24B, Marconi and Osram PT.625, and the Mazda AC/PEN. These valves, when properly operated, have outputs between one and two watts—enough, with a moving-coil loud speaker, for a small hall, and more than enough for domestic purposes.

Provided consideration is given to these two points—and the added expense incurred by the necessary components is trifling—the power pentode will be found to give an exceedingly good account of itself, and certainly will give a greater number of milliwatts undistorted output per volt grid swing than any other valve. Owing to its sensitivity it must, of course, be used directly after the detector valve, without an intermediate L.F. amplifier and a volume control provided to prevent the peak grid swing exceeding the grid bias voltage. There is a brilliance of tone in pentode reproduction which is often in welcome contrast to the deep and 'boomy' reproduction of very low impedance triodes so often used with ill-matched speakers. Brilliance of pentode reproduction may be purposely introduced to compensate for loss of sidebands in an H.F. amplifier.

Another point in favour of the pentode is that it lends itself well to the use of a tone control. Those who are designing sets with this type of output and who are not too sure of the load that their speaker imposes, should watch the needle of the milliammeter placed in the anode circuit. If with the correct bias and H.T. voltage a strong signal causes the needle to flick upwards, there is second harmonic distortion, and a higher load impedance is required. A flick downwards, which is the more likely to occur, suggests the presence of a third harmonic component, and the impedance of the load must be reduced as already outlined.

The popularity of all-mains sets has led to the marketing of a number of new mains rectifying valves. An interesting newcomer is the Marconi and Osram UG.U. It differs from the vacuum type in that the bulb contains mercury vapour, which is ionised by the electrons emitted from a hot cathode, and thus the anode current is considerably increased. By this means the impedance is reduced and the voltage regulation greatly improved. This half-wave rectifier will give 4 amp., rectified current at nearly 1,000 volts, provided the H.T. is switched on about a minute after the filament. For such valves as the D.A.60 a heavy-duty rectifier of this type is invaluable.

The Marconi and Osram Uio has been added to the U5, U8, U9 range, and in the Mazda series we have a number of new full-wave rectifiers styled UU.120/250, UU2, and UU.30/250, which possess the advantage of having indirectly heated filaments, ensuring a good margin of overload capacity.
THE THEORY OF THE

SUPERHETERODYNE

by

A L M SOWERBY M.S.

There was once a time, now about five years since, when it was the ultimate ambition of every really keen wireless enthusiast to become the proud possessor of a "Superhet," which was regarded as the last word in luxury receivers.

The principle of this receiver was invented by the well-known American investigator Edwin H. Armstrong, but it must not on that account be confused with that other favourite of the early days of broadcasting, the "Armstrong Super." The latter has, as its unabbreviated title, "The Armstrong Super-regenerative Receiver," and generally used only one valve, whereas the one we are about to discuss was known, in extenso, as the "Armstrong Supersonic Heterodyne Receiver," and simply exuded valves from every pore. If a "superhet" contented itself with five or six valves one might with fair safety hazard the guess that some of them were doing double duty by being made to amplify at two frequencies simultaneously (reflex working); from seven to nine valves was the usual allowance, while the enthusiastic sometimes ran the total up to a round dozen.

The basic idea of the superheterodyne receiver is the exact opposite of that of every other kind of set. Normally, one tunes the high-frequency amplifier to fit the wavelength of the signals being received, readjusting all the tuning controls every time one passes from one station to another. With the superhet, the amplifier is set once and for all to one unchangeable wavelength, and the wavelength of the received signal is altered to suit the amplifier. Since one valve at least—and more usually two—must be provided for the sole purpose of effecting this wavelength change, the superhet must inevitably be a little extravagant in valves, although, with modern valves, six or seven would very comfortably provide long-range frame-aerial reception.

In the days when the superhet was highly popular, neither modern valves nor modern knowledge was available. As a result, amplification at high frequency was a very unsatisfactory business, for all attempts to obtain an appreciable stage gain on wavelengths below about 750 metres were thwarted by instability. On much longer wavelengths, from about 3,000 metres upwards, the difficulties were much less acute, and real amplification, approaching that which is usually obtained to-day on the broadcast wavelengths, was readily attainable. For receiving distant stations on a wavelength round about 300 metres there were only two possibilities: either one paid scrupulous attention to the aerial-earth system, and then used a plain det.-L.F. set with very critically adjusted reaction, or one used a superhet, changing the received signal from its original wavelength to a much longer one, which could be amplified effectively even with the imperfect apparatus of the time.

The steady improvement in valve characteristics and the appearance of the screen-grid valve, combined with the persistent attacks of innumerable investigators and experimenters upon the problems of high-frequency circuits, gradually made it possible to amplify signals at their original wavelength, so that the need for converting them into a long-wave signal became less imperative. The advantages of the superheterodyne receiver thus became of less and less importance, while its defects, which were many, became correspondingly more obvious. For the last three years or more the superhet has taken a back seat, for the excellent reason that almost equivalent sensitivity, with a much higher standard of quality in reproduction, could be attained with the expenditure of fewer valves by using straight high-frequency amplification of the signals on their original wavelength.

The reference just made to the defects of the superhet must not be taken to mean that these faults are in any way bound up with the principle of the receiver. The truth of the matter is that while straight high-frequency
The Theory of the Superheterodyne.

amplification advanced by leaps and bounds, the design of the superhet, owing to its waning popularity, received practically no attention at all. In the light of experience gained in other directions, it should now be possible to design a superhet which would be free from all the defects commonly attributed to receivers of its type.

Where the Superhet Principle Scores.

While the writer does not anticipate that the present type of receiver will need to be superseded for short-range work, he is inclined to think that for long-distance reception the superhet, in some form or other, will eventually return to its old position of dominance, though for quite new reasons. If this is so, it will be the demand for high quality, that is becoming almost daily more insistent, that will bring the superhet back into favour, for high quality, combined with high selectivity, can only be attained by the very free use of band-pass filters in a multi-stage amplifier. While it is comparatively easy to design and build such an amplifier for a superhet, where it has only to deal with a single wavelength, it has proved difficult to produce a compromise that will be really satisfactory when tuned over a wide range of wavelengths in a receiver of normal type. Moreover, difficulties of tuning limit the complexity permissible in a straight amplifier, whereas in a superhet, in which the amplifier is tuned once and for all when the set is built, even the most elaborately complex circuits can make no difference whatever to the ease of handling the completed receiver.

It has already been said that the difference between the superhet and all other receivers is that instead of adjusting the amplifier to suit the wavelength, the wavelength of the received signal is adjusted to suit the amplifier. This result is achieved by a feat of electrical jugglery carried out within the receiver itself, and since a very similar wavelength change is performed in a

simple one-valve set whenever it is allowed to oscillate, we will take this as a starting point in following out the changes that occur.

If some such circuit as that of Fig. 1, which represents a leaky-grid detector with reaction, is allowed to oscillate, there will be heard in the telephones certain noises with which almost every reader is familiar. When the tuning

is such that no station is being received, nothing but a slight hiss is heard, but as the tuning condenser is varied one hears a succession of whistles; beginning as very high notes, sinking down to below audibility, and then rising in pitch once more until the note be-

comes too high for the telephones to reproduce or the ear to hear. Each of these whistles, as everyone knows, stands for a station—one speaks, conveniently but quite erroneously, of "hearing the carrier waves," meaning that the whistles just described have been heard.

An Explanation of the Whistles.

The manner in which these whistles arise is indicated roughly in Fig. 2, in which is shown five sets of waves. The upper set, marked a, is intended to represent the waves generated by the oscillating valve in the receiver itself at some particular setting of the tuning dial; there are twenty complete oscillations shown in the diagram. The next row, labelled b, stands for the oscillations picked up from a transmitter and c is the sum of a and b; it represents the resulting voltage applied to the grid of the valve, while d represents the anode current of the valve, assuming it to be a nearly perfect grid rectifier. The resultant anode current is represented by e, ignoring fluctuations too rapid for telephones to follow. The curve thus shows the frequency of the beat note.

The manner in which these whistles arise is indicated roughly in Fig. 2, in which is shown five sets of waves. The upper set, marked a, is intended to represent the waves generated by the oscillating valve in the receiver itself at some particular setting of the tuning dial; there are twenty complete oscillations shown in the diagram. The next row, labelled b, stands for the oscillations picked up from a transmitter and c is the sum of a and b; it represents the resulting voltage applied to the grid of the valve, while d represents the anode current of the valve, assuming it to be a nearly perfect grid rectifier. The resultant anode current is represented by e, ignoring fluctuations too rapid for telephones to follow. The curve thus shows the frequency of the beat note.

The two sets of waves are arriving simultaneously at the grid of the detector valve shown in Fig. 1, so that at any instant the high-frequency voltage applied to this valve will be the sum of the voltages from the two sources. This sum is shown in the third row of waves, lettered c in Fig. 2. It will be noticed that a new periodicity has made its appearance through the addition of the two sets of waves; the high-frequency voltage

During the transmission of a signal, the two oscillations received arrive simultaneously at the grid of the detector valve, as shown in Fig. 1. The grid oscillations are increased in volume by the valve, the amplitude of the oscillations being proportional to the volume of the signal. The resulting voltage applied to the grid is shown in the second row of waves, labelled b. The anode current of the valve is represented by the curve e, referring to the diagram. As repairs take place, the grid is charged with a voltage the frequency of which is that of the beat note. The result is that the grid becomes charged at the same frequency as the beat note, and the anode current is correspondingly varied. As the grid is charged, the anode voltage drops slightly, and the valve is put into oscillation. The result of this is that the anode current is correspondingly varied, and the anode voltage drops slightly, and the valve is put into oscillation. The result of this is that the anode current is correspondingly varied, and the anode voltage drops slightly, and the valve is put into oscillation.

An Explanation of the Whistles.

The manner in which these whistles arise is indicated roughly in Fig. 2, in which is shown five sets of waves. The upper set, marked a, is intended to represent the waves generated by the oscillating valve in the receiver itself at some particular setting of the tuning dial; there are twenty complete oscillations shown in the diagram. The next row, labelled b, stands for the oscillations picked up from a transmitter and c is the sum of a and b; it represents the resulting voltage applied to the grid of the valve, while d represents the anode current of the valve, assuming it to be a nearly perfect grid rectifier. The resultant anode current is represented by e, ignoring fluctuations too rapid for telephones to follow. The curve thus shows the frequency of the beat note.

The two sets of waves are arriving simultaneously at the grid of the detector valve shown in Fig. 1, so that at any instant the high-frequency voltage applied to this valve will be the sum of the voltages from the two sources. This sum is shown in the third row of waves, lettered c in Fig. 2. It will be noticed that a new periodicity has made its appearance through the addition of the two sets of waves; the high-frequency voltage
The Theory of the Superheterodyne—
alternately dies away and then rises again to a maximum as the two original waves come in and out of step with one another.

If the valve were adjusted to act as an amplifier, the plate current would vary in exact sympathy with the voltage impressed on the grid, so that $c$ may also be taken to show the variations in plate current that would take place in these circumstances. It would vary rapidly at high frequency on either side of the mean value represented by the straight line, and, since the telephones could not possibly follow this variation, no sound would be heard.

We started, however, with the assumption that the valve was arranged to act as a leaky-grid rectifier. If this is the case, the anode current will no longer be a faithful copy of the voltage applied to the grid, but will follow some such course as that indicated at $d$, one-half of each high-frequency alteration being suppressed. The excursions made by the plate current will now all be on the same side of the steady value represented by the straight line, so that the mean plate current will vary at a rate much slower than that of the high-frequency oscillations. The dotted line drawn through the high-frequency waves shows this slower variation, which is repeated, with the high-frequency fluctuations omitted, in the curve marked $e$. This curve has a new frequency, entirely different from those of the original pair of high-frequency oscillations which gave rise to it. A moment’s examination of the figure will show that in the time in which the high-frequency oscillations $a$ and $b$ go respectively through twenty and twenty-two cycles, the final result-
The Theory of the Superheterodyne.

A local oscillator, there is deflection of the meter mA. If the source of the signals with which the oscillations of V₂ are beating is simply a local oscillator, there is nothing to be heard in the second pair of telephones T₂. But if the coil L is replaced by a frame aerial, and the local station is used as the incoming signal in place of a simple oscillating valve, then, when the meter mA. shows that the supersonic heterodyne note has been tuned in by suitable adjustment of C₂ and C₃, the programme is quite well heard in the telephones T₂, though the first pair T₁ make no sound at all.

The experiment shows that if one of the two original waves from which the beat note is compounded is modulated by speech or music, then this modulation is reproduced on the new wave formed by rectifying the mixed oscillations as already described. It follows that a second detector, as used in this experiment, is required to extract the programme from the long-wave beat-frequency delivered by the first valve. The output from this valve, hereafter to be called the "frequency-changer," is thus identical with an ordinary long-wave transmission as picked up by an aerial, and must be treated as such in all respects. It can therefore be heard with any receiver, from a simple crystal detector to the most ambitious multi-valve set, so long as this is tuned to the required long wavelength.

The whole box of tricks, consisting of a frequency-changer followed by a long-wave receiver, makes up the superheterodyne receiver we are discussing. Usually, the long-wave set that follows the frequency-changer is much more ambitious than a mere crystal detector; it consists usually of a long-wave amplifier, known as the intermediate-frequency amplifier, a detector (second detector), and a low-frequency amplifier. The whole is shown, in schematic form, in Fig. 4, which represents a complete "superhet." 

The Intermediate Frequency Amplifier.

The signals are picked up on the frame and passed on to the frequency-changer, which consists, as we have seen, of an oscillating detector valve or its equivalent. They emerge from this transformed to a new wavelength, and are amplified in this form by the intermediate-frequency amplifier to any extent that is deemed necessary. They then encounter the second detector, after which they are magnified by an audio-frequency amplifier of perfectly standard type until they can be passed on to the output valve and the loud speaker. There is no particular reason why the frequency-changer should not be preceded by a stage or two of ordinary high-frequency amplification if desired; with the magnification split up in this way between two different frequencies it would be possible to attain an overall magnification of several million times without risk of instability. This extra amplification is, however, not usually necessary.

The tuning of the intermediate-frequency amplifier in a practical receiver is not variable, as in the experimental circuit of Fig. 3, but is fixed permanently at some wavelength chosen by the designer of the set. Tuning is accomplished by so adjusting the frequency of the oscillations generated in the frequency-changer that the frequency difference between them and the signal to be received is equal to the frequency for which the intermediate amplifier is designed.

In addition to the local oscillator, it is necessary to have a detector valve to rectify the composite wave (c in Fig. 2) so that the new frequency (d and e in Fig. 2) can be extracted from it. If an attempt were made to utilise the simple circuit of Fig. 1, it would be found that when the grid circuit was tuned to the correct frequency for the local oscillation it would be detuned far enough from the signal being received to cause a very serious drop in strength. It is therefore necessary to provide two tuned circuits in place of the one of Fig. 1, tuning one to the signal and setting the other into oscillation at the frequency needed to provide the correct beat note. Sometimes the two circuits, tuned to different frequencies, are attached to the same valve, but it is preferable, unless it is specially necessary to economise in valves, to separate these two functions, using one valve as a detector and one as an oscillator. An arrangement of this kind, which is a typical frequency-changer, is shown in Fig. 5.

Choosing the Intermediate Frequency.

In designing a superhet one is at liberty to choose any value one likes for the intermediate frequency; it has been usual to work at about 100 kilocycles (3,000 metres) or thereabouts. Assuming this value, it becomes necessary to tune the oscillator to a frequency removed by 100 kc. from that of the signal being received, in order that the beat note may have the correct frequency. It is quite immaterial whether the oscillator is working at

---

1 When short waves are being received the percentage distuning is so small, especially if a low I.F. is used, that a single tuned circuit is perfectly satisfactory. See H. B. Dent, "Superheterodyne Short-wave Adaptor," The Wireless World, April 29th, 1930.
The Theory of the Superheterodyne.—

a higher or lower frequency than that of the signal. If the station to be received is working on 1,000 kc. (300 metres), then the required beat will be produced if the oscillator is tuned either to 900 or to 1,100 kc. (333 or 270 metres). Since both these frequencies will be within its tuning range, there will be two separate settings of the oscillator tuning condenser, either of which will bring in the 1,000 kc. station required. In the same way, there will be two alternative positions for every station.

This two-position effect has certain disadvantages, the most obvious being that one cannot be sure, from the reading of the oscillator tuning dial, what station is being received. A more serious drawback is found in the fact that when the oscillator is tuned to, say, 900 kc., it will provide the 100 kc. beat note required for the intermediate-frequency amplifier by interaction with either a signal of frequency 1,000 kc. or with one of frequency 800 kc. There is thus a strong tendency on the part of the receiver to tune in two stations at once, so that means have to be taken to sharpen up the tuning of the frame-aerial circuit to enable signals from one of these stations to reach the grid of the first detector to the complete exclusion of the other. Failure in this respect means that both stations will be heard together. For this reason, and not for the sake of extra amplification, which is more readily available in the intermediate-frequency amplifier, it has often been found desirable to precede the frequency-changer with a stage of tuned high-frequency amplification operating on the original wavelength of the signal.

There are many points of considerable interest and importance in connection with the design of the frequency-changer and of the long-wave receiver which follows it, while the question of the best choice of frequency for the intermediate amplifier opens up a number of rather fascinating possibilities. It is hoped to deal with some of the more outstanding points in later articles, to which the present contribution may be regarded as an introduction.

International Amateur Congress.

The International Amateur Congress held last July in Antwerp was attended by delegates from almost every European country. Mr. H. B. Old, G2VQ, represented the R.S.G.B. It was agreed that the authorities in their respective countries should be urgently requested to allow official delegates from among amateur transmitters to take part in future international radio conferences and that these amateurs should form a consultative committee under the presidency of Mr. K. B. Warner, the secretary of the I.A.R.U.

It was also proposed that further international amateur meetings should be held in 1931 at Rome or Milan; 1932 in Madrid; 1933 in London, and 1934 in Berlin.

Exclusive Amateur Wavebands.

The delegates also agreed that urgent requests should be made to the authorities that commercial stations should be forbidden to conduct tests on wavebands reserved exclusively for amateur use and that the 3.5 megacycle (85 metre) band should be included among those for amateurs only.

Calibration Stations.

The services of G5BR and G5YK in the transmission of calibrated wavelengths were cordially recognised, and it was proposed to establish similar stations in Berlin, Paris, and Budapest.

7 and 14 Megacycle Vagaries.

A correspondent in Eltham, sending us his experiences while listening for telephony on the 7 mC. waveband, writes that during the last two months the only time he has been able to receive British stations with any strength was between 09.00 and 12.00 B.S.T.; after this they became weaker, and, during the afternoon, he could only hear neighbouring stations in London. From 20.00 till 22.00 B.S.T. stations in Devon, Scotland, and on the Continent, would come in at about R9 signal strength, but fading was very bad, and after 23.00 B.S.T. he found it impossible to hear any telephony.

New Call-sights.

G2PW F. H. Walters, 5, Whitehorse St., London, E.I.
G2FC F. J. Clark, 83, Byegrove Rd., Colliers Wood, S.W.14. [Change of address.]
G2NU W. E. Nutson, 45, Richmond Rd., Gillingham, Kent.
G2NG N. E. Leigh, Tanglewood, Newton Hill, Wakefield. [Change of address.]
G2VP A. Smith, 12, Ferres Avenue, West Drayton, Middlesex. [Change of address.]
G2YW T. P. Allis, 60, Radnor Road, Belfast. [Change of address.]
Z2ZF L. Sanderson, 186, Croxted Rd., West Dulwich, S.E.21. [Change of address.]
Snain.

ST0HL and STWFT (Portable) (Ex ST0HJL), E. J. Hill, Wireless Section, 4th (B) Squadron, R.A.F., Khatton, working on 14 and 28 mC. wavebands between ground and aircraft, and will welcome reports.

AN ACTIVE AMATEUR STATION. G 6PP, owned and worked at 54, Purley Avenue, N.W.2, by Mr. M. W. Pippel, who was last year awarded the "Rotab" Cup, presented by the President of the R.S.G.B., which may be seen in the background. The 7mC. transmitter on the left uses the Hartley circuit with harmonic crystal control. Next to it is a small 14mC. T-P T-G transmitter with the O-V-2 receiver, employing the Reinartz circuit, on the right. The station has been in communication with 38 countries distributed over four continents. The input has never exceeded 5 watts.
December 21st, 1928.

**READERS’ PROBLEMS.**


The Service is subject to the rules of the Department, which are printed below: these must be strictly observed, in the interest of readers themselves. A selection of queries of general interest is dealt with below.

A Differential Volume Control.

My receiving set is situated in a rather remote part of the house, its position being determined by the necessity of having it as close as possible to the aerial lead-in, consequently my loud speaker is situated at some distance from the set. I usually listen to the local station, and have arranged my receiver so that the output voltage is working well within the limits of its maximum permissible grid swing, even on loud passages of music. However, I notice a distinct loss of quality, and it has occurred to me that this is due to the fact that when I apply the volume control I am altering the impedance in the plate circuit of the last valve. Is there any way of getting over this trouble, as it is obviously inconvenient to run to the distant receiver every time that I wish to diminish volume? T. P.

If, as we assume, you have arranged matters so that the relationship between your loud speaker impedance and the A.C. resistance of the output valve is correct, in accordance with the details given in an article in the May 28th issue of this journal, it is obvious that the method of volume control which you are using will alter that relationship, and quality will suffer accordingly. The difficulty can, however, be overcome in quite a simple manner. It must be remembered that for best results the external circuit impedance must be of such a value that maximum energy transfer from the output valve takes place at a frequency somewhere near middle C. The external circuit impedance in your case will not be made up by the loud speaker impedance alone, as the paralleled volume control resistance will exert a modifying effect. As this latter resistance is lowered in value in order to bring about a decrease in volume, the effective external circuit impedance will also be lowered. It is necessary, therefore, to arrange another resistance in such a manner that it compensates for this effect and so preserves the impedance in the external circuit at a more or less constant value. There are several ways of accomplishing this desirable end, but experiment has shown that the method of connection shown in Fig. 1 gives the best results. It will be noticed that the volume control is connected across the loud speaker in a manner similar to that of a potentiometer, the slider connecting to one output lead while the compensating resistance is in series with the other lead. Fortunately, special resistances of this type suitably mounted and of the correct value are now on the market. This method of volume control is by no means perfect, but results from it are greatly superior to those obtained by many of the usual arrangements.

**Coil Inductance.**

I have several well-made single-layer solenoid coils (taken from an obsolete solenoid) each with 60 turns of No. 26 D.S.C. wire, and a diameter of 2 in. Will you please tell me what is the approximate inductance value of these coils? If suitable it is proposed to use them for a filter circuit. Incidentally will you refer me to any published instructions for calculating the inductance of coils of this kind so that I may be able to estimate values myself in the future.

M. N. L.

You do not say what is the winding length of your coils; without this information it is impossible to make an accurate estimation of their inductance. However, assuming that adjacent turns are touching, it will be about 150 microhenrys—a low value for use in a filter circuit, but the coils should do fairly well.

Inductance is easily and accurately calculated with the help of the Abac which appeared in The Wireless World for November 25th, 1928. These Abacs have since been published in book form.

**Resistance and Impedance.**

I have been told that the figures for D.C. resistance usually given for loud speakers are approximately proportional to the inductance of the loud speaker, and can, therefore, be taken as a rough guide to this latter value. Can you confirm this? R. P. D.

This statement is likely to be misleading, with the exception that loud speakers of what is sometimes known as the 1 in./resistance class, merely those having a D.C. resistance of about 2,000 ohms have a much larger impedance than those of the low resistance or 120-ohms class. It is, however, possible to select a number of loud speakers all having approximately the same D.C. resistance which have a widely different impedance value at any given frequency.

If, on the other hand, you wish to control volume by a method of volume control which you are given in an article in the May 28th issue of this journal, it is obvious that the method of volume control which you are using will alter that relationship, and quality will suffer accordingly.

If the receiver does not already include an output transformer or choke filter, we suggest that the simplest way of using the phones with safety is to join them, with a fixed condenser of from 1 to 2 mfd. in each lead, across the primary winding of the L.F. transformer. If your receiver does not include one, very fair results can be obtained by similar connecting the phones across a coupling resistance, particularly if the resistance has not too high a value. It will hardly be necessary to add that the phones should be disconnected when the loud speaker is used.

**RULES.**

The free service of the WIRELESS WORLD Technical Information Department is only available to registered readers and subscribers. A registration form can be obtained on application to the publishers.

(1.) Every communication to the Information Department must bear the reader's registration number.

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

(3.) 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.

(4.) Designs or circuit diagrams for complete receivers or eliminators cannot be answered. Letters on this subject must be clearly stated.

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

(6.) Designs for components such as L.F. chokes, power transformers, complex coil assemblies, cannot be supplied.

(7.) Queries arising from the construction or operation of receivers must be confided to constructional sets described in "The Wireless World," to standard manufactured receivers; or "Hi-Fi" sets that are supplied in their original form and not embodying modifications.
UNDY
8-Pole Dynamic

THE GREAT SURPRISE
for
THE NEW SEASON.

A Chassis with 8-poles
better than you have as yet seen
and heard.

A Chassis which surpasses every-
thing known.

A tone rendering such as you
have not yet heard.

Visit your dealer to-day and ask
him to show you this marvel.

No harassing "tuning-in" and
absolutely true to nature in every
tone register.

If you wish to purchase an 8-pole Chassis, there is only

UNDY 8-POLE Dynamic.

A patent has been applied for in all civilised countries to cover the UNDY new 8-pole principle
(Patent application No. 11360/30).

RETAIL PRICES:

Chassis with Unit. 50/-
Cabinet No. 404, the finest Luxury Model - 90/-
Cabinet No. 404a, Mahogany highly polished - 70/-
Cabinet No. 410B, Mahogany polished - 55/-

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

Perfected Foolproof Radio.

Select your programme from the comfort of your armchair by merely pushing buttons.

Auto Radio Table Model, complete with Moving Coil Speaker and Control Box... £75

UNLIKE OTHER DEVICES OF THIS TYPE, THIS INSTRUMENT HAS A WIDE CONTINENTAL RANGE.

ELECTRICAL REPRODUCERS, LTD., 102, West Regent Street, GLASGOW, G.S.

DONOTONE

THE BEST LOUD SPEAKER

NEW IDEAL MODEL

FOR REAL RADIO ENJOYMENT

Price 6 GNS.

Diameter of Case, 18 inches; depth, 9 inches.

DEMONSTRATION'S DAILY.

THE DONOTONE (Regd.) LOUD SPEAKER


Phone: HOLBORN 6523.

INTERVALVE TRANSFORMER

SHOWN WITH SUCCESS AT OLYMPIA.

Read the "Wireless World" September 24 issue. We produce below an extract from what is printed regarding Parmeko.

"The products of this firm have always exhibited what can truly be described as sound radio practice. Their mains transformers and chokes, the range of which has been added to this season, still show the same high standard, as is evident from an inspection of their efficient voltage ratios and curves."

Wireless World.

With a Primary Inductance curve within 1% of 0.01 Henries through a range of 1 to 40 milliamps, we are able to say INTERVALVE TRANSFORMER is the market to touch our NEW PARMEKO!

Parmeko constant-inductance L.F. transformer.

PARTRIDGE & MEE LIMITED

26, Dover Street, LEICESTER

Phone: Leicester 22276.

74, New Oxford Street, LONDON, W.C.1

Phone: Museum 5070.

E BONITE PANELS

BECAUSE IT IS BRITISH MADE & RELIABLE.

LOOK FOR BECOL TRADEMARK.

Sole Manufacturers:


INSIST ON HAVING EBONITE PANELS
For Quality and Efficiency

The SELECTOR ELECTRIC '55'

Complete (A.C. only) £50 Gas, or £9 down and 12 monthly payments of £4. 10. 6.

The Selector '55' makes an instant appeal to the wireless enthusiast. Technicians will appreciate the ingenuity that is everywhere evident in studying the layout. Not an inch of space has been wasted, not a single component is out of place. The resulting 'balance' is in every way perfect, enabling full use to be made of the directional properties of the frame aerial.

Home and foreign stations are received without background. The regional stations can be separated with ease. Reproduction through the moving coil loud speaker embodied in the set is perfectly clear and undistorted. Control is very smooth and accurate, eliminating the need for fine adjustment of reaction. The Cabinet is of fine quality mahogany. See "Wireless World" report Sept. 10, 1930.

Quality Supreme


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

The SQUIRE SYLPHONE.

Manchester Radio Exhibition.
Stand No. 15, Gallery.

The new Squire Moving Coil Speaker; it incorporates laterally supported diaphragm with free edge—increased concentrated field—no field leakage—no air-damping—vibrationless moving coil—full efficiency over complete audio-frequency range and many other new scientific features. The maximum advance in quality of reproduction has been made in this speaker.

Ask your dealer to let you hear one.

FREDERICK SQUIRE, LTD.,
LESWIN PLACE, STOKE NEWINGTON, N.16
TELEPHONE: CLISSOLD 6334, M.C.6
ADVERTISEMENTS.

THE WIRELESS WORLD

OCTOBER 1ST, 1930.

ELECTRAD

TRUVOLT RESISTANCES

Truvolt wire wound variable potentiometers simplify the construction of H.T. Eliminators and positively do away with all guesswork. The resistance element is a nickel alloy wire.

There is no wire to rust or zinc to oxidise. Truvolt are air-cooled and give a positive and lasting service. All the units listed below are rated at 25 watts.

Electrad originated the Truvolt. Note these reduced prices and ensure that the units you buy have the name Electrad stamped upon them.

<table>
<thead>
<tr>
<th>Type</th>
<th>Resistance</th>
<th>Current</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.5</td>
<td>500</td>
<td>224</td>
<td>8/-</td>
</tr>
<tr>
<td>T.75</td>
<td>750</td>
<td>182</td>
<td>8/-</td>
</tr>
<tr>
<td>T.10</td>
<td>1,000</td>
<td>158</td>
<td>8/-</td>
</tr>
<tr>
<td>T.20</td>
<td>2,000</td>
<td>112</td>
<td>8/-</td>
</tr>
<tr>
<td>T.25</td>
<td>2,500</td>
<td>81</td>
<td>8/-</td>
</tr>
<tr>
<td>T.50</td>
<td>5,000</td>
<td>91</td>
<td>8/-</td>
</tr>
<tr>
<td>T.75</td>
<td>7,500</td>
<td>71</td>
<td>8/-</td>
</tr>
<tr>
<td>T.100</td>
<td>10,000</td>
<td>56</td>
<td>8/-</td>
</tr>
<tr>
<td>T.200</td>
<td>20,000</td>
<td>35</td>
<td>8/-</td>
</tr>
<tr>
<td>T.250</td>
<td>25,000</td>
<td>32</td>
<td>8/-</td>
</tr>
<tr>
<td>T.500</td>
<td>50,000</td>
<td>22.5</td>
<td>8/-</td>
</tr>
</tbody>
</table>

Write for the Electrad catalogue—it's free.

THE ROTHERMEL CORPORATION LTD.,
24, Maddox Street, London, W.1.

'Phone: MAYFAIR 0578/9.

Continental Sales Office:
27, QUAI DU COMMERCE, BRUSSELS, BELGIUM.

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

IDEAL FOR RADIOGRAMS

NO INTERFERENCE

if you fit a

PAILLARD

ELECTRIC INDUCTION MOTOR

No brushes or commutator to cause interference. No belt. The motor runs smoothly and silently, without variation in the revolution speed even with largely fluctuating mains current. 7½ volt-covered burnable, automatic brake and cut-out. For 100-330 and 200-250 v. 8. A.C. £17 5s. 6d.

£4/17/6 (without Unit Plate, £6/10/0).

Super Pickup and Arm, £2/16/6.

Portable Gramophone Cabinet fitted with Paillard Motor, Super Pickup and volume control, £8/15/0 complete.

APOLLO GRAMOPHONE CO., LTD.,
4-5, Bunhill Row, LONDON E.C.1.
MISCELLANEOUS ADVERTISEMENTS

NOTICES

THE CHARGE FOR ADVERTISEMENTS in these columns is 5s. 6d. per word or less, 10s. 0d. for every additional word.

Each paragraph charged separately and name and address must be quoted.

SECTIONS DISCOUNTS are allowed to Trade Advertisers as follows: 10¾% on 50 copies or more of the same advertisement; 15½% on 100 copies or more of the same advertisement.

ADVERTISEMENTS for these columns are accepted up to TUESDAY NOON (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Advertisements for these columns are accepted up to TUESDAY NOON (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Advertisers often receive so many answers to their enquiries are requested to make their replies concise. They are also requested to observe that a reply to an advertisement charge, which must include the amount of the charge where due, is payable in cash, unless the advertiser stipulates a minimum of 50% cash payable on part exchange until material is sent to us from all over the world, not being accepted. If a single item of a customer's property is ever been returned, rejected offers from Xmas list amount to only 3.

There is no charge for the first appearance of an advertisement, but the advertisement charge is fifty shillings for every time the advertisement is repeated from the same columns. The advertisement charge is wholly borne by the advertiser. The advertisement charge is wholly borne by the advertiser. When this is desired, the sum of 6d. to defray the cost of wires, although every care is taken to avoid mistakes.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

Wireless World," both parties are advised of its receipt.

If the money be deposited with "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

The terms which are printed at the end of each advertisement, unless accompanied by instructions to the contrary. The terms which are printed at the end of each advertisement, unless accompanied by instructions to the contrary. Advertisements in this section must be strictly prepaid.

If the money be deposited with "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.

To FIRST POST on THURSDAY MORNING (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 39, Hartfort Street, Coventry; Goldsmith Buildings, Navigation Street, Slough, 200, Devonshire, Manchester; 105, W. Vincent Street, Glasgow, G.2.

Readers who hesitate to send money to unknown persons, although every care is taken to avoid mistakes.

The address No. 000, c/o "The Wireless World," Hertford Navigation Street, Birmingham; 10, Sloane Street, S. W.1.
good news for wates meter users

now a universal meter.

the wates polyscope

an amazingly ingenious device which can be used in conjunction with any r i r meter and enables you to test for broken valve filament, insulation of condensers, short circuits, distortion. if valve is working to correct characteristics, whether circuit is complete and numerous other tests.

the wates test plug for valves.

makes the testing of valve consumption, filament faults, distortion and checking of the valves characteristics a simple and accurate operation. for 4 or 5-pin valves.

write for lists giving details of all tests you can make with these 3 master instruments.

the standard battery co.

(dept. w.w.)

194-188, шатсденbury avenue, london, w.2.

the wireless league

require additional engineers.

in connection with their personal technical service to full members, the wireless league require qualified engineers with practical experience, for part-time service, to call upon members in all parts of great britain and northern ireland, to give advice on wireless receivers. write, stating qualifications, experience, references, etc. to the technical secretary, wireless league, 15, greysrver crescent, london, s.w.l.

benjamin switches

push pull and rotary type. very compact. full particulars in our catalogue no. 1142. the benjamin electric ltd., tariff rd., tottenham, n.17.

mention of "the wireless world," when writing to advertisers, will ensure prompt attention.
There is no circuit so perfect that it cannot gain from the inclusion of Colvern Components. Build Colvern into your new receiver, use Colvern wherever you can — feel your set tighten up its performance — feel the power of its extended range — hear it take on added crispness of tuning. British craftsmanship and design have done this for you — ensuring you efficiency, reliability, pin-point accuracy — always.

The New Colvern Wire-Wound Variable Resistor is illustrated above. It has the outstanding advantage of smooth and silent operation. Sizes: 1,000, 2,500, 10,000, 25,000 and 50,000 ohms. Other values available for special requirements. Price £6.

ACCUMULATOR HIRE
DON'T Buy Dry Batteries, join our service; we keep you continuously supplied with fully charged sets... higher efficiency, lower cost, regular service, anywhere within 12 miles of Charing Cross, for less than the cost of a marketable dry battery. Nothing to buy, no deposit, payment on delivery or by quarterly subscriptions. If your dry battery habit has in use for one month or more we definitely guarantee that accumulation will give better and more extensive reception; we also give the same service with low tension accumulators. Write for separate terms, from the smallest portable size upward, over 15,000 satisfied users. Write or phone: London's largest, most efficient and complete wireless accumulator service, for their interesting booklet B2, post free. Radio Service (London), Ltd., 105, Torrington Av., Camden Rd., W.N. Phone: New 2025 (3 lines). [1466]

CHARGERS AND ELIMINATORS

ADVERTISEMENTS
OCTOBER 1ST, 1930.

Excellent Selectivity

PHILIPSON'S Safety H.T. Supply Units are Famous for Reliability and Silent Working. Our New Type Model B Is Now Famous for Value. For D.C. mains model D.C.4 gives 100v. at 15 m.a., D.C.5 gives 150v. at 20 m.a., D.C.6 gives 200v. at 35 m.a., D.C.7 gives 250v. at 50 m.a., D.C.8 gives 400v. at 25 m.a., D.C.9 gives 1,000v. at 25 m.a., D.C.10 gives 1,500v. at 25 m.a., D.C.11 gives 2,500v. at 0.5 m.a., D.C.12 gives 3,000v. at 0.5 m.a., D.C.13 gives 10,000v. at 0.1 m.a., D.C.14 gives 20,000v. at 0.01 m.a., D.C.15 gives 50,000v. at 0.001 m.a., D.C.16 gives 100,000v. at 0.001 m.a., for H.T. and L.T. transformers, for H.T. and L.T. chargers. Please write for list. [1477]

PHILIPSON'S Safety H.T. Supply Units are Guaranteed for 12 months; write for our booklet, "Radio Power." [1478]


CHESTER BROS.—All types of mains transformers and tappings, £311716; A.C.6, for 25 cycle mains, £5.00.; A.C.5, 120v. at 20 m.a., £3; A.C.4, 240v. at 20 m.a., £1.50; A.C.7, 120v. at 10 m.a., £1.50; A.C.8, 240v. at 10 m.a., £3.50; A.C.9, 120v. at 20 m.a., £2; A.C.10, 240v. at 10 m.a., £4.00.; for D.C. mains model D.C.1, 100v. at 0.5 m.a., £1.50; D.C.2, 100v. at 0.5 m.a., £2.25; D.C.3, 100v. at 0.5 m.a., £2.75; D.C.4, 200v. at 0.5 m.a., £4.00.; D.C.5, 120v. at 0.5 m.a., £2.50; D.C.6, 240v. at 0.5 m.a., £4.25; D.C.7, 200v. at 0.5 m.a., £4.75; D.C.8, 400v. at 0.5 m.a., £6.00.; D.C.9, 600v. at 0.5 m.a., £6.75; D.C.10, 1,000v. at 0.5 m.a., £10.00.; D.C.11, 1,500v. at 0.5 m.a., £15.00; D.C.12, 2,000v. at 0.5 m.a., £20.00.; D.C.13, 2,500v. at 0.5 m.a., £25.00; D.C.14, 3,000v. at 0.5 m.a., £30.00; D.C.15, 3,500v. at 0.5 m.a., £35.00; D.C.16, 4,000v. at 0.5 m.a., £40.00.; D.C.17, 4,500v. at 0.5 m.a., £45.00; D.C.18, 5,000v. at 0.5 m.a., £50.00. [1476]

CHESTER BROS.—Write for list. [1209]

SAVAGE'S Mains Transformers and Power Chokes. [1323]

SAVAGE'S New Foreign Listeners' Four Equipment. [1324]

SAVAGE'S New Prices — Again Make Them Famous for Reliability and Silent Working. [1325]

SAVAGE'S Mains Transformers for the New Westinghouse House Units; please write for list. [1326]

SAVAGE'S Mains Transformers for the New Westinghouse House Units; please write for list. [1327]

SAVAGE'S Mains Transformers — Transformer, N.F.L.4, 54.; smoothing choke, O.P.M., 20.; output choke, C.T., 20.; SAVAGE'S Mains Transformers, H.T., 500-6-500 volts, £3; 750 volts, £3.75; 1,000 volts, £4; 1,250 volts, £5; 1,500 volts, £6; 2,000 volts, £8; 3,000 volts, £10; 4,000 volts, £12; 5,000 volts, £15. SAVAGE'S Mains Transformers, V.T., 250-0-350 volts, £3; 500 volts, £5; 1,000 volts, £7; 2,000 volts, £10; 3,000 volts, £15; 4,000 volts, £20; 5,000 volts, £25; 6,000 volts, £30; 7,000 volts, £35; 8,000 volts, £40; 9,000 volts, £45; 10,000 volts, £50. [1328]

SAVAGE'S Mains Transformers, V.T., 250-0-350 volts, £3; 500 volts, £5; 1,000 volts, £7; 2,000 volts, £10; 3,000 volts, £15; 4,000 volts, £20; 5,000 volts, £25; 6,000 volts, £30; 7,000 volts, £35; 8,000 volts, £40; 9,000 volts, £45; 10,000 volts, £50. [1329]

SAVAGE'S Mains Transformers, V.T., 250-0-350 volts, £3; 500 volts, £5; 1,000 volts, £7; 2,000 volts, £10; 3,000 volts, £15; 4,000 volts, £20; 5,000 volts, £25; 6,000 volts, £30; 7,000 volts, £35; 8,000 volts, £40; 9,000 volts, £45; 10,000 volts, £50. [1330]

SAVAGE'S Mains Transformers, V.T., 250-0-350 volts, £3; 500 volts, £5; 1,000 volts, £7; 2,000 volts, £10; 3,000 volts, £15; 4,000 volts, £20; 5,000 volts, £25; 6,000 volts, £30; 7,000 volts, £35; 8,000 volts, £40; 9,000 volts, £45; 10,000 volts, £50. [1331]

SAVAGE'S Mains Transformers, V.T., 250-0-350 volts, £3; 500 volts, £5; 1,000 volts, £7; 2,000 volts, £10; 3,000 volts, £15; 4,000 volts, £20; 5,000 volts, £25; 6,000 volts, £30; 7,000 volts, £35; 8,000 volts, £40; 9,000 volts, £45; 10,000 volts, £50. [1332]
**Chargers and Eliminators,—Cont.**

**ZAMPA**, the cheapest, best and most silent eliminator on the market. 2 to 300 volts, for all types. 4/6.

**ZAMPA Power Rider, 120v.,** at 80 volts, with tapping, incorporating Westinghouse rectifiers; 4/6.

**ZAMPA Heavy Duty Rider, 200v.,** at 20 volts, with tapping, 6/6; sent on 7 days' approval against cash. Full particulars of these and other kits will be gladly forwarded on request.—Min Wireless Co., Market St., Wellington, Notts. (1238)

**Purchased** in Fron, one only.—Phillips dual battery charger, A.G., boxed, new spare valve and resistance lamp, changes up to 6 E.T. cells, 1 cell at 6 volts, and 120 volts R.T. at 600 milliamperes; cost £2 6s. 6d., will sell to first person sending 5/- to Thomas Wireless Engineer, 50, Colwyn Road, Northampton. (1213)

**CABINETS.**

**CABINETS to your own requirements; quotations by return.**—Hammond, 1, Stratford St., Nuneaton. (1244)

**High's Cabinets—Table models in solid oak and rosewood, £1 15s. 6d. F.O. 15s. 6d. F.O.**

**High's Cabinets—Rifted with Radion or Resonator valves if required.**

**High's Cabinets—Industrial model, with separate battery compartments; from £5 15s. 6d. to £3 15s. 6d.**

**High's Cabinets Made to Customers' Own Designs.**

**High's Cabinets—Write for new 16-page art catalogue—F. Jagod, The Hook, Haydock Ed., 3/2.**

**Iphone—Ralphon 6/6.**

**BEAUTIFUL Portable Cabinets, fancy wood and finish; none inferior, choice of 600, 250 volt, and twin portable units, 6/6.**

**Appley 12, Morns Avenue, W.11.**

**Phone Museum 2047.**

**CABINETS for all Requirements.—F. W. Ramsay, 73, Shelleygate St., London, N. I.**

**CABINETS, SIFAM Pocket Volmeter—£5 15s. 6d.**

If any difficulty write to: SIFAM ELECTRICAL INSTRUMENT Co. Ltd., BUSH HOUSE, ALDWICH, LONDON, W.C. 2

---

**The "Wireless World"**

**BAND PASS—Three—SCREENING BOX**

- 6½ inches square in Aluminium. Absolutely electrically sound and air tight sections.

**4/- RETAIL**

Trade enquiries solicited.

YATES SUTTON LTD
38-42, York Street, LEICESTER.

---

**The Wireless World**

**October 1st, 1930.**

**EXACT TUNERS**

25 to 9,000 meters. No further coils are required, tuning as simple as A.B.C., see "Wireless World." January 25th: "We can strongly recommend these tuners." Send postcard for particulars to Mr. Walmsley to THE EXACT MANUFACTURING CO., Graft Works, Priory Place, COVENTRY.

---

**Metal Cabinets**

For D.C. in Polished Oak and to specification, complete with Aluminium Screening Boxes and Base Plate. **Price £3 7s. 6d.**

**WINGROVE & ROGERS, Ltd.,** 18, Wellington Rd., Birkenhead.

---

**Polar**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**CABINETS**

For C.D. in Polished Oak and to specification, complete with Aluminium Screening Boxes and Base Plate. **Price £3 7s. 6d.**

**RIGBY & WOOLFENDEN, ROCHDALE**

---

**BONA FIDE TRADERS' GUIDE.**

Send for our comprehensive Illustrated List.

**THE QUALITY HOUSE.**

**PERSEUS MFG. CO., LTD. (Dept. W.W.).**

**BRANSTONE RD., BURTON-ON-TRENT.**

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**W. H. PARKER, Sheetmetal Workers, Back Autumn Terrace, LEEDS.**

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.

**WINGROVE & ROGERS, Ltd.,** 188-9, Strand, London, W.C. 2

---

**Metal Cabinets**

For all Wireless World sets from 22/6. Aluminium screening boxes, all sizes, to order. Standard size from stock, 8x5x3½, price 4½ each.

**POLAR**

The widest and finest range of British made CONDENSERS.
Standard Model £5. 10. 0.

THE ARISTOCRAT OF LOUD SPEAKERS

The best Speaker that brains and skill can produce. Luxury in its realism and luxury in the craftsmanship of its exquisite cabinet. A Speaker that gives a living interpretation of the light and shade of every sound. A Speaker that you will be proud to invite your friends to see and hear.

A Speaker that costs no more than others. Models from £5. 10. 0 to £15. 0. 0.

Your local Bel-Canto dealer can demonstrate it on your own set at home. Illustrated booklet of all Speaker models, CONSTRUCTORS’ KITS and the Bel-Canto Radiograms on request.

Established 1926.

DIRECTOR OF SALES,
BEL-CANTO RADO LTD.,
Worple Way, The Vale,
Acton, W.3.
Telephone: Shepherd's Bush 1663.

BEL-CANTO
REALISM IN RADIO

LOUD-SPEAKERS.

EPICH Moving Coil Speakers.

EPICH—Everybody who heard the Model 99 agreed with the "Sunday Times" that it was the finest Speaker in Olympia.

EPICH—Everybody who heard—who didn't agreed with the London "Evening News" that the Super Cinema Model was truly named.

EPICH—But those who managed to hear the new Model 101 (Domino) under fair working conditions will never forget it.

EPICH—They will never rest until one of these Speakers is on their sets.

EPICH—The new 101 (Domin) Model.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domin).

EPICH—The new 101 (Domin).

EPICH—The greatest advance in the history of energised Moving Coil Speakers.

EPICH—The new 101 cannot be inadequately described.

EPICH—All standards of quality reproduction must be revisited.

EPICH—Never before has such clarity been achieved.

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—These contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—Never before has such clarity been achieved.

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.

EPICH—The new 101 (Domino).

EPICH—The new 101 (Domino).

EPICH—They will never rest until one

EPICH—Never before has such sensitivity and power been obtained in a Home model.

EPICH Model 101 — The speaker of no comparison.

EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPICH—First and foremost the Cabinet Models C12, C13 and C14, prices complete from £5/10/6.

EPICH—They contain very powerful permanent magnet Moving Coil Speakers.

EPICH—They are not just units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPICH—No shrillness; no box resonance, but clear, sharp, marvellous reproduction.

EPICH—Magnificent woodwork; very compact.

EPICH—They cost less than some makes of inferior units without cabinets.

EPICH—Permanent Magnet Moving Coil Speaker Units for portables; £3/15; ready for use.

EPICH—Standard Cross Magnet Permanent Magnet Speaker, price £4/4; the Linen of its kind.
**WIRELESS IN EVERY ROOM**

Lotus Remote Controls allow perfect reception in any number of rooms simultaneously and, without interference, from one set. Models for Sets using Batteries or H.T. Eliminators, and for All Mains Sets.

Prices from 30/6 to 47/6

From all Radio Dealers.

---

**THE WIRELESS WORLD**

**WIRELESS**

**ROOK!**

**IN EVERY**

**GARNETT,**

**44**

**Complete Speakers from**

**TURNER & CO.**

Mains Sets.

**H.T. Eliminators, and for**

**of rooms choice.**

This Unit is your obvious

in the highest class for

World's " technical staff,

Units

On test against 30 other

TAKE THE ADVICE of the EXPERTS

On test against 30 other Units by "Wireless World's" technical staff, the Tunewell was placed in the highest class for quality of reproduction.

This Unit is your obvious choice.

22/6.

Complete Speakers from 28/6 to 63/6.

Write for list.

**TURNER & CO.**

54, Station Road, New Southgate, N.11

---

**LETTERS TO THE EDITOR**

**Valves and Valving**

I have an old 8 valve set, the valves being: 41a; 42a; 43a; 44a; 55a; 9a; and 14a. What are the service qualities of these valves, and how are they used in the set? Do they require any special care or treatment? Please answer this question in a timely manner.

**SPECIAL OFFER**

**WONDERFUL RETURNS!**

34 Replies!

This extract from a letter recently received further proof of the advertising value of "The Wireless World".

"We feel we ought to write you of the wonderful returns from our small advertisements in 'The Wireless World.' Recently from a small advertisement in your paper we received thirty-five replies. From another publication we received seven replies."


---

**THE MOTORCYCLE**

**The Motorcyclist's Newspaper**

**EVERY THURSDAY — 3d**


---
THE WIRELESS WORLD  
October 1st, 1930.

**SENSITIVE MICROPHONES**

Latest Improved Designs.

For RADIO BROADCASTING, PUBLIC ADDRESS, and SPEECH-MUSIC TRANSMISSION to ANY DISTANCE.

All Descriptive Lists Free.

**"COMPACTUM" MICROPHONE COUPLER.**

For DEAF AIDS, Deaf telephones, Loudspeaking TELEPHONE, CRYSTAL AMPLIFIER, EXPERIMENTS, etc.

Components, Etc., for Sale.—Contrl Regentone Eliminator, W.22, £2 15/—; Ferranti A.F.6, 20/-; Polar condensers, 0.005 mfd. drums, 9/—; L15, Southwood Hill, Ilford, E. S. [1930] EXACTLY as New, Ferranti A.F.5, 18/6; Watson 3011 microphone, £2 10/—; L16, London, 37/10, pick-up and tone arm, 25; H.T. salary converter, 15/-; 500-600 m.A. cond. 45/-, L16, 13/6; Mandel 30.215, 12/6; 1'm spark coil, 5/-; 4 days approval, tens. one 1.—Matheison, 10 Tiber Ave., Chelmsford. [1937]

**WEIGHTHOUSE** Rectifier, style A.5, 15/-; 2 Var E.P. phones, 15. each, after 5 p.m.—H. R. Brandish, "My Lodge" St. Faith's Rd., West Dulwich. [1938]

**FERRANTI** Triode Couple, £20/0/-; Microphone, inclusive plugs for the Microphone cord (set).

By fixing a Stand Microphone on top of the "COMPACTUM" Coupler, it is only necessary to connect one pair of plugs of the "COMPACTUM" Coupler to a good Microphone and the other pair to the Pick-up terminals of the Amplifier (or Wireless Set) in order to broadcast Announcements right away.

For advertising in The Wireless World—writ to the Advertising Manager, 9th Floor, 89 SELHURST ROAD, S. NORWOOD, S.E.25. 

**THE WIRELESS WORLD**

Advertisements.

**BAKER'S SUPER-POWER A.C. MODEL.**

These two models have been accepted as the most realistic and perfect reproducers of speech and music at OLYMPIA—Hear them yourself once and be convinced—

For RADIO BROADCASTING, PUBLIC ADDRESS, and SPEECH-MUSIC TRANSMISSION to ANY DISTANCE.

**"COMPACTUM" MICROPHONE COUPLER.**

For DEAF AIDS, Deaf telephones, Loudspeaking TELEPHONE, CRYSTAL AMPLIFIER, EXPERIMENTS, etc.

For RADIO BROADCASTING, PUBLIC ADDRESS, and SPEECH-MUSIC TRANSMISSION to ANY DISTANCE.

All Descriptive Lists Free.

Size of polished Mahogany box 4½ × 4 × 3½ inches.

For broadcasting Speech and Music, and for making Announcements by Microphone through Loudspeaking telephone, CRYSTAL AMPLIFIER, EXPERIMENTS, etc.

If a Valve Amplifier or a Wireless Set is provided with connections for a Coupler Microphone Pick-up, it is only necessary to connect one pair of plugs of the "COMPACTUM" Coupler to a good Microphone and the other pair to the Pick-up terminals of the Amplifier (or Wireless Set) in order to broadcast Announcements right away.

By fixing a Stand Microphone on top of the "COMPACTUM" Coupler, an excellent self-contained SPEECH AND MUSIC RELAY is obtained.

The "COMPACTUM" Coupler comprises a Microphone Transformer, a Volume Control, a small toggle switch, and a standard "Ever-Rady" battery of about 600 working hours. If desired, a Volt Accumulator can be placed in the box instead of the dry battery.

Price, complete for immediate use with any good Carbon Microphone, inclusive plugs for the Microphone cord and for connections to Amplifier (or Wireless Set)


Phone: Museum 5258.
THE WIRELESS WORLD
October 1st, 1930.

REPAIRS.

SCOTT SESSIONS and Co., Great Britain's radio doctors; read advertisement under Macdonald column.

GUARANTEED REPAIRS by Experts.—Loudspeakers, telephone, speakers, pick-ups, any type, re-wound, re-manufactured, and adjusted post free to 4/-; transmitters, from 50/ to £1.0.0;—Howell, Earlsfield, Middlesex. [5036]

LOUDSPEAKERS, speakers, pick-ups repaired by experts, re-wound and overhauled for 4/-.—Watts, 1, Daniel's Terrace, Upper Compton, Plymouth. [5136]

YOUR Transformer Recomposed or Replaced & Turned Promptly: 3/-, post free to James, 160, Bute Road, Southport. [5160]

EXCHANGE.

WE WILL Accept Your Surplus Apparatus (making a high average over the payment for any new apparatus); your enquiry will be dealt with promptly.—Boslock and Sonnini, 1, Westminster Yard, S.W.1. [5246]

6 V. M.O. Speaker, 5-64/-, for pick-up; sell 30/-.—Woodley, 6, Addercombe Av., Croydon. [5056]

SNAPPY Part Exchange Bureau; send list of your goods, stating new requirements, for our quotation.—9, Blue Bell Mansions, W.6. [5052]

PERRANT S.A.I., Chiswick, 230, 50 cycles, quite new, for Parliament House in 200, for constructing chassis and cash adjustment, 72, Crown St., Rochdale. [5746]

TUITION.

INSTRUCTION in Morse, day or evenings; also, kymo—Telegraph School, 22, Tailord Road, Pim- ham, S.E.2. [5575]

CORRESPONDENCE Courses of Instruction in Wireless.—Write for free particulars to the Correspondence Dept., Young's, 90, Euston Road, London, N.W.1. [5553]

SITUATIONS VACANT.

EARN Big Money in the Wireless Trade! Become a trained salesman and radio expert. A short training enables you to qualify for a really big job with good salary, enabling in an introduction to prospective employers. Write P.O. box 7625, c/o The Wireless World, for forty-seven special weeks' course of instruction in the evenings, commencing August 1st.—Dept. T.C.O., The London Telephone Training College Ltd., More House, Earl's Court, S.W.3. [5446]

EXCEPTIONAL Opportunity for Ambitious, capable man with knowledge of import, export and world’s trading markets; electrical, radio and component experience essential.—Kingston district.—Write Box 7570, c/o The Wireless World. [5552]

WANTED, wireless electrician, with some knowledge of car equipment and magnetism, state experience and wage.—Skinner, Ilford. [5573]

RADIO and Gramophone Salesman Wanted for New Shop in Kent, for writing, selling, experience and wages required.—Box 7614, c/o The Wireless World. [5558]

LABORATORY (amplifiers, etc.) in N.W. London for three years; make arrangements for construction and Wiring of Experimental Apparatus; must be quick and neat worker with knowledge of wireless circuits, starting wages, 3/—/week.—Box 7547, c/o The Wireless World. [5544]

WORKS Manager for Works in Birmingham, with experience of mass production in electrical and wireless apparatus; state experience and wages required.—Box 7619, c/o The Wireless World. [5538]

EXPERIENCE in Eliminator dealing with currents quite.*—Box 7625, c/o The Wireless World. [5556]

YOUNG'S

(Glasgow) Ltd., 48, Stockwell St., Glasgow.

MAHOGANY RADIO GRAMOPHONE CABINET.

Hand French polished, piano finish.

Will take gramophone, any set up to 10", 12", and loudspeaker and battery compartment 18" high, 22" wide and 16" deep.

Delivered free England and Wales.

Suggested Wholesalers:


POWER CHOKES guaranteed for twelve months substantially built, for smoothing circuits in eliminators dealing with currents 100 to 300 milliamperes, indentation 30 to 60 hours.

8/6 post free.

Note change of address

all manufacturers' goods

advertised in "Wireless World" can be obtained by post from Young's.

All goods guaranteed. State a description of your requirements today and pay the postman.

YOUNG'S

(Glasgow) Ltd., 48, Stockwell St., Glasgow.

THE IDEAL RADIO-GRAMOPHONE CABINET.

In Oak, Mahogany or Walnut. With change boxes for up to 4 boxes. Height 45", width 36", depth 19". Also 8", 12", and 16" sizes. Complete fitted with Electric Motor switchable for A.C. or D.C. 0 to 250 volts, with 18" interchange, finish. Further information on request. Ready to receive your radio set. Easily fitted. P.O. Box 755, Garratt Lane, Tooting, London, S.W.17.

M. W. MORRIS (Cabinets), 1, Kingsley Road, Hounslow, Middx.

Telephone: Hounslow 655.

Price Complete in Oak, £12.

M. W. MORRIS (Cabinets), 1, Kingsley Road, Hounslow, Middx.

THE WIRELESS WORLD.

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

A14
THE DIX-ONEMETER
It has Two Clear Scales with Mirror for Accurate Reading: only 6 Terminals, but 50 Ranges.

NOW ONLY
50/-
A remarkably low price for a meter worth £10

M I C R O P H O N E S

NEW CLIX LINES
No. 25. Resilient Socket. Black, insulated, for thin panels. Flux mounting 2d.

NEW CLIX LINES
No. 26. Resilient Socket. Insulated. For use with metal, or any type of panel. Red or Black 2d.

WIRELESS & ELECTRICAL Purposes.

Coil Formers

Radio Panels

Concordia Electric Wire Co. Ltd.

The N & K Inductor

LOUD SPEAKER

The performance is remarkable for the unusual output in the bass...... The general effect is perhaps the closest approximation to that of the moving coil that has yet been achieved with a moving iron armature.

—Wireless World Test Report, July 30th

IENCE FOR WIRELESS

As supplied to the Leading Telephone Apparatus Manufacturers.

FLEXIBLE & INSTRUMENT CORDS

of all types.

Connectite Wire

New Sawley, Nr. Nottingham.

MANCHESTER RADIO EXHIBITION, CITY HALL, DEANSGATE, OCT. 8TH TO OCT. 18TH, 1930.

LECTRO LINX, LTD., 254 VAUXHALL BRIDGE ROAD, S.W.1

CONRAD WIRE & CABLE CO.

Toronto, Toronto, Canada


DARWINS LIMITED, FITZWILLIAM WORKS, SHEFFIELD.


COBALT STEEL

Unrivalled for all WIRELESS & ELECTRICAL Purposes.

Write to Magnet Dept. for Latest Catalogue.

G unearthed steel

MAGNETS

Your opportunity — See Redfern’s

Cobalt Steel

The Perfect Loud Speaker

A. BRODERSEN

11, Redwood Road, London, N.3.

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

Accumulators Elite ........................................ 48
Adolph, Fred ................................................. 47
Apollo Grammophonos Co., Ltd. ......................... 38
Appleby, E. Hestavington ................................ 37
Automatic Coil Winder and Electrical Equipment Co., Ltd. ......................................................... 5
Baker's "Selhurst" Radio .................................... 45
Baynes, W. ...................................................... 33
Bel Canto Radio, Ltd .......................................... 12
Benjamin Electric, Ltd. 20, 40, 42 ...................... 41
British Blue Spot Co. Ltd. .................................. 27
British Columbia Music Co. Ltd. ......................... 38
British Thomson-Houston Co. ............................ 21
Brodersen, A. ................................................. 47
Brownie Wireless Co. (Great Britain), Ltd. .......... 46
Bulgin, A. F., Ltd ............................................ 40
Brown Wireless Co. (Great Britain), Ltd. ........... 40
Burton, C. F. & H. ........................................... 13
Burton Bros. ................................................... 29
Colburn, Ltd .................................................... 41
Colcvern, Ltd .................................................. 47
Conservatory Electric Wire Co., Ltd. .................. 37
Cossor, Ltd. ................................................... 57
Coxeter, C. .................................................... 57
Crampton, F. ................................................... 46
Dablander Condensers (1925) Ltd. ....................... 14
Dyson, J. & Co. Ltd .......................................... 38
Edison Swan Electric Co., Ltd. .......................... 12
Electronic Radio .............................................. 36
Electronic Reproducers, Ltd .............................. 36
Ezra, Mannig Co. .............................................. 18

Buy on Deferred Terms —

Britain's Best Battery with the Unique Semi-Oil Submerged Feature. Absolutely Thousands prevent surface leakage DOUBLE CAPACITY TYPE, 40 volt, 30 amp. hours or 10/- deposit

From your Dealer or these London Distributors — CECIL POHLMAN, 77, Great Portland Street, LONDON, W.1.

Accumulators Elite, Hebble Mill, Saltershebble, HALIFAX. Telephone: 4304.

See this Unique Unit at the Manchester Radio Exhibition on

STAND No. 8. MOORES & CO.

Here is the speaker unit that will bring joy to thousands! Small in size—yet

volume has not been sacrificed. Its compactness and its powerful yet sweet tone make it the IDEAL UNIT for the

PORTABLE SET user. As an example of sterling value and quality it

stands head and shoulders above anything else in its class.

GIVE ONE A TRIAL—THAT'S ALL WE ASK.

The Sheffield Magnet

THE SHEFFIELD MAGNET

From your Dealer or Direct

THE SHEFFIELD MAGNET

Co., Broad Lane, SHEFFIELD.
BAYLISS TRANSFORMERS, CHOKES, Etc.

FOR THE MAINS

The illustrations show a few of our various types of Electrical equipment.

We manufacture Transformers up to 130,000 Volts, oil insulated, for Testing purposes, pressure testing outfits, self-contained apparatus for testing overhead porcelain insulators, etc., general Testing Transformers for the Electrical Trade, Converters, Generators, etc., to 10 K.V.A., all types of smoothing chokes, reactances, etc. Oil and air insulated. Converting equipment for operating Radio receiving sets as distinct from Audio amplifiers only, and Rotary Converters for operating from low voltage storage batteries. Test sheets, etc., are issued with each component where required, indicating its performance under final test, which are guaranteed. Our Technical Dept. will be pleased to advise and give assistance where possible to retailers, service agents and others who care to avail themselves of this.

We invite members of the Trade to our Audition room at any time, where we can demonstrate and show our products, and give useful information and help where required.

WILLIAM BAYLISS LTD.
Contractors to the Admiralty, War Office, Colonial Governments, etc.
Sheepcote Street, BIRMINGHAM

Telephone: Mid. 1409
Telegram: "Drawbench, B'ham."

London Agents: A. F. BULGIN & CO., Ltd., 9-11, Cursitor St., Chancery Lane, LONDON, E.C.4
Telephone No.: Holborn 2072.

BAYLISS ROTARY CONVERTERS
(D.C. to A.C.) for Radio & Gramophone Equipment

(d) Small power Transformer where somewhat larger outputs are required than our smallest type (b). Prices from 35/- each.

(e) A larger size Transformer than (d) with a capacity suitable for Power amplifiers, etc., requiring anode voltages up to 500 at 200-250 M.A., with corresponding L.T. range. Prices from £5 5s. Od. each.

(f) B. Type Rotary Converter, maximum rating 400 watts, designed for operating Audio frequency amplifiers and general purposes. Price £12 10s. Od.
These battery-heated 5-electrode output valves are intended primarily for use in the last stage of receivers having no other low frequency stage.

The five-electrode characteristic results in a very high degree of amplification, while their A.C. output is comparable with that of a three-electrode valve of the usual "super-power" class, so that, given a reasonable signal voltage from the detector stage, they will supply all the volume required for normal domestic equipments.

The performance of Mullard pentodes is characterised by particular brilliance of the higher frequencies, although there is no lack of bass.

Mullard
THE MASTER VALVE

METHODS OF VOLUME CONTROL

The Wireless World

The Paper for Every Wireless Amateur

Wednesday, October 8th, 1930

FIRST - BECAUSE OF
THE FILAMENT

Mullard
THE MASTER VALVE

PLUG IN - THAT'S ALL

ALL-ELECTRIC RADIO


DEPENDABILITY

New Knob Control Drum - Dial
Operated by a knob and makes a complete revolution, giving a reduction of 2:1 and being the equivalent of a 6 dial. Has a very open scale and positive drive. (Special lighting bracket for illuminating Dial, price 6d. extra.)

PRICES (including moulded lumper plate):

Cat. No. W.296. Knob Control Drum Dial with 505 "Mite" Condensers 14/-
Cat. No. W.297. Dial with 503 "Mite" Condensers 16/-

(Dial also supplied for use with other than Utility "Mite" Condensers, price 10/- including panel plate.)

Wilkins & Wright, Ltd.,
UTILITY WORKS, HOLYHEAD RD., B'HAM.

License under design Reg. No. 732271.

Copyright. Registered as a Newspaper
for transmission in the United Kingdom.
A marvellous invention, has laid the wireless bogey! — run-down accumulators! Three little floats — red, white, green — in your accumulator will show you at a glance just what is happening inside. Warning you in plenty of time that recharging is due. Think! No more guessing. No more ruined programmes. No more spoiled week-ends. Remember — none but National ‘Dagenite’ Radio Accumulators have this wonderful device. For the best winter’s wireless you ever had — get an all-British ‘Dagenite’ — made by National.

A marvellous invention, has laid the wireless bogey! — run-down accumulators! Three little floats — red, white, green — in your accumulator will show you at a glance just what is happening inside. Warning you in plenty of time that recharging is due. Think! No more guessing. No more ruined programmes. No more spoiled week-ends. Remember — none but National ‘Dagenite’ Radio Accumulators have this wonderful device. For the best winter’s wireless you ever had — get an all-British ‘Dagenite’ — made by National.

An example of Dagenite prices.

- P.O.F. Type L.T. Accumulator (with ‘Tell Tale’ device) 2 Volt—20 Ampere hour capacity—10/- P.G. Type, as above but without ‘Tell Tale’ device, 1/6 less. H.T 10-Volt units from 5/-.


**USE NATIONAL ACCUMULATORS**

**THE DAGENITE SERIES FOR CAR AND RADIO**

Mention of “The Wireless World,” when writing to advertisers, will ensure prompt attention.
Designed for operating powerful speakers in radio gramophones, small public address equipments and the like, type D.O.20 has the low impedance of 2,000 ohms and the very good mutual conductance of 2.5, while its high amplification factor of 5 renders it suitable for use following an amplifier giving only a moderate stage gain, such as when resistance-capacity coupling is employed.

Its A.C. output is amply sufficient to operate one or two moving coil speakers or four electromagnetic speakers with ease.

The D.O.20 requires an anode voltage of about 425, and its filament, which consumes 1.3 amps. at 7.5 volts may be supplied with raw A.C. through a step-down transformer from the mains.

**Price**

30/-

Mullard

THE MASTER VALVE


Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
JUST LOOK AT THIS
REMARKABLE
NEW H.F.
CHOOSE!

THE TELSEN H.F.
CHOOSE WITH THE
WONDERFUL CURVE

The remarkable performance of this new Telsen H.F. Choke will be appreciated from the accompanying graph, showing the curve of this component, which is the result of a standard choke test carried out by J. W. Rayner B.Sc., A.M.I.E.E., at the Posthill Laboratories.

It is designed to cover the whole wave-band from 18 to 4,000 metres, has exceptionally low self-capacity and is shrouded in genuine Bakelite. Inductance 100,000 microhensies, resistance 400 ohms.

Price 2/6 each.

Telson Valve Holders, Pro. Pat. No. 292,473. An entirely new design in Valve Holders, embodying patent metal spring contacts which are designed to provide the most efficient contact with the valve legs, whilst allowing the valve to be inserted or withdrawn with an easy movement instead of being subjected to undue strain which often causes damage and loss of efficiency to the valves. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts.

Price 1/6 each. Also 5-pin model Price 1/3.

ADVT. OF TELSEN ELECTRIC CO. LTD., BIRMINGHAM.

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

2 ADVERTISEMENTS. THE WIRELESS WORLD October 5th, 1930.
Meet us at:
MANCHESTER RADIO SHOW, OCTOBER 8-18—STAND No. 26 MAIN HALL.

THE BRITISH BLUE SPOT COMPANY LTD.
BLUE SPOT HOUSE, 94/96, ROSOMAN STREET, ROSEBERY AVENUE, LONDON, E.C.1

Distributors for Northern England, Scotland, and North Wales: H. C. RAVSON (Sheffield and London) LTD.
400, London Road, Sheffield; 22, St. Mary’s Parsonage, Manchester; 183, George Street, Glasgow.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
WESTMINSTER ABBEY
ADVERT. OF THE TELEGRAPH
CONDENSER Co. Ltd. N. ACTON, W.5.
Range, quality, volume—all are improved if you use the Mazda AC/SG in the H.F. stages of your all-mains set. It is a remarkable valve with a colossal amplification that will enable you to bring in the most distant stations with a clarity and volume which you have never before experienced.

Selectivity also is assisted because the large magnification allows you to use a degree which will ensure maximum selectivity and amplification.

MAZDA AC/SG
CHARACTERISTICS

| Fil. Volts | 4.0 |
| Fil. Amps | 1.0 |
| H.T. Volts | 200 |
| Amplification Factor | 1200 |
| Mutual Conductance (MAV) | 3.0 |

PRICE

25/=

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
PERFECT PARTS MAKE THE PERFECT WHOLE

Burton COMPONENTS enjoy an unrivalled reputation for their efficiency and reliability. Every part is built on sound scientific lines to give best results at lowest cost.

All Burton Components are registered designs, and manufactured under various patents or patents pending.

The Burton Valve Holder.
Special Five Pin Type.
Suitable for A.C. Valves, etc.
Price 1/3 each.

The Burton BAKELITE (Dielectric) CONDENSER.
Entirely eliminates arcing, and ensures a perfectly clean contact with centre spindle at all times. Supplied with pointer knob, one hole fixing. Two capacities.

103 and 303 . Price 2/6 each.

Ask for BURTON COMPONENTS

C. F. & H. BURTON, PROGRESS WORKS, WALSALL, ENGLAND.

NEW

WESTINGHOUSE METAL RECTIFIERS FOR HIGH TENSION ON STAND 66 (TONMAN HALL)

MANCHESTER RADIO SHOW

Call at the Stand for a copy of the 1931 edition of "The All-Metal Way," enlarged to 40 pages of valuable technical and practical data for mains users, or send 3d. stamp for a copy to

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

H.T.5. 120 volts. 20 m.a.
also
15/-

H.T.6. 175 volts. 25 m.a. 17/6

and

H.T.7. 200 volts. 28 m.a. 21/-
Make the set that has made a nation wonder!

**Osram**

You assemble the various parts of the "OSRAM MUSIC MAGNET 4" with the greatest ease directed step-by-step by a full size constructor's Instruction Chart. The best results are certain of attainment. You will be thrilled at the mighty power of this set (and yet it can whisper), its immense range and perfect purity and fidelity.

**SPECIAL FEATURES**

1. The two Screen Grid Stages give extreme selectivity and sensitivity with an unrivalled range.

2. Enormous amplification with perfect stability is given by the complete shielding of H.F. Circuits.

3. Equal efficiency guaranteed on both wave length bands.

**HIRE PURCHASE TERMS:**

"OSRAM MUSIC MAGNET 4" for cash or on hire by a half deposit and 12 monthly payments of 18/6. Sold by all Wireless Dealers.

£11·15·0

**INCLUDING**

- Osram Valves
- Gecophone Components
- Polished Heavy Oak Constructor's Cabinet

**FREE CHART**

POST COUPON NOW FOR

Please send Instruction Chart to

The "Osram" Gift of Co. Ltd.,

10 Kingsway, London, W.C.2

Cut out coupon and return in postcard or envelope. Multiples posted in either case.

**THE SET THAT BRINGS THE CONTINENT TO THE BRITISH ISLES**


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

Just as an arterial, by-pass road prevents congestion in a busy town, so does the "Hypercore" Smoothing and Output Filter Choke relieve the speaker of all distortion and other interferences, leaving the pure, loud volume of reception to flow unimpeded.

"Hypercore" is one of the famous Big Three, and like the "Hypermu" and "Hypermite" its secret of success is the special utilisation of "Nickel-Alloy" cores which give a performance in the choke and transformers positively unequalled by imitations or other types.

The "HYPERCORE" Smoothing and Output Filter Choke

17/6

It gets the best from your speaker

Write for illustrated leaflets giving full details of the R.I. Nikalloy Big Three- Hypercore, Hypermu and Hypermite.

R.I. LTD., "MADRIGAL" WORKS, PURLEY WAY, CROYDON

Wingrove & Rogers, Ltd., 188-9 Strand, London, W.C.2

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

Rejuvenate your set!

The most efficient and economical way of renewing and improving the vitality of your receiver is to fit new modern-type condensers—making sure they are Polar.

Polar Condensers and Controls, by their advanced design and wonderfully precise construction, put new life into your set.

DOUBLE GANG "IDEAL"

This consists of two Polar "Ideal" condensers mounted on one frame. Efficient tuning, both fast and slow motion, is obtained with only one knob control. Particularly suited for receivers of the S.G., Detector, L.F. class. Aluminium screen is fitted between the two condensers, and the whole is rigidly built.

·0005 - 18s. 6d.

Also supplied in other capacities.

POLAR "IDEAL" A condenser with both Fast and Slow Motion control. Accurate tuning is easily obtained by reason of the design, construction and smooth yet firm action. Its wide tuning range alone gives it definite superiority over other condensers. Sturdily built and constructed throughout of chemically-cleaned hard brass. One-hole panel fixing. Fitted with Phosphor-Bronze balls for Short Wave working if desired.

·0005 - 12s. 6d. ·00035 - 12s. 4d. ·0003 - 12s.

POLAR "PRE-SET" Knob control is easy and accurate, always giving the same capacity for the same number of turns. Setting secured by locknut. Carefully designed. Accurately constructed. Max. capacities: ·001 or ·0003 - 2s.

WRITE FOR THE NEW 24-PAGE POLAR CATALOGUE "W"—FREE.
OPERATE YOUR A.C. RECEIVER from D.C. MAINS PRIVATE HOUSE PLANT or L.T. ACCUMULATOR by means of an

FREE!
"The Book of the M-L Rotary Transformer."
which deals with all machines of our manufacture.
Write to-day for your copy.

M-L MAGNETO SYND. LTD.,
Radio Dept., COVENTRY. Telephone: 5001.
Contractors to the Air Ministry, the British Broadcasting Corporation, the General Post Office, Marconiphone, the Gramophone Co. Ltd., etc., etc.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.

"IT FITS YOUR PORTABLE"

UNRIVALLED FEATURES IN ALL-MAINS RADIO
for any set standard or portable.

PRICE £6:0:0

Cash or 10-down and the balance in monthly installments of 15s each and one of 16s.

ASk YOUR DEALER OR FOLDER FOR

This wonderful Combined Eliminator and Trickle Charger is the finest All-Mains Unit yet produced and is as simple to connect and as compact as an H.T. Battery and every bit as safe.

It has no moving parts nor valves, incorporates the Westinghouse Metal Rectifier and is fully guaranteed for 12 months. Small enough to fit the Battery space in portable and cabinet receivers, it provides smooth and constant High and Low Tension current entirely free from hum.

There are two variable tappings of 0/100 and 0/120 Volts respectively and one fixed of 150 Volts. Output 25 m/A at 150 Volts—the highest of any unit designed for portables. The Trickle Charger caters for 2, 4 and 6 Volt L.T. Accumulators.

CLARKE'S

ATLAS
ALL-MAINS UNIT A.C. 188

H. CLARKE & CO. (MCR) LTD., OLD TRAFFORD, MANCHESTER

Winners!

HERE are the two finest 5-valve portables your money can buy. Equal in quality and performance to many sets costing double. Easiest to operate—wonderful range. Hear them at any good wireless dealers to-day.

NATIONAL

OAK
12
GNS.

SYMPHONY

MAHOGANY
13
GNS.

RADIO EXHIBITION COMPETITION

WINNERS:

1st Prize: Mr. A. O. Wood, 44, Blenheim Road, Peckham.
2nd Prize: Mr. T. Frankling, "Acacia," Temple Road, Epsom, Surrey.

Write for illustrated brochure and name of nearest dealers to:

THE BRITISH RADIOPHONE LTD.,

Telephone: Holborn 6744.
NEW RADIO FOR OLD
WE WILL BUY YOUR OLD RADIO SET

How would you like an up-to-date 3-valve Receiver which will tune in to all wave lengths? Not an ordinary Receiver which tunes in only to the high and medium wave lengths, but one which will always receive the wonderfully efficient short wave stations of the World—stations you have probably never heard. These Short Wave Sets are so amazingly efficient that listeners who possess Short Wave Sets hear America and other far distant stations regularly. Pittsburgh—Schonfeldy—Manila—Bangkok—Enochoven—New York—Sydney—Nairobi—those and many others come in clear, loud and free from interference. "World Radio" gives a list of over 70 Short Wave Stations—you can listen to them yourself with the "Empire Link" Receiver.

Imagine the finest Radio Receiver you have ever heard then add the advantages of Short Wave reception and you have some idea of the enjoyment you will get from the possession of an "Empire Link" Receiver.

NOW YOU CAN HAVE A NEW AND UP-TO-DATE "EMPIRE LINK" RADIO SET WHICH WILL TUNE IN TO EVERY BROADCASTING WAVELENGTH IN THE WORLD

No need to wait—you can buy an "Empire Link" now; selling your old Receiver to us in part exchange. In order to make it still easier for you the "Empire Link" is supplied as a Kit of Parts so that you can build the Receiver yourself and save pounds. No technical knowledge is necessary—the Components almost fall into position, that's how easy it is to put together.

The "Empire Link" Short Wave Kit comprises every part necessary to build the complete Receiver... Cabinet, Components, Valves and Cables for all wave lengths from 15 to 2,500 metres.

The cash price of the "Empire Link" Short Wave Kit complete is only £11, and we will buy your old set in part exchange. Take advantage of this generous offer now of new radio for old. Or if you wish you can purchase your "Empire Link" by easy monthly payments of 21½. Fill in and post the coupon now.

CASH PRICE
£11-11-0

EASY TERMS
12 Monthly Payments of 21½

THE "EMPIRE LINK"
SHORT WAVE KIT

READY RADIO
(R.R. LTD.)
159, Borough High St., London, S.E.1

Sole Distributors
Ready Radio

FORM A

To Ready Radio (R.R. Ltd.), 159, Borough High St.,
London Bridge, S.E.1

I wish to purchase one of your new 1931 "Empire Link" Short Wave Kits, for which I enclose
(a) £7.0.0, for Complete Kit
(b) £5 - 3 - 6 for Complete Kit (except for Valves)
(Cross out whichever does not apply)

NAME
ADDRESS

Fill in Form "B" if you require particulars of our easy monthly payments or part exchange system.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
The pick of the Broadcast Programmes at your instant command —— perfectly presented

THE GAM-BRELL BUCKINGHAM MODEL

The pick of the Broadcast Programmes at your instant command —— perfectly presented

THE GAM-BRELL BUCKINGHAM MODEL

THE BUCKINGHAM

FOR DIRECT CURRENT
Oak - £37. Mahogany - £38
Walnut - £40.

FOR ALTERNATING CURRENT
Oak - £45. Mahogany - £46
Walnut - £48.

A New Novotone Model

The TYPE J

Possessing exactly the same characteristics as the type S, but having a slightly less overall amplification.

With the introduction of this new Novotone practically every user of an electrical pick-up is catered for, no matter what type of amplifier he is using.

The Type J can be used with almost any average circuit without making alterations of any sort. A standard form of volume control can be used across the output terminals without affecting the reproduction in the slightest. The compensating curve of the Type J remains the same as that of the other two models, but the overall amplification is slightly less. The result when reproducing records is "amazing realism.

Type J £3 - 3 - 0

Type J Standard Model £5
Type H for High resistance pick-ups £5

GAMBRELL RADIO LTD., 6 Buckingham St., W.C.2

WRITE FOR FREE DESCRIPTIVE FOLDER W.

EDDYSTONE SHORT WAVE APPARATUS

EDDYSTONE SHORT WAVE INDUCTANCE UNIT.

This is an improved pattern of the original type of unit, being more efficient and simpler in use. It forms the complete inductance portion for building a short wave receiver, providing an aperiodic coil, grid coil and reaction coil. It has only one tuning coil, which is adjustable independently of the moving portion of the stand and is thus variable. A new and a duplicate coil and three double grid and reaction coils are supplied with the stand, covering a range from 15 to 95 metres.

Price 22/6 complete with full instructions. Extra coils for B.B.C. wavebands can be supplied.

EDDYSTONE MIDGET VARIABLE CONDENSER.

The "EDDYSTONE" Midget Variable Condenser is a small and neat instrument which is easily mounted, has a smooth motion and can be adjusted to a very small minimum capacity of a relatively large one. It is very suitable as the means of coupling an aerial to the grid coil of a short wave receiver. In this position, the coil is removed in such an extent that easy reaction control is obtained, which may occur due to the aerial being removed by a slight variation of this condenser capacity. It is also suitable for trimming use across a larger capacity or at a medium-dyno condenser.

Price 2/6

EDDYSTONE 6-PIN INTER-CHANGEABLE COILS.

These coils enable an all-wave receiver with high efficiency on all wavelengths to be easily and simply built, the full waveband covered by them being from 12.5 to 2,000 meters. The coils themselves, although of full low loss design, are strong and substantial and will withstand rough handling. The skeleton mounted form is made from first-class bakelite and the winding which touches only on the points of support on the ribs is practically air wound. We claim these coils to be the best designed and most efficient in its short wave class yet on the market. A full range of coils for tuned aerial and high frequency transformer circuits are available.

Prices 4/6 and 5/6 each.

SEND FOR NEW LISTS OF EDDYSTONE SHORT WAVE APPARATUS.

SOLE MANUFACTURERS:

STRATTON & Co., Ltd., BROADGATE STREET, LONDON, E.C.

WEBB'S RADIO ELECTRIC STORES, 161, Charing Cross Rd., W.C.2

ADVERTISEMENT

Note: Mention of "The Wireless World" when writing to advertisers, will ensure prompt attention.
RELIABLE RECTIFYING VALVES

Philips manufacture rectifying valves for voltages up to 4,000 and all currents up to 40 amps. Over a hundred types are specially manufactured for use in all-electric receivers, H.T. d.c. supplies, battery chargers, for all of which absolutely reliable rectifying valves are essential.

Type 1821 (shown above) is a full-wave rectifier with a maximum anode voltage of 250 and gives an output of 60 m.A. The filament takes a current of 1 amp. at 4 volts.

Price 17/6

Full details of complete range are available on request.

PHILIPS RECTIFYING VALVES

Made by the manufacturers of the famous Philips Argenta electric lamps, all-electric radio receivers, commercial and industrial fittings, and neon signs.

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Hear all there is to hear
and hear it better with,

a Dubilier all-electric set;
and the long winter evenings become a real
delight. If you are not satisfied with your
local programmes you can reach out to

where you will—Rome, Paris, Berlin,
Toulouse, Brussels, Vienna. All and
more can be received at real alternative
programme strength and quality.
The Dubilier all-electric set is
extremely economical to run, costing
as it does but a few pence a month
for mains current.

**Prices:**
2 Valve Set, £15.0.0
3 Valve Set, £25.0.0

DUBILIER CONDENSER CO. (1925) LTD.,

**Another Lewcos Achievement**

LEWCONS engineers are occupied year in and year out on problems
connected with the improvement of radio reception and this new
component—the L.F.T.3—is one of the most successful of Lewcos
achievements. It has a Constant Inductance for different values of anode
currents.
With an ordinary transformer the inductance of the winding is considerably
different for varying anode currents. In other words, the two
halves of the low frequency wave are not amplified equally, introducing
marked distortion. If the inductance is constant, however, as in the Lewcos
L.F.T.3, the amplification remains the same, irrespective of signal strength.
Write for fully descriptive leaflet, Ref. L.F.T.3.

We have submitted a sample of the L.F.T.3 to an independent
authority for testing, the report of which is given here.

**Write for Lewcos Free Sheet of Blue Prints of Four Suggested Circuits Utilising Lewcos Components.**

**Prices:**
L.F.T.3. printed circuit board, Radio 1-3
Type 12, Price 20/-

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

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
"The Wireless World" justifies the R.G.D. in the Special Exhibition Number:

**THE SET**

*They say:*

"The R.G.D. radio-gramophones have many points of interest both with regard to their circuit and details of construction... the present writer cannot claim to have yet examined all the apparatus in the exhibition, but believes that there are few, if any, other instances where this highly satisfactory method of tuning is employed."

**THE R.G.D. DE LUXE MODEL.**

For those desiring the very best that both Radio and Gramophone can give, the "R.G.D." De Luxe Radio-Gramophone is the ideal instrument. The Radio side of this instrument is so powerful that given favourable atmospheric conditions over 30 stations can be received with ample volume. The quality of reproduction from distant stations is equal to that of local stations.

*In Oak £80 In Mahogany £85*

**THE UNIT**

"Visitors to Olympia have an opportunity of judging the excellent quality and very considerable volume afforded by these instruments."

**THE R.G.D. DE LUXE RADIO-GRAMPHONE**

has many new features!

- 2 Screened Grid Stages!
- Band Pass Filter!
- Super Selective!
- Single Knob Tuning!
- Fader from Radio to Record!

*All mains operated with exclusive cabinet design.*

—Also Moving Coil Speakers, Cinema Amplifiers, Gramophone Amplifiers, etc.

**The Radio Gramophone Development Co.**

72, Moor St., Birmingham.
When buying Valves—Remember!

Empire Wireless Communications

The B.B.C., Metropolitan Police, Trinity House Lightships and Beacon Stations, Croydon Control Tower and all large Passenger Liners—

USE

MARCONI VALVES

Buy the Valves the Experts use!

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Are International Relays Wanted?

Evidence goes to show that the interest in foreign reception is greater to-day than ever it has been, even when we make full allowance for the percentage increase in the number of listeners.

We have always contended that one of the principal charms of broadcast reception lies in the ability of the listener to pick and choose his programmes and wander from place to place at home or on the Continent at will.

If the old policy of the B.B.C.—that of insisting that reception of the local programme was all the listener needed—had been continued, then by now the time would have probably arrived for telephone wires to take the place of the ether in the distribution of programmes, and wireless would no longer have been needed as the link, except where wires to individual houses could not be arranged.

But the public has decided that the old B.B.C. policy would not hold good. Interest in foreign reception, in particular, has guaranteed the future of the wireless set, and put wired wireless as a substitute on the shelf for many years to come. But to-day the B.B.C. is harping back to the old policy in so far as the idea of international relays is concerned. By all means let the B.B.C. relay those programmes which are beyond the reach of the vast majority of listeners, such as transmissions of interesting events across the Atlantic, but we think the B.B.C. should act very cautiously in the matter of retransmission of those Continental programmes which so many listeners can to-day receive direct on their own sets, perhaps better than when relayed by the B.B.C. and with the advantage that they can choose the station.

We understand that to obtain lines for a good Continental relay is a very expensive matter for the B.B.C., and, in the circumstances, we believe that it is not worth while when direct reception is so good. The B.B.C. has long since abandoned the idea of catering first of all for the crystal user, and now it seems that it might also be well to consider if the user of an unselec-tive valve set should not to-day be relegated to the same ranks as the crystal user. We do not mean by this to imply that we wish to penalise these listeners, but we feel they should not expect to be spoon-fed just for the reason that their apparatus, for the want of minor alterations or improvements, has not progressed with the times. A receiver which is selective enough to give satisfactory reception of stations under the Regional scheme without mutual interference is, generally speaking, capable of receiving programmes from several of the more powerful Continental transmitters both on the long and short waves. Any motorist of to-day is entitled to resent a hold-up of traffic due to the presence of five-mile-an-hour old crows on the road. We do not want the B.B.C. to devote energy and money to pampering the old crows by giving them what they are quite able to provide for themselves.

In This Issue

Are International Relays Wanted?
Volume Control
Unbiased Opinions
Notes on the Band Pass Four.
Current Topics.
Quality Reception.
Broadcast Greetings.
Guide to the Manchester Show.
Laboratory Tests.
Readers' Problems.
Merits and Failings of the Various Methods Explained.

Among the problems which confront the designer of a receiving set or electrically reproducing gramophone the difficulty of arranging a satisfactory method of volume control is one of the most awkward. The perfect volume control must have the following attributes:

1. Its inclusion must in no way modify the overall frequency response of the amplifier. Thus, if associated with the L.F. stages there must be no change in the quality of the output by way of suppressing or augmenting particular audio frequencies.

2. A wide range in the change of volume must result. A cutting down to at least one-tenth of the original volume is desirable, and in general the volume control should provide a complete fade-out of the signal.

3. The device used must provide a smooth control so that it can be operated without audible evidence of its use beyond that of changing the volume. There must be no scraping, rustling or clicking, and at no point must there be a sudden increase or decrease of volume. The change of volume as judged by the ear must, as far as possible, be spread out uniformly over the range of the control.

It is proposed to review some of the methods which have been used and suggested from time to time, and to see how near these various arrangements approach the ideal and the extent to which they fulfil the conditions just defined. Of the various available methods a broad classification may be made, so that the various types fall under one of the three following headings:

1. Pre-detector methods in which the volume control is applied to the H.F. amplifier.

2. Post-detector methods in which the control is introduced into the L.F. amplifier.

3. Control of both the H.F. and L.F. stages, an arrangement which is often desirable in a long-range quality receiver of generous design.

It is obvious that volume control must be applied to the L.F. amplifier when the detector valve and its following stages are to be used for gramophone reproduction. It may be mentioned that the desirable method of volume control which is arranged to regulate the amount of input to the detector may have an effect on the quality obtained. The behaviour of the detector as regards introducing distortion is largely a question of supplying its grid with the correct signal potential. This point has, however, been omitted in what follows, as it is really a separate problem.

Pre-detector Methods.

The inclusion of a volume control before the detector becomes necessary only where the H.F. input is large and implies, therefore, the inclusion of an H.F. amplifier or the possible working of a set close to a transmitting station. The first, and possibly the most...
Volume Control.—

A straightforward arrangement of H.F. volume control is that shown in Fig. 1, and consists of the inclusion of a filament rheostat in the L.T. supply of the first H.F. valve. This method is particularly simple, and in modest sets may be considered entirely satisfactory. If applied, however, to a highly selective H.F. stage, such as that produced by a neutralised triode and a tuned circuit which includes a good coil, the effect of reducing the filament current may be that of increasing the selectivity. In any case a noticeable effect on quality results due to the change in the A.C. resistance of the valve with variation of its filament current. Reproduction therefore, tends to become lowered in pitch, though this may be compensated for by the general reduction of sound level and the non-linear effect of the ear with various sound intensities.

The second method is that shown in Fig. 2. As a volume control, this method was perfectly unobjectionable, though it may under certain circumstances possess disadvantages in other directions. The volume control resistance is arranged as a shunt across the tuned circuit, and in consequence regulates the H.F. voltage developed. Such an arrangement has been applied to an intermediate stage in a superheterodyne receiver, and is particularly effective in that it serves also as a method of stabilising. Values must be carefully chosen, however, or otherwise this method of volume control becomes none other than a regulation of regeneration. Modifications of this method are shown in Figs. 3 and 4.

In one case a series resistance is introduced into the tuner circuit, the effect being precisely similar to the fitting of a variable shunt resistance as shown in Fig. 2. While the maximum value of the shunt resistance may be of the order of 250,000 ohms, the series resistance of Fig. 3 may have a maximum value of 100 ohms. The other arrangement shown in Fig. 4 regulates the bias applied to the valve, and as the negativity increases the volume falls. This method gives satisfactory results when applied to a single H.F. stage using a neutralised triode.

It must not be overlooked, however, that underbiasing of the H.F. valve at once limits its signal handling properties, while overbiasing results in rectification, both conditions producing the effect of flatness of tuning. Increase of grid bias is a method commonly introduced as a volume control in mains-operated screen-grid H.F. stages, and, in view of the criticism that can be levelled against other methods, this arrangement must be considered one of the most satisfactory.

The third method under this heading is the H.F. potentiometer (Fig. 5) connected across the tuned circuit and arranged to regulate the signal input passing on to the following stage on the detector. The obvious merit of this circuit is that operation of the volume control does not materially affect the working of the H.F. amplifier, so that it does not suffer by way of increase in selectivity with resultant sideband cutting. It must not be overlooked that this method does, to some extent, control regeneration. Practically all methods of H.F. volume control are, however, subject to this criticism, and a decline in the tendency to oscillate as the volume control is turned towards the position of zero cannot be regarded as a serious objection. Change in the tendency to oscillate results from a reduction in the detector load on the H.F. circuit. If used between two H.F. stages the loading again becomes reduced as the potentiometer contact is moved towards zero so that a receiver can, in fact, be brought to a critical condition of sensitivity by using the control first as a regulation of reaction and then as an adjustment of volume. Examples of the use of the H.F. potentiometer are to be found in the Megavox receiver described some while ago, and in the more recent Band Pass Four. Depending upon the dynamic resistance of the tuned circuit, the value of the resistance to be used must be selected. Although it may be thought that a very high value of resistance is desirable, experience reveals that 50,000 ohms is a satisfactory value, and particularly is this true where the preceding stage incorporates a screen-grid valve.

Before turning to the control of volume in the L.F. amplifier, it may be mentioned that there is a growing tendency to regulate the voltage input as delivered to
Volume Control.—

the aerial. The obvious method is that of introducing a small series connected condenser in the aerial lead. An advantage of this arrangement is that the voltage is not decreased by increase of damping, and, in fact, assuming the use of a neutralised triode H.F. stage, the tuning may become excessively sharp. The smaller the condenser, the more its impedance to the H.F. current circulating in the input tuned circuit, and in applying this method one must select a condenser of small zero capacity, or otherwise insufficient reduction of signal strength results when tuned to a nearby transmitting station. It is obvious that change of the series aerial capacity as a means of volume control may demand change of tuning capacity, and the decline in the signal may result partly from detuning. Some correction can be made in this direction by using a differential condenser in the aerial circuit so that the capacity of the aerial may remain as far as possible constant. While at first sight it may be thought possible to maintain the aerial capacity at a fixed value by the use of a differential condenser a small change is unavoidable, this being readily revealed from a calculation of the series-parallel values of this differential condenser, as its moving plates are swung between the two fixed sections from zero to maximum.

Post-detector Methods.

Assuming that volume control is not only introduced for the purpose of regulating the output of the loud speaker to the requirements of the listener, but also to perform the more important function of avoiding valve overloading, it becomes necessary to introduce control as early as possible in the train of valves. H.F. volume control assists in the regulation of the potential fed to the grid of the detector, so that it may be neither too little nor too great, either condition tending, perhaps, to give rise to detector distortion. Having fed the detector with its required voltage for distortionless rectification, attention is turned first to the adjustment of the ultimate signal and next to a regulation of the voltages passed on by the L.F. stages, so that no valve is required to accept a greater signal than that
Volume Control.—which it can handle without distortion. While it may seem obvious that any form of L.F. volume control should immediately follow the detector, it may happen in a generous amplifier that volume control may be applied to more than one of the L.F. stages. Provided that the control is properly designed, it is, of course, seldom that a second one, in a later stage, will be required, though the use of a partial control in each stage may not be without advantage. When more than one L.F. control is used, it is worth noting that when an increase in volume is required the control nearest the input end of the amplifier should be operated first. Conversely, when decreasing volume adjustment is first made at the output end. In the following notes reference is only made to the use of a single volume control as applied to a normal broadcast receiver with a modest output stage.

Variable resistances forming part of the intervalve coupling immediately following the detector may be suggested as methods of controlling volume, but are objectionable in several ways. For instance, a resistance may be connected in the anode circuit, as shown in Fig. 6, so that the amplification falls with reduction in its value. In using such an arrangement noisy operation invariably results owing to the fact that the resistance is carrying the anode current to the valve.

Fig. 10.—Adjustment of volume by a variable shunt on a L.F. transformer primary.

Slight irregular variations in contact resistance as the slider is moved along the resistance element are amplified in the succeeding stages, and may give rise to a rustling sound as the control is operated. Next one might consider connecting a resistance in the grid lead to the following valve, as shown in Fig. 7. This is probably one of the worst systems of volume control. It forms, with the grid leak, a potentiometer regulating the potential applied to the grid of the succeeding valve. The resistance of the leak cannot be much under 0.25 megohm, so that to obtain a range in volume of only 2:1 the value of the resistance would need to be 2 megohms. A resistance of this value in conjunction with the input capacity of the valve and stray capacities in the wiring would constitute a filter circuit, and a reduction in volume would be accompanied by loss of the upper audio-frequencies.

In Fig. 8 is shown a method of volume control depending on a change in the resistance between grid and filament. This is an undesirable arrangement, for as the value of the resistance is reduced it becomes comparable to, or even less than, the reactance of the coupling condenser C at the lower audio-frequencies, and in consequence a marked falling off in the bass results as the volume is reduced. Fig. 9 represents the equivalent circuit of the couplings between the detector and L.F. valves, and makes clear the effects of change of resistance as compared with the reactance of the paths provided by valve capacity, the values of which vary with frequency. Applying the use of a variable resistance to volume control in association with an L.F. transformer, mention is first made of the use of a variable shunt across the transformer primary or secondary (Figs. 10 and 11). Modern intervalve transformers are designed to work with a specific load, and their frequency-response characteristics are only as stated by the makers, provided that they work in conjunction with this load. The effect of an increase in load such as would result from a reduction in the value of the resistance is that of reducing the effective impedance of the transformer. As this reduction in impedance affects the lower
Volume Control.—
frequencies first the result of the operation of this volume control is that a reduction in the strength of the bass occurs as the volume is reduced.

Consequently, there is only one permissible method of control left to be considered, and that is the use of a high resistance poten-
tial divider. This may be applied in various ways, and although by no means free from pitfalls, can invariably be arranged to give satisfactory results.

Dealing with the resistance-coupled stage first, Fig. 12 shows an undesirable method of application. It is open to the same objection as that given for Fig. 6, that it may be noisy in operation. It is not very easy to see at first why this should be so, since the tapping apparently carries no

D.C. The explanation is that as the tapping is moved along the resistance the D.C. potential applied across C varies, and this gives rise to small charging or discharging currents into or out of C via the tapping. This current varies irregularly owing to the varying contact resistance of the slider, and these irregular variations are amplified in the succeeding stages, giving evidence of the operating of the control by a rustling noise from the loud speaker. It is men-
tioned, however, that a well-constructed and continuously variable wire-wound resistance probably does not cause very serious trouble. The method can, however, be used quite successfully if the variable resistance r is by-passed by a choke L (Fig. 13). By this means the D.C. voltage drop across the choke is negligible.

**Figure 12**—Anode resistance arranged as a potentiometer in a resistance-coupled stage.

**Figure 13**—The volume control in this case passes but little of the anode current, resulting in a noiseless control.

**Figure 14**—Grid leak used as a potentiometer method of volume control.

**Figure 15**—An interstage transformer with a potentiometer-regulated primary.
Volume Control.—
Suitable values may be taken as 80 to 100 henrys in respect of the choke when passing a current of 2 to 5 mA, 0.1 mfd. for the coupling condenser, 1 to 2 megohms for the leak, and values up to 250,000 ohms for the resistance. The valve might have an A.C. resistance of about 10,000 ohms.

Fig. 14 shows another alternative. In this case the leak r is in the form of a potentiometer, so that either a resistance or a choke may be used in the anode circuit of the valve. The limiting factor in this case is the fact that r must not be excessive or otherwise the portion of the resistance which remains in circuit near the minimum volume position (g) will act as a filter tending to suppress the higher audio-frequencies, as already explained. Suitable values may be taken: R, 50,000 ohms or an inductance of 50 to 80 henrys at 2 to 5 mA; C, 0.25 mfd.; r, values not exceeding 0.25 megohm. The valve may have an A.C. resistance of about 7,500 ohms.

Turning now to the transformer-coupled stage, as shown in Figs. 15 and 16, it will be obvious without explanation that a tapped potentiometer input associated with the primary of the transformer, as shown in Fig. 15, is quite unsuitable. Consequently, a resistance on the secondary may prove satisfactory, provided that the valve, resistance and transformer are properly chosen. This forms a good method of control, being absolutely noiseless in operation, assuming a well-made potentiometer is adopted, while the frequency characteristic is not modified to any appreciable extent as the control is operated and regulation is, moreover, provided from maximum to zero. It is, however, necessary to guard against two possible mistakes. First, r must not be too high on account of the possibility of the low-pass filtering effect, and, secondly, it must not be too low on account of its possible effect upon the transformer characteristics, the increase in load causing a loss of bass. An alternative arrangement possessing the same advantages and limitations is shown in Fig. 17. Apart from the volume control portion the merits of this scheme are well known.

The only point now remaining for discussion is the question of range of volume, i.e., the ratio between maximum and minimum loudness. It is well known that the relationship between acoustic output and audibility is by no means a linear one. Roughly, the audibility is proportional to the logarithm of the acoustic output, and the acoustic output, in its turn, is proportional to the square of the voltage across the speaker terminals.

If we have a volume control potentiometer giving a resistance ratio of 100:1, the resulting acoustic output ratio is 100²:1 = 10,000:1, and the audibility ratio = 4:1, the necessity for a very wide range of input variation is therefore apparent. Generally a potentiometer of usual construction will give 100:1 ratio, but if it is especially desired to cover a very wide range of audibility with a single volume control, the use of a "graded" resistance element in the potentiometer is advisable. When one of these "graded" potentiometers is in use, care should be taken that it is connected the right way round, otherwise it will be worse than a "straight" element.

Fig. 18 shows the correct and incorrect ways of connecting a graded potentiometer. To avoid complication, the necessary H.F. stopping and decoupling devices are not shown in the diagrams. In summarising the method it may be seen that the need for H.F. volume control, and, in spite of criticism, one might be tempted to use either the variable condenser or H.F. potentiometer method. When control is applied to the L.F. amplifier in association with an intervalve transformer, the best method becomes that of a potentiometer connected across the intervalve transformer secondary. Should the transformer be filter-fed with resistance and condenser, as is now customary, the potentiometer may be associated with the primary, or, better still, connected across the secondary in the same way as if the transformer is connected in the anode circuit.

**Next Week's Issue will include**
**STAND TO STAND REPORT**
**OF THE MANCHESTER RADIO SHOW**
Unbiased.

By FREE GRID.

The Radio Show
-A Lament.

At the risk of being accused of repeating what has been said every year by every journal, wireless or otherwise, I feel I must record my opinion that the Wireless Show, which closed its doors on September 27th, was—as well as being the biggest—far and away the best that has ever been staged. Not only were the valves, components and sets far better from the technical point of view, but the outward appearance of the sets and, above all, their price, were infinitely more satisfying. Having said this, however, I feel that there are certain aspects of the Exhibition which cannot be allowed to pass without comment.

The chief criticism I have to make is concerning technical information—or, rather, the lack of it—available at the various stands. With one or two notable exceptions, the stand attendants, salesmen, "engineers," or whatever else they choose to call themselves, appeared to be adopting the role of the superior and languid youth whom one meets at the Motor Show, but without the real information which you can usually extract—extract is the right word, for one has to work like a dentist to get it—from the aforementioned young men if you go about it in the right way. I include the valve manufacturers in particular, as there may be some excuse for the complete-set vendors; for, after all, the man who wants to buy a complete receiver usually wants a musical box only and cares little or nothing for the technical whys and wherefores; in the case of valves, however, things are very different, and one ought to expect a little real technical knowledge.

My particular grouse is over the type of valve curve which has been advocated in the technical columns of this paper during the past few months. My efforts to obtain these or, indeed, any technical assistance in the matter at all were in vain. In some cases the person to whom I addressed my enquiries thought he had "heard of them at some time or another, but anyway they were no good, and it was merely a journalistic stunt"!! In others attempts were made by suitably attired sirens to fob me off with a bag of "literature."

Hats Off to Genius.

Although, as I have already intimated, technical wisdom is not quite so necessary in the case of the vendor of complete sets, surely all salesmen should know what the various knobs and terminals are for? As an instance that this elementary knowledge is not universal, I should like to quote an experience of my own—one of a type which I have found out was by no means peculiar to me or, indeed, to the particular stand concerned. My attention was attracted by a remarkably fine-looking all-mains transportable, the performance of which, judging by the reputation of the firm in question, is probably as excellent as its appearance. The presence of a small socket in the back of the instrument rather puzzled me, and so, venturing to interrupt a graphic account of how his business had done well at Doncaster the other week, I asked a very superior person all about it. "That," he replied with an air of omniscience, stopping condescendingly to ignorance, "is for connection to the mains." As I could plainly see the double socket mains connection lower down, I ventured to point this out to him. But he was a foeman worthy of anybody's steel, for he immediately asked me: "Have you not heard of the three-wire system?" I had. "Well," he said, "it is rapidly extemporisng, "that socket is for the third wire." I silently removed headgear in tribute to real genius and passed on. I found out afterwards, by the way, that the socket was for an optional earth connection.

Short-wave Shortcomings.

I noticed that in spite of the increased interest taken in short-wave reception as the result of the Empire Broadcasting campaign which has at last borne fruit (good old W.W.I.), relatively few short-wave receivers were exhibited. I confidently think, however, that this state of affairs will be remedied next year. D.C. receivers this year are not only available, but can be had in transportable form. So far as I can recollect, there was not a single all-D.C. set shown at the exhibition last year, and, of course, it is only two years since the first all-A.C. receiver appeared, and a clumsy contraption it was, too.

In one or two instances I noticed that the grid bias battery has been retained by manufacturers of all-mains receivers. In my opinion, this is the weak link in some otherwise excellent receivers. It is true that the grid battery needs renewing only about once in every six months, but nevertheless I make so bold as to prophesy that even then it will be forgotten by many people, to the great detriment of the life of their valves. It may be argued that loss of quality will draw people's attention to this fact, but it must not be forgotten that the falling off in quality will not be sudden, but on the other hand will be so very slow and insidious that it will not be noticed by many people until their valves have been irretrievably ruined. There is no reason for the retention of the grid battery in an all-mains receiver put forward by a manufacturer—it is quite different in the case of the experimenter's set where valves may be changed.
Notes on 

THE BAND PASS FOUR  


By W. T. COCKING. 

WHEN building a multi-stage receiver such as the Band-Pass Four it is never wise to depart from the original specification, for in nearly every case there is a reason, and sometimes an important reason, for the choice of a component, and for its position in the set. There are, however, certain modifications which may be carried out without affecting the performance of the receiver, and without introducing either instability or a lack of sensitivity. 

Perhaps the most important of these modifications is the introduction of a gramophone pick-up, and while this can easily be carried out in the present design there are undoubtedly pitfalls for the unwary. As the power stage directly follows the detector it is necessary to convert the power grid detector into an ordinary low-frequency amplifier. This necessitates, care, for the switching arrangements must be in the high-frequency circuits of the receiver. 

As stated in the previous article describing the set there must be some 12 volts peak across the primary of the interstage transformer in order fully to load the push-pull power stage, and although the amplification factor of the AC/HL valve is 35, the actual stage amplification with the 20,000-ohms coupling resistance is only about 21 times. The pick-up, therefore, must be capable of putting 0.57 volts peak on the grid of the AC/HL valve. This necessitates a fairly sensitive pick-up, but there should be no difficulty in choosing one which will give the required output, and which also has a good frequency characteristic, from among those recently reviewed in this journal. 

The grid of the usual indirectly heated cathode valve should not be less negative than –1 volt; the AC/HL valve, therefore, must have a minimum bias of 1.57 volts. The H.F. stages are normally biased to 1.8 volts by a current of 18 mA, flowing through a 100-ohms resistance, and the simple connections of Fig. 1 immediately suggest themselves for the pick-up. It will be seen that the grid return lead is taken to negative H.T., and the grid bias is due to the voltage drop across the H.F. biasing resistance. The bias voltage will not be equal to the normal H.F. bias of 1.8 volts, since the total current will be reduced by biasing the AC/HL valve; it will be about 1.7 volts; which is ample to avoid grid current. 

Space can easily be found beneath the baseboard for the decoupling resistance R of 0.25 meg. and the decoupling condenser C of 1 mf, and the most convenient place for them is just underneath the detector valve-holder. Two terminals for the pick-up connections can be mounted on a small ebonite strip held by brackets to the back of the right-hand screening box, in exactly the same manner as the aerial and earth terminals are attached to the front of the first screening box. The single-pole change-over switch, which must be of the low-capacity type and of small dimensions, should be mounted as near to the grid terminal of the detector valve-holder as possible. 

When using the pick-up care should be taken to keep the local station in the minimum, and to tune the set to a wavelength upon which there is no powerful local transmission. If these precautions are not taken the local station may force its way through the set and cause interference with the gramophone reproduction. The sole objection to this method of adding a pick-up is the necessity for keeping the cathodes of the two H.F. valves heated, for it is their anode current which is relied upon for the provision of the full grid bias voltage. It is thought that this is not a serious objection, since the current consumption is low. If desired, however, the more complicated arrangement of Fig. 2 may be used, but care must be taken to see that the switch Ss is placed in a position such that the filament 

---

1 The "Band-Pass Four," June 26th and July 2nd, 1930. 
2 "Gramophone Pick-ups Tested," March 26th and April 2nd, 1930.
Notes on the Band Pass Four.—

wiring of the set is not lengthened; in particular, it must not be placed near to the detector valve, as this would probably introduce hum. The switch S1 must, of course, be placed close to the detector as in the former arrangement, and it must be remembered that there would be a grave risk of trouble from hum if a single switch were used to replace the two indicated.

Alterations to the H.T. rectifying circuit, as distinct from the smoothing circuit, should not affect the performance, provided that there is a potential of 256 volts, at the 62 mA., required by the set, across the terminals of the 4-mfd. condenser. The substitution of a Westinghouse H.T. metal rectifier for the U.8 valve would necessitate a specially wound mains transformer. The output of this rectifier is a little less than that of the U.8 valve specified, being about 230 volts at 62 mA., and the reduction in voltages will make itself felt chiefly in a slightly reduced power output. This reduction is not likely to be serious, however, and quite satisfactory results should be obtained.

The same remarks apply to those who wish to use D.C. mains for the 4-H.T. supply and a four-volt accumulator for the low tension. A pair of P.X.4 valves may be substituted for the P.025 valves in the push-pull stage to secure uniformity in the L.T. supply; to avoid extensive alterations to the grid bias arrangements and probable trouble from motor boating, however, it would be wise to substitute dry batteries for the normal free grid bias arrangements.

Modifications for D.C. Mains.

With some mains extra smoothing equipment may be needed, but since the mains transformer and rectifier are not required there is plenty of space available for any necessary additions. The greatest difficulty likely to be encountered with D.C. mains working will be due to the low voltage available for the power detector, and it is probable that it will be unsatisfactory with mains of lower voltage than 240. Incidentally, care must be taken in the operation of the set from D.C. mains as, if the positive be earthed, the screening boxes and all metal parts will be at the full mains voltage, and there will be a grave risk of shock. In any case, a 1-mfd. condenser must be inserted in both the aerial and earth leads in order to comply with the I.E.E. regulations.

At the present time the use of power grid detection with H.T. voltages of less than 240 volts cannot be recommended; the output with lower voltages is limited, and is certainly insufficient fully to load a pair of P.X.4 valves. Experimental work is being carried on with a view to evolving an interstage coupling which will allow the use of power grid detection with anode voltages of from 150 to 200 volts, and when this has been done there is no reason why the power grid detector should not work satisfactorily upon low-voltage D.C. mains.

In general, it is unwise to change from the values specified by the designer, and this is particularly true of those specified for the H.F. stages. The Mullard 54VA, a test report on which recently appeared in these pages, would appear to be suitable for the Band Pass Four. Little, if any, greater amplification can be expected, however, and there is some risk of introducing instability, which can be cured in the manner indicated below. It must not be forgotten, if these valves are used, that it will be necessary to change the values of the anode-circuit volt-dropping resistance, the screen-grid potentiometer, and the H.F. grid-bias resistance.

The H.F. circuits are normally adjusted so that, with the volume control at maximum; the set is near the oscillation point, but does not actually oscillate at any point within the tuning ranges. When the alterations mentioned above have been made it may easily happen that instability sets in or else one of the circuits has in some way become slightly damped, and the set is too stable. This may also be found even when the original specification has been strictly adhered to, owing to slight variations in individual components and the placing in the set. Tappings are provided on the anode-circuit coils to meet these cases, and it is by their adjustment that the set is, under all conditions, brought into its best operating condition.

In all these are some twenty-seven different

—the method of adding a pick-up when the H.F. valves must be switched off. The resistance R is 0.25 meg.; r1 is the normal bias resistance of 100 ohms and r2 is 400 ohms. C and C are respectively 1 mfd. and 2 mfd.

**TABLE I.**

<table>
<thead>
<tr>
<th>Position</th>
<th>1st H.F. Anode Coil</th>
<th>2nd H.F. Anode Coil</th>
<th>Detector Grid Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>2</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>3</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>4</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>5</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>6</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>7</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>8</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
<tr>
<td>9</td>
<td>Full coil</td>
<td>Full coil</td>
<td>Full</td>
</tr>
</tbody>
</table>

*2 "A New A.C. Screen Grid Valve." July 2nd, 1930.*
Notes on the Band Pass Four.—

Ways in which these tappings may be connected, and each will give a different degree of stability and amplification. A few of the more important positions are given in Table I for the medium-wave band and in Table II for the long-wave band; they are arranged in their approximate order of stability, beginning with the least stable arrangement. It should be noted that the tapping positions are indicated by the amount of the coil to be included in the anode circuit of the valve. As an example, the tapping designated "1/4 coil" means that the anode lead of the valve must be connected to the tapping on the coil which is two-thirds of the way from the low-potential end of the coil. Similarly, the "normal" connections for the long-wave coil are those given in the original article, and the phrase "tapping, reversed connections" means, leave the anode lead joined to the tapping, and reverse the connections to the outer ends of the windings.

There are three conditions of satisfactory adjustment for the Band Pass Four, and which of these is chosen will naturally depend upon the builder's preferences in the matters of ease of control, ease of adjustment, quality, range, and selectivity. Each of these three adjustments gives a different "feel" to the set, and since it is the sensitivity which is chiefly affected it is convenient to designate them as "low," "high," and "normal" sensitivity.

**Low Sensitivity.**

The adjustment for low sensitivity is by far the easiest, and it results in the attainment, under all conditions, of the best possible quality from the set. The circuits are a long way from the oscillation point, and the tuning is by no means critical. The range of the set, however, is considerably less than that obtainable with either of the other adjustments, and the sensitivity is only sufficiently great to give full loud speaker reproduction from a few of the stronger Continental stations, such as Radio Paris, Hilversum, Kalundborg, Rome, Toulouse, etc. Owing to this reduced amplification this adjustment can only be recommended to those who desire the best possible quality with high selectivity and a limited number of alternative programmes. The adjustment can be made with certainty by placing the coil tappings as in condition 9 in Table I for the medium wave band, and as in condition 4 in Table II for the long-wave band.

**High Sensitivity.**

The adjustment for maximum sensitivity is equally simple, and consists in placing the anode leads as in conditions 1 in both tables. This adjustment gives, under all conditions, the maximum range and selectivity, but an expense of quality. With the volume control set at maximum the anode-circuit tappings are so placed that the receiver oscillates at all settings of the tuning dial. Oscillation can be controlled by means of the volume control, which, in addition to its proper sphere, is used as a control of regeneration. It will
Notes on the Band Pass Four.—
be seen that by adjusting the control so that the set is nearly, but not quite, oscillating the maximum range is secured.

Under these conditions the band-pass filters no longer retain the sidebands, and the quality is little better than that given by more normal tuning circuits. The full quality can be obtained, however, by placing the volume control in a position such that the set is not close to oscillation. Briefly, this sensitivity adjustment allows of the attainment of high quality with low sensitivity, and of ordinary quality with high sensitivity, merely by the adjustment of the volume-control knob. It will be seen, therefore, that if a certain loud speaker strength be required from all stations the quality will depend upon the strength of the transmitter, and, within limits, the stronger the station the better will be the quality.

This adjustment can be recommended for those who want to get the most out of the set, and who do not require to listen to programs in which there is not very much going on. Oscillation must always be avoided or the set will radiate quite as badly as any of the old single-valve sets. The quality with the volume control turned well down will be about as good as that with the low-sensitivity adjustment, while the sensitivity and selectivity will also be of the same order.

Normal Sensitivity.
This adjustment aims at securing all the advantages of the high-sensitivity adjustment, but with the circuits so adjusted that oscillation can never occur. At best this is a compromise, and the sensitivity is lower than that of the high adjustment, although it may closely approach it. As might be expected, the adjustments necessary to arrive at this condition are more difficult to carry out. The ideal to aim at is so to adjust the anode-circuits tappings that, with the volume control at maximum, the set is nearly, but not quite, oscillating at all points within the tuning ranges. It will usually be found impossible completely to attain this condition, and there will be a slight falling off in sensitivity at one or both ends of the tuning range. The tapping positions for this condition were given in the original article as two-thirds on each coil (condition 5 in Table 1), and this will usually be approximately correct.

Ganging Changed by Alteration in Tapping.
To obtain the best results a certain amount of experimental work is necessary, but this can quickly be carried out if the following procedure is observed: Set the tappings for condition 5. If the set be unstable try condition 6; if it be still unstable try condition 7, and so on. On the other hand, if the set be too sensitive try condition 4, and so on. The various conditions in the tables are arranged in their approximate order of stability, but in one or two cases the difference is so small that slight variations between different sets might upset the order of stability.

This is the best adjustment for good all-round results, and can be recommended to those who want a receiver which, in addition to giving first-class quality with high selectivity, is highly sensitive without requiring any care in operation to avoid oscillation.

The adjustment of the ganging was discussed at length in the original article, and little more need be said about this. It must be borne in mind, however, that alterations to the positions of the anode-circuit tappings will affect the ganging to a slight extent; and after altering these tappings it will be necessary to readjust the equalising condensers. Similarly, if any alteration be made to the aerial the ganging of the first tuned circuit may be upset and need readjustment. It must not be thought, however, that the ganging will be greatly upset, for even without readjustment the set will usually continue to give satisfactory results. It is only when the very finest results are required that it becomes necessary to pay attention to such details as these.

A New Session.
Each year the Radio Exhibition heralds the opening of the wireless season, though some of the more enterprising organisations are already under way before London opens its doors.
Actually a few energetic clubs maintain their activities throughout the summer, finding that field days and occasional lectures during the long waves help to retain the interest of members and guarantee a good start for the winter.

Birmingham Malsarts.
Previously during the all-year-round club is Radio Club (Birmingham). During the past summer, frequent meetings have been held and visits paid to places of wireless interest. On a recent Saturday a party of twenty members were conducted over the London Regional station at Birmington Park, every detail being clearly explained by the B.B.C. engineers.

The winter programme includes lectures, demonstrations of the latest apparatus, debates, outings to places of interest, and several social events. Full particulars can be obtained on application to the Hon. Secretary, 112, Hilliard Road, Gravelly Hill, Birmingham.

For Bristol Enthusiasts.
The Friday evening lectures of the Bristol and District Radio Society, which proved highly popular last year, are to be continued as before in the Geographical Lecture Theatre of the University of Bristol.

"Radio Records," an instructive film presented by Messrs. E.ades, Ltd., was shown at the opening meeting, held on Friday, October 3rd. The meetings will be held weekly at 7.15 p.m. in the first quarter of an hour being devoted to discussion.

Hon. Secretary, Mr. S. T. Jordan, 1, Myrtle Road, C progression, N.W.

Elementary Lectures.
Wireless beginners in the N.E. district of London have an opportunity to increase their technical knowledge by means of a series of weekly lectures on elementary radio to be given at 7.45 p.m. on Fridays at the Dalston Literary Institute under the auspices of the London County Council. The lecturer is Mr. Robert W. Middle, A.I.R.E.

Particulars can be obtained on application to the Head of the Institute, Mr. R. H. Roberts, Dalston County Secondary School, Croydon.

Fridays, October 8th and 15th.
Bristol and District Radio Society.—At 7.30 p.m. (Discussion from 7.15 p.m.) in the Geographical Lecture Theatre, University of Bristol. Lectures: "Wires, the Progress and History," by a representative of the G.E.C.

CLUB NEWS.

FORTHCOMING EVENTS.

WEDNESDAY, OCTOBER 10th.
Newnham Radio Society.—At 8 p.m. at Millwall School, Totherdown, N.10. Lectures: -*Elementary Principles of Radio*—by Mr. Leonard Harding, B.Sc., A.I.C. (First of a series of four.* Lecture (in a series of four meetings) of the B.B.C. at the Newnham Radio Society at 8 p.m. in Titherdown, N.10."

Bristol Radio Society.—At 8.30 p.m. in the Fernleigh Club, High Street, Lansdown, from 8 p.m. onwards. Weekly Meetings of the Bristol Radio Society.

THURSDAY, OCTOBER 11th.
Kensington Radio Society.—At 8.30 p.m. at 21, Princes Road, Earls Court, S.W. Lectures: "Recent Improvements in Valve Manufacturing," by Mr. P. R. de la Cressonay, London, and "The New Forster Type of Valve," by Mr. P. R. de la Cressonay, London.

Stoke Radio Club.—At 7.30 p.m. at the Pinner and District Amateur Radio Society, Pinner. Address: "The New Forster Valve," by Mr. P. R. de la Cressonay, London.

Elmwood Radio Society.—At 8.30 p.m. at the Angel Meeting House, Hertford. Address: "The New Forster Valve," by Mr. P. R. de la Cressonay, London.

FRIDAY, OCTOBER 12th.
Bristol and District Radio Society.—At 7.30 p.m. (Discussion from 7.15 p.m.) in the Geographical Lecture Theatre, University of Bristol. Lectures: "Wires, the Progress and History," by a representative of the G.E.C.

Meetings Twice a Week.
The Kendal Town and District Radio Society has opened its winter season. Meetings are held twice weekly, on Tuesdays and Fridays at 8 p.m. New members will be cordially welcomed.

The Bromley Park station was visited by an interested party on a recent occasion under the auspices of the London County Council. The Hon. Secretary, Mr. H. B. Sartain, 40, Harrow Road, Regent's Park, N.W.

Elementary Lectures.
Radio beginners in the N.E. district of London have an opportunity to increase their technical knowledge by means of a series of weekly lectures on elementary radio to be given at 7.45 p.m. on Fridays at the Dalston Literary Institute under the auspices of the London County Council. The lecturer is Mr. Robert W. Middle, A.I.R.E.

Particulars can be obtained on application to the Head of the Institute, Mr. R. H. Roberts, Dalston County Secondary School, Croydon.
Events of the Week in Brief Review.

SUPER-STATION FOR IRELAND.
What will probably be the most powerful broadcasting station in Western Europe is shortly to be erected in the Irish Free State. We are in a position to announce that the Saorstát Government has placed a contract for the erection of a 50-kilowatt transmitter with Marconi's Wireless Telegraph Co., Ltd.
The site has not yet been fixed, but will probably be in the neighbourhood of Athlone. The wavelength will be 413 metres.

WIRELESS AND WINE.
Radio-Beiers, the French broadcasting station, re-opened on September 23rd after an interval of silence. Situated in the French wine district, the station is to feature talks on subjects of interest to wine producers and wine consumers.

FRENCH RADIO EXPORTS DOWN.
French official statistics show that the exports of wireless products fell considerably during the summer, the figure for June being half that of the same month in 1928 and the lowest recorded since December, 1926.

BELGIAN PAY UP.
At least 100,000 Belgian listeners will, it is hoped, have taken out receiving licences by the conclusion of the first year's administration by the new National Institute of Broadcasting. The Committee joyfully announces that the tax receipts are mounting satisfactorily.

OLYMPIA SHOW COMPETITION.
As we write these notes we learn that the entry forms for The Wireless World Olympia Show Competition are arriving in large quantities at the editorial offices, and some few days still remain before the closing date for forms to be posted.
It is not expected that it will be possible to announce the result of the ballot for two or three weeks because the task of sorting out the votes and ascertaining the winners in each class must necessarily take a considerable time. Meanwhile, we hope that every reader has participated in the ballot and will send in his form in good time if he has not already done so. The results will be announced as early as possible in The Wireless World. The prizes will be awarded, and subsequently it is again our intention to review the winning apparatus in the pages of this journal.

BROADCASTING AT 11 P.M.
When a landlord complained last week at Lambeth County Court that his lodger's wireless set was working between 11 and 12 at night, Deputy Judge McCreary expressed surprise. Counsel, according to a newspaper report, said he thought there were foreign station broadcasts at that hour.

FOR CLUB SECRETARIES.
"The Theory, Design and Operation of Gramophone Pick-ups" is the title of a new lecture, prepared by Messrs. Burnult, for delivery before radio societies. The lecture, which deals in particular with the Burnult Needle Armature Pick-up, can be followed by a demonstration.
All interested should communicate with Mr. W. D. Oliphant, B.Sc., Research Dept., Burndump Wireless (1929), Ltd., Easton House, Blackheath, S.E.3.

PUBLIC "PHONE TO JAPAN?"
We learn that new directional equipment is being erected at the G.P.O. wireless station at Rugby in preparation for radio telephony tests between this country and Japan. A Post Office official informed The Wireless World that arrangements for the tests were fully discussed with Dr. Inada, Japanese Minister of Posts and Telephones, on his recent visit to England, and that preliminary experiments may start in a few weeks' time.
Should the tests prove successful a public service will be opened with Japan similar to the existing transatlantic service.

FOR MANCHESTER STUDENTS.
Wireless is included in the programme of winter courses arranged by the Manchester Municipal College of Technology.

THE STENODE RADIOSTAT.
We learn that a licence to manufacturers under the Stenode Radiostat patents is being issued by the British Radiostat Corporation, and we believe that the royalty has been fixed at 37s. 6d. per set.
At the cable invitation of the Radio Manufacturers' Association of America, the Stenode Radiostat is to be demonstrated at the Chicago Radio Show on October 20th, and Dr. James Robinson, the inventor, accompanied by Mr. Percy W. Harris, are sailing for America this week to arrange the demonstration.

NEW "SUPERHET" BOOM IN AMERICA.
The lowest prices in the history of American radio prevailed at Radio World's Fair, which has just closed after a successful week's run in the Madison Square Garden, New York.

GERMANY'S "BROADCASTING HOUSE." An aerial view of the new giant headquarters in Berlin of the German Broadcasting Company. The novel form of the building is typical of the daring architectural experiments common in Germany to-day.
Refinements rather than basic changes marked the majority of the receivers on view, writes a correspondent. The trend towards the superheterodyne was very noticeable. With their production all centred in Camden, N. J., described as "the new radio hub of the world," the Radiola, Victor, General Electric, Westinghouse and Graybar firms all offered superheterodynes. Newcomers in the superheterodyne field are the Grigsby-Grinnow and Atwater Kent Companies. There are now nearly fifty makers of "midget," sets, while at least a dozen manufacturers are offering car radio installations.

COMPULSORY RECEPTION.
From December 31st next, a Royal Decree, postponed to permit the manufacture of sufficient apparatus, will require all Italian non-passenger ships of less than 1,400 tons to carry an apparatus capable of receiving the Rome weather forecasts within a radius of 625 miles.

A MENAGERIE BROADCAST.
"You are at this moment in the central cage of the Zoological Menagerie" was the announcement which recently thrilled listeners to the Radio P.T.T. Nord station at Lille. For three-quarters of an hour the programme consisted of the snarls, grunts, and other vocal efforts of a number of lions, tigers, leopards, wolves, hyenas, and bears. Our Paris correspondent reports that the item was accepted as an agreeable contrast to a recent concert by canaries.

The microphone, it is stated, had a narrow escape from the jaws of the lion, Sultan.

TESTS FROM NORMANDY.
Tests with a new broadcast transmitter of 600 watts aerial output are taking place daily at Caen (No. next). Usually in the mornings between 11 and 1 o'clock, on a wavelength of 229 metres. British listeners are invited to send reports to Emissions Radio Nordyne, post office Caen, 59, rue St. Martin, Caen, France.

TWO RECORDS.
At a time when record breakers are being smashed in every sphere of human activity, from tree sitting to attendances at radio shows, France steps forward with two more claims, writes our Paris correspondent. France has suddenly realised that it possesses not only the highest aerial in the world (Riffler Tower), but the highest wireless station, the latter being that situated in the Pic du Midi, at a height of nearly 3,000 ft.

BLENDED SOLDIERS AND WIRELESS.
In the Fifteenth Annual Report of St. Dunstan's for the year ended March 31st, 1930, sincere thanks are offered to the many Wireless Clubs, traders, and individuals who have helped blinded soldiers throughout the country to secure, install, and maintain wireless sets in their homes.

The report describes the efforts which are being made to make the lives of warblinded men happy and useful.

DEADLY WORDS.
"Though the building, presumably, harbours thousands of deadly kilowatts at only one spot do they seem not adequately leashed, and that is in the B.B.C. exhibit. At that point alone you are warned of high voltage..."

Thus wrote a Birmingham journalist who visited the Olympia Radio Show, evidently unaware that the total power output of the B.B.C. amplifier supplying all the loud speakers did not exceed a kilowatt and a half.

KDKA IN KILOWATT CONTES.
With KDKA, Pittsburgh, about to go on the ether in after-midnight tests with 400 kilowatts of power, Station WGY, Schenectady, revealed plans to resume its experiments with 320 kilowatts in similar tests when it recently applied to the Federal Radio Commission for a renewal of the experimental licence of W2XAG.

THE WIRELESS CHAIR. A corner of the control room at Budapest, showing the chair specially constructed to facilitate manipulation of the dials. Note the high arm.

THE WIRELESS WORLD. October 8th, 1930.

QUANTITATIVE ANALYSIS OF TELEVISION.
Some Developments in Television Based on Quantitative Analysis is the title of a lecture to be given this evening (Wednesday) by Mr. J. H. Owen Harries at the opening meeting of the Television Society's winter session. The meeting will be held at 7 o'clock at University College, Gower Street, London, W.C.1.

THE FERRY PHONE.
A new use for wireless telephony has been found by the Canadian National Railway. The train ferries, operating between the mainland at Torquemine, New Brunswick, and Burdeud, Prince Edward Island, convey passenger coaches and freight cars. Although the distance covered is not great, weather conditions frequently lengthen the time required for the passage. To maintain communication with the ferries at all times, the company has installed two small 100-watt wireless telephonic transmitters and associated receivers. The ship sets are operated by remote control from the captain's cabin.

TRANSMITTERS' NOTES.

7- and 14-Megacycle Wave-bands.
Mr. Robert Holmes (G6RH) sends us his observations on recent short-wave working from his station at Allerton, Liverpool. Conditions generally are still very bad, and though there is plenty of work on the 42-metre band, very few distant stations are heard. The 21-metre band is, he says, nearly always blank, though he has been in communication with CT2AA at Faiay, Azores, and on Saturday, September 19th, with WB1UX and WB5M in Massachusetts at 22.00 and 23.05 B.S.T. After 23.30 on that night all the distant stations seemed to disappear but several Belgian amateurs came in at unusual strength, especially ON4FM from Antwerp. Mr. Holmes asks if any others observed peculiar conditions on that wave-length.

The R.S.G.B. Trophies.
The "Rotab" Cup, presented in 1926 by Mr. Gerald Muncue for annual competition, has this year been won by Mr. F. Frank Miles (G5ML). This Trophy is awarded to the member who has accomplished some important long-distance transmission, or who has carried out, on behalf of the Society, some duty which has furthered its progress. The Worley Talbot Cup, presented in 1928 by Dr. Worley Talbot, has been won by Mr. Cecil Rumbeckle (SUSRS). The Powditch Transmitting Trophy is awarded to Mr. J. W. Matthews (G5LL) and the Receiving Cup to Mr. J. H. Wood (G930) for 10-metre test held during this year. The Somerset Cup, presented by Mr. E. T. Somerset for short-wave working, has been won by Miss Barbara Dunn (G6YL). The Committee Cup is awarded to Mr. W. H. Winchcombe (G6ZH).
Highest actual amplification!

—due to its abnormally low inter-electrode capacity

The effective H.F. amplification per stage that can be obtained in any Screened Grid Set is largely controlled by the inter-electrode capacity of the S.G. Valve. It is well known that the lower the self capacity of the valve the greater its effective stage amplification. Important features in its design and construction permit the inter-electrode capacity of the new Cossor 215 S.G. to be reduced to the order of .001 micro micro-farads. This is substantially lower than the self capacity of any other Screened Grid Valve on the market. It follows, therefore, that this new valve permits a big increase in effective amplification. In fact, results are obtained which, a year ago, would have been considered quite impracticable.

**GREATEST EFFECTIVE STAGE GAIN**

**Cossor 215 S.G.**
- 2 volts
- 15 amp.
- Impedance 200,000
- Amplification Factor 330
- Mutual Conductance 11 m. a.v.
- Normal working Anode Volts 120. Positive Voltage on Screen approx. 60.
- Price 20/-

**THE NEW Cossor 215 S.G.**

**Advertisements for “The Wireless World” are only accepted from firms we believe to be thoroughly reliable.**
"VOLUME CONTROL"
For many years this splendid Volume Control has been extremely popular with the public. It is regularly specified by all the Radio Journals, giving proof of its efficiency.


"The Midas Clarostat," effectually & mechanically identical to the "Volume Control," but with Soldering Gags and without Baseboard Bracket. Same size, same Resistance Ranges, same useful-ness, only 5/-. 

CLAUDE LYONS LTD.,
76, OLDHALL ST.,
& 40, BUCKINGHAM GATE,
LONDON, S.W.1.

"STANDARD"
Universal Range: 100 ohms to 5 megohms; dissipates 15 w. at 230 v. or 30 w. at 120 v. (See "Wireless World" tests): the accepted control for Eliminators. Also made in a wide variety of other ranges, replacing cumbersome fixed resistances. After six years selling better than ever.

"Stone" Types (N.P.) . . . 9/6
"M" Types (Brass Finish) . . . 8/6

THIS IS NOT THE WHOLE STORY.
THERE ARE MANY OTHER TYPES.

Remember it is your loud-speaker which has the final word in the quality of your radio and choose CELESTION.

Made by the firm which has specialised for nearly five years in sound reproducing instruments.

CELESTION, LTD.,
KINGSTON-ON-THAMES.
London Boroughs
48a Victoria St., London S.W.1

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The Correction of Defects in the Receiving Set.

By JOHN HARMON.

(Continued from page 372 of previous issue.)

If we abandon the use of reaction, and replace it by high-frequency amplification, and if, in addition, we eliminate audio chokes and voltage transformers by the use of resistance-capacity coupling in the audio amplifier, we can improve the reproduction of transients considerably. But the inductive and resonant loud speaker which is in universal use to-day offers a serious bar to further improvement. So weell is this fact recognised that there is a distinct tendency to arrange for broadcasting programmes to be as free from transients as possible. The frequency with which the smooth and strongly rhythmic music of Bach is performed in the studio, as compared with the neglect of the works of Wagner, with their abrupt changes of mood and thunderous effects, may be traced to this cause.

The production of theatrical noises has been carefully studied at Savoy Hill, and it appears that in all cases the actual noise must be replaced by a device which gives a simpler and less abrupt air disturbance. We must not shatter the listener's illusions by giving away these secrets, but one typical example may be cited as it is rarely called for: this is the imitation of the sound of a lawn mower or reaping machine by the rotation of an egg whisk! The reader can try this for himself, and will no doubt agree that there is a ridiculous similarity between the sounds.

We must now come to grips with the remedies which can be administered to unsatisfactory sets, and we shall find it best to begin with the output end and work backwards, since the performance of each stage is governed by the input supplied to it by the preceding stage.

The Loud Speaker.

The loud speaker is the weakest link in the wireless chain in that it introduces more distortion than any other single component. Usually, the low and high frequencies are attenuated, and often a lack of damping produces a peak somewhere about 1,000 cycles in the upper soprano register. The obvious cure for this state of affairs is to by-pass this region by a tuned circuit inserted in parallel with the speaker, and as this is a matter of importance we shall go into it in detail.

If, as in Fig. 9, we insert a series circuit tuned to 1,000 cycles, its

---

4 We apologise in advance to Messrs. Smith, Jones, and Dobinson, whose loud speakers are not only perfect but actually improve on the original music.
Quality Reception.—

Impedance at that frequency is that of the resistance alone since the coil neutralizes the condenser, while at other frequencies the impedance may be quite large. The frequency at which the speaker blasts or sounds excessively loud should first be found by striking the corresponding note on the piano. Then from Fig. 10 a choice can be made of inductance and capacity which tune to this frequency. Thus at 1,000 cycles we may choose one henry and 0.015 mfd. The value of the series resistance can be chosen to suit the circumstances, i.e., the sharpness of the cut-out required. Fig. 11 shows the variation of impedance with frequency of such a series circuit. The curves correspond to a one-henry coil with a capacity to tune to 1,000 cycles, and the numbers attached to the curves indicate that the ratio of the series resistance to the reactance of the coil 1,000 cycles is 1, 0.4, 0.2, 0.1 or 1/15. Since reactance \( = \frac{2\pi fL}{2\pi} \times 1,000 \times 1 = 6,280 \) ohms; if we choose a resistance 0.1 times this value the reactance will be \( 0.280 \times 0.1 = 628 \) ohms, and the impedance on tune will accordingly be 628 ohms, as shown for the peak of the 0.1 curve in Fig. 11. At 2,000 cycles or 500 cycles the impedance rises to 10,000 ohms, and has a negligible effect in shunting a 2,000-ohm speaker.

If we choose a coil of 2 henrys the reactance is doubled, and if we keep to the same ratio of resistance to reactance the whole curve should be displaced upwards by an amount equal to the distance between 1 and 2 on the vertical scale. Accordingly, by copying the curves on tracing paper we can displace them to fit any reasonable value of reactance and resistance. Thus with a low-impedance speaker we might require a 0.1 henry coil: in this case the curve must slide downwards by a distance equal to the distance between 1 and 10 on the vertical scale. This brings the curves off the squared diagram, but the same result can be attained by leaving the curves in position and dividing the vertical-scale numbers by 10.

If the one-henry coil is to be tuned to, say, 2,000 cycles, the curves should be displaced parallel to the dotted line till the peaks rest on 2,000 cycles. All reactance of values will then be doubled as the formula indicates should be the case.

A suitable air-cored coil can be wound on the circular former shown in Fig. 12. The resistance and inductance obtained when different wire gauges are used to fill the winding space are calculated from "Radio Data Charts" and are given in the table.

The last column shows that the resistance is a small fraction of the reactance, and an added resistance is necessary to broaden the absorption band. The 0.12 henry coil is suitable for low-impedance speakers, while the 0.8 henry coil is of the right order for high-impedance speakers.

Inductance Calculation for Iron-Cored Coils.

When an iron-cored coil is used, the core being built up from Stalloy stampings, the inductance is given by the formula

\[
\text{Henry's} = 1.3 \times \left( \frac{n}{100} \right) \times \frac{b}{t} \times l
\]

where \( n \) = number of wire turns.

\( b \) = breadth of stamping (Fig. 13) in inches.

\( l \) = length of mean magnetic path (Fig. 13) in inches.

\( t \) = thickness of built-up core in inches.

Thus for a No. 4 stamping \( b = \frac{14}{7}, l = \frac{8}{9}, \) hence if 500 turns are put on \( L = 1.3 \times \frac{8}{9} \times \frac{14}{7} \times 1 = 1.3 \) henrys when the core is built up to a thickness of \( \frac{9}{7} \).

Fig. 14 illustrates four ways of.
Quality Reception.—

coupling the speaker. The first method of direct connection is to be utterly condemned since the D.C. valve current will upset the balance of the reed and pull it towards the stop; chattering may thus be caused when the amplitude of vibration becomes large at low frequencies, and the unbalance will cause unsymmetrical vibration and introduce harmonics. Besides, the impedance of the speaker is probably smaller than that of the valve, so that the power transformation is not efficient. Transformer coupling with the primary in the plate circuit gets rid of all these difficulties and is the method most commonly used. The iron core should be built up from stampings, at least No. 4 size, to avoid magnetic saturation due to the direct current. Low notes will be lost if the volume of iron is insufficient. Stalloy should be used for this transformer in preference to the new nickel-steel alloys, which are easily saturated by D.C., but are quite suitable for diagrams (c) and (d) in Fig. 14, where no D.C. component exists.

**Table of Inductance Windings.**

<table>
<thead>
<tr>
<th>Wire Diameter in Inches (S.C.C.)</th>
<th>Turns</th>
<th>Yards</th>
<th>D.C. Resistance in Ohms</th>
<th>Henrys</th>
<th>Reactance at 1,000 Cycles</th>
<th>Resistance Reactance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.034</td>
<td>1,560</td>
<td>500</td>
<td>0</td>
<td>0.12</td>
<td>700</td>
<td>0.012</td>
</tr>
<tr>
<td>0.022</td>
<td>4,000</td>
<td>1,000</td>
<td>65</td>
<td>0.80</td>
<td>5,000</td>
<td>0.013</td>
</tr>
<tr>
<td>0.018</td>
<td>2,930</td>
<td>1,400</td>
<td>140</td>
<td>1.7</td>
<td>10,000</td>
<td>0.014</td>
</tr>
<tr>
<td>0.014</td>
<td>11,700</td>
<td>2,900</td>
<td>580</td>
<td>8.8</td>
<td>45,000</td>
<td>0.014</td>
</tr>
</tbody>
</table>

D.C. current in the transformer primary is eliminated when choke-condenser coupling is used, but it must be remembered that the choke itself must be large enough to avoid magnetic saturation. This coupling is an attractive one for the experimenter since the speaker and transformer are cut off from the H.T. supply and so can be experimented with safely.

Push-pull transformation gives the best quality of all: the magnetic effects of the D.C. components cancel out in the primary, and in addition the curvature of the lower bend of the characteristic of one valve is compensated by the opposite curvature of the upper bend of the other. The absorption circuit of Fig. 11 can be used when required with any of these coupling schemes since it is simply connected across the terminals of the loud speaker.

If the speaker should give excessive reproduction of high frequencies the absorption circuit can be tuned to a higher pitch and will deal with the matter effectively, but a simpler method is to connect a condenser across the speaker terminals. Values between 0.02 and 0.05 mfd. are suitable for a 2,000-ohm speaker.

In the rare case of excessive reproduction of low notes the best method is to reduce the low-frequency input to the grid of the power valve by using a smaller grid condenser than usual.

The Power Valve.

The purchase of a milliammeter for insertion in the plate circuit of the power valve is well justified. Not only does it give timely warning of the need to recharge the H.T. and L.T. batteries, but the slightest overloading is at once proclaimed and the correct value of grid bias made manifest. Since the grid of the power valve is not in direct connection with the preceding stage, but either inductively connected through a transformer or capacitatively through a condenser and grid leak, the oscillations impressed on the grid swing symmetrically above and below the undisturbed value of the grid potential, and hence if the valve is working over the straight part of its characteristic curve the swing of plate current will also be symmetrical. Accordingly, the average current as read on the plate meter should remain constant.

When the valve is overloaded this symmetry is destroyed and the needle flickers. Moreover, the direction in which the needle first moves at the beginning of a flicker indicates the state of the grid bias; if the bias is insufficient the top of the grid swing is cut off when it reaches the filament voltage, owing to grid current, so that the top of the plate current swing is also cut off, and the average current decreases. If the bias is excessive the negative grid swing reaches the curved parts of the characteristic where the plate current is smaller, so that the average current increases. The correct bias is found by adjustment till flicks occur on the average as often to the right as to the left.
Quality Reception.

It is easy to adjust the whole receiver so that the power valve is the first to overload; a steady plate current then indicates that the set is working within its capacity.

Pentode versus Triode.

The introduction of the pentode power valve has made it possible to cut out a stage of intermediate L.F. amplification and so to feed the power valve directly from the detector. This economy, however, is not without drawbacks from the point of view of quality; these arise from the peculiar characteristic curves of the pentode and the distortion produced by them.

The curves of a triode (Fig. 15) are sensibly parallel and equally spaced straight lines over a considerable length, and with a suitable plate load the working point moves along a line such as AB. It is easily seen that for equal changes of grid potential equal changes of plate current occur, so that no distortion results.

![Triode Characteristic Curves](image)

Fig. 15.—Triode characteristic curves. With 150 plate volts, 20 volts grid bias and a resistance load of 8,000 ohms thrown in the plate circuit through a transformer, the dynamic characteristic is the thick line. It is clear that the plate current follows the grid swing without distortion.

In the case of the pentode (Fig. 16) the characteristics are curved from the origin up to the value of the supply voltage, and straighten out beyond this point. The working line AB intersects many of the characteristics where they are strongly curved, and it is plain that the change in plate current is no longer proportional to the grid swing over the whole of the working line, and hence distortion arises. The distortion, however, is not severe since it produces only a slight flattening of the current swing equivalent to the introduction of about 5 per cent. of a third harmonic, and may be considered negligible compared with the errors associated with the average loud speaker. In a search for the best possible quality, however, we must remember that this distortion does actually exist.

(To be continued.)

**BOOKS RECEIVED.**


*Guide to Wireless* (fifteenth edition), compiled by G. J. Dale, of the Saxon Radio Co., Blackpool. A handbook which, while dealing mainly with the apparatus and components of this firm, contains much useful advice to novices in the choice and equipment of receiving stations, including a three-valve receiver for wavelengths from 14 to 550 metres. Pp. 96, with numerous illustrations and diagrams. Price 1s., post free.

OCTOBER 8TH, 1930.

Warehouse Calling.

Studio No. 10, which I was privileged to visit a few days ago, suggests to a passer-by a derelict fire station converted into a night club. If he were to follow one of those dress-suited figures past the deserted wharves and through the red doors of a corner warehouse, the inquisitive visitor would find himself in the largest broadcasting studio in Britain, if not in the world.

A Flood of Light.

The colour scheme—green and yellow—helps to give a sense of vastness to the new "studio," which is bathed in a flood of light from ninety-six 100-watt lamps.

Crip Echo Effect.

Many listeners who heard the preliminary broadcast on Friday last by Jack Payne and his dance orchestra will have noted the crisp echo effect, not unlike that which we associate with the Grand Hotel, Eastbourne. This is partly due to the undraped walls, consisting merely of painted brick, and to the unusual height of 30 feet from the carpeted floor to the draped ceiling.

Four Microphones.

 Provision is made for four microphones. The extensions are taken to the amplifier in a small room adjoining the studio and thence by private line, about 500 yards in length, to the control room at headquarters.

An "O.B." Triumph.

Although Studio No. 10 is regarded almost as an annex to Savoy Hill, the arrangements are in the hands of the "O.B." Department. They have done their job well in transforming a dungeon into a palace in less than five weeks.

Twelve Months.

Considering the price per acre of infold limelime and carpets cut to fit, it is a pity that the new studio is to be dismantled in twelve months' time, when Broadcasting House is opened.

The thoughtful listener may ask whether the output of the orchestra of 135 players will make such a difference in his loud speaker as to warrant the expense.

Noisy Loud Speakers.

The oscillation nuisance was once the main theme for fiery correspondence received by the B.B.C. Nowadays more letters deal with the noisy loud speaker.

From time to time tactful pleads are made at the microphone, but these seem merely to provoke the retort that the Englishman's home is his castle or, rather, his concert hall.

Troubles of the Semi-detached.

The B.B.C. can hardly be expected to sympathise violently with those who suffer through the broadcasting enthusiasm of their neighbours. If, as Savoy Hill must wish, we all listened all the time we should never hear the neighbour's set.

Wireless World

By Our Special Correspondent.

The loud speaker has come to stay, and those who are unable to preserve a detached attitude in a semi-detached villa should quarrel with the builders, not the B.B.C.

A Fortune Waiting.

Builders are now offering starting inducements to prospective purchasers of Empire Broadcasting.

From the Prime Minister himself we have already learnt that Empire Broadcasting is included in the agenda of the Imperial Conference. But we may be sure that the discussion will take a different form from that at the recent conference of delegates from the Colonies. Unlike the Colonies the Dominions are not thirsting for entertainment of any sort so long as it comes from the Old Country.

The Dominions Won't Pay.

The Dominion delegates will show financial rather than artistic concern over the Empire broadcasting proposals. On reliable authority I learn that suggestions will be put forward for a direct pro quo arrangement as regards programmes, in preference to any system of payment.

The Case of Australia.

It is not difficult to appreciate the Dominion point of view. Australia, to take an example, enjoys good programmes of her own, and her licence-holders would be entitled to ask whether the luxury of receiving beam relays from England would be worth an addition to the already stiff annual licence fee of 2s 4d.

Manchester Show Broadcast.

The North Regional evening programme on October 14th consists of an orchestral concert from the seventy-second Manchester Radio Exhibition at the City Hall, Manchester. The artists are the Northern Wireless Orchestra, conducted by T. H. Morrison, and Dorothy Donaldson (soprano). The music will be of a popular nature, and of particular interest is Saint-Saëns' very amusing piece, "Le Carnaval des Animaux."

A Broadcast Banquet.

In addition to the Prince of Wales's speech at the League of Nations Union banquet on October 30th, the relay from the Guildhall will include the speech of Lord Grey of Fallool, the chairman.

The banquet is in honour of the delegates from the Dominions and India attending the Imperial Conference and the British and Dominion delegates to the eleventh Assembly of the League of Nations.

Opéra in the Studio.

When Puccini's opera, "Madame Butterfly," was first produced at the Scala, Milan, it was greeted with howls of derision. It has since been received everywhere with enthusiasm. Percy Pitt will conduct the broadcast performances on October 15th and 17th.

Elizabeth Nelvi title rôle.

Wireless Describe.

Despite the prevailing impression that the British public is advancing in radio knowledge, the B.B.C. received a letter last week which began:

"I shall try and give you a description of my wireless. A quantity of wire are enclosed in a box; on the front of this box there is an accumulator with figures from 0 to 180. . . ."
MANCHESTER RADIO SHOW.
LIST OF EXHIBITORS—SEE PLAN OPPOSITE.

The Seventh Annual Wireless Exhibition, organized by “The Manchester Evening Chronicle,” will be opened on Saturday, October 8th, in the City Hall. The following List of Exhibitors, together with the Plan on the opposite page, will provide readers attending the Show with a suitable Guide to the Stands. The Exhibition remains open until Saturday, October 18th.
A Review of Manufacturers' Recent Products.

EAGLE H.T. BATTERY.

These batteries are made by the Eagle Engineering Co., Ltd., Eagle Works, Warwick, the manufacturers of the well-known "Chakoplane" components and receivers. The sample tested was a standard capacity 66-volt unit, for which the maximum economical discharge rate is of the order of 0.03 A.

Owing to the terminal voltages being somewhat higher than the nominal value, the initial current through the loading resistance was 2.7 mA. This value was maintained for a very short period only, and during the first 100 hours showed a comparatively rapid decline. At no time during the test did the current attain a steady value and maintain it for any definite period. Thus there is no well-defined cut-off point, and, as will be seen from the curve, the voltage fell at a fairly uniform rate throughout the useful life of the battery. If we decide that its working life terminates when the voltage per cell drops to 0.9, it would give 175 hours' work, assuming the initial discharge to be of the order of that shown here. Most batteries can be kept in commission until the E.M.F. of the cells drops to 0.75 volt, and under these conditions the Eagle Standard 66-volt battery would survive for 320 hours. Of course, it would be necessary to provide a "boosting" battery to raise the voltage to that required to operate the set satisfactorily.

The price of the 66-volt unit is 7s. 6d., and there is available also a 90-volt battery at 11s. 6d., and a 25-volt unit at 13s. 6d. These are of the same type and of standard capacity.

WATMEL DUAL RANGE TUNER, Type 31.

In the Watmel dual range coil special pains have been taken to nullify, so far as a compact assembly will permit, the effect of an idle long-wave coil when receiving on the medium broadcast wave-band. The tuned coils are sectional wound, moulded bakelite ribs being used to space these from the arial and reception windings, which are carried on a paxolin tube 13mm. in diameter. The secondary consists of eight sections, with the two end sections wound in the opposite direction to the remainder of the coil.

With the switch set for medium-wave reception, each half of the long-wave coil is connected in parallel with its respective end section, the mutual inductance being negative. For long-wave reception the two end sections are inoperative, and the long-wave coil, consisting of the six middle sections only, is in use. The idle end sections, being wound in the opposite direction to the main portion of the coil, introduce no appreciable "dead end" effect. A centre tapping is available on both ranges.

The wave-change switch is housed in the hollow base, with the actuating lever protruding through one end. Two

Discharge curve of the Eagle 66-volt standard capacity H.T. battery.
Laboratory Tests.—
operating rods of different lengths are provided, thus enabling the units to be mounted close to the panel, or set back to allow space for the tuning condenser to be interposed.

A practical test showed that sensitivity depends largely upon reaction when the unit is used in a simple 0-1 set; the selectivity is generally good, the two Brookmans Park transmissions being easily separated in the northern suburbs of London. Long-wave reception is equally good, and reaction is smooth on both wavebands, a reaction condenser of 0.0003 mfd, being ample large for all purposes when a leaky grid detector is adopted.

When tuned by a 0.005 mfd. condenser, the wave range covered is from 225 metres to 550 metres, and 585 metres to 2,140 metres on the medium- and long-wave bands respectively, using an aerial of average size.

The makers are Watmell Wireless Co., Ltd., Imperial Works, High Street, Edgware, and the price of the unit is 17s. 6d.

EDISWAN E.S.75 POWER VALVE.

This valve has been developed especially for use in public address amplifiers and similar type equipment where a big output is demanded. It will deliver 25 watts of undistorted power with 1,000 volts H.T., the maximum safe anode dissipation being 75 watts.

A special dull-emitter filament, rated at 10 volts and taking 3.25 amperes, is fitted, and the vacuum is of an abnormally high order. The bulb, stems and "pinch" are constructed from specially prepared heat-resisting glass, and it is claimed that this ensures a long working life.

The electrodes are of the familiar "flattened" type, mounted vertically in the bulb, but, of course, far more robust and executed on far more generous lines than in the average super-power output valves. Relative displacement between the electrodes is prevented by anchoring each to a stout bridge-piece located under the dome of the glass envelope.

At 1,000 volts H.T. and with optimum grid bias the A.C. resistance is of the order of 2,000 ohms, and the amplification factor 5; the mutual conductance under amplifying conditions being accordingly 2.5 ma. per volt.

It has been deemed necessary to adopt a bayonet type fitting, which follows closely American practice, in place of the usual pins and socket holder. In keeping with the valve, it is built on generous lines, and consists of a massive bakelite moulding carrying stout phosphor-bronze springs, which make sure contact with the four stubby pins on the base of the valve. Massive soldering tags complete the assembly.

Ediswan super-power valve, type E.S.75.
The maximum anode voltage is 1,250, and the maximum anode dissipation 75 watts.

The valve is made by the Edison Swan Electric Co., Ltd., 1a, Newman Street, Oxford Street, London, W.1, and the price is £12. The special base costs 12s.

CATALOGUES RECEIVED.
Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.—24-page illustrated catalogue of Benjamin components.

The Telegraph Condenser Co., Ltd., Wales Farm Road, North Acton, London, W.3.—Illustrated catalogue of mica dielectric, paper dielectric, and electrolytic type condensers for use in wireless circuits. Smoothing condensers tested to 15,000 volts D.C. are included.


MYCALEX.

Sir,—We have had our attention drawn to your issue of August 3oth, 1929, page 167, by a letter in which, on page 167, there is an article relating to Mycalex by Mr. W. H. F. Griffiths. We are very much concerned to see that to this very valuable intellectual property should be attributed a defect, which is surely one of manufacture.

The material upon which the tests in question were made has evidently been obtained from Germany. We regret to say that the production there was not in accordance with the requirements for this highly specialised product, which necessitated a special construction of furnace and press to obtain the results eliminating the defect of soft crust or skin, to which Mr. Griffiths refers.

Our London factory has been equipped with a plant capable of making a perfect product, and we shall be pleased to place at the disposal of anybody desiring to test this samples of our present production.

E. H. KINNARD, Managing Director,
Mycalex (Parent) Co., Ltd.

ACUMMULATOR CHARGING.

Sir,—Some considerable time ago you were good enough to publish a letter of mine on the subject of accumulator charging.

From personal experience—and from what I hear from friends all over England—things do not seem to have got any better than they were two or three years ago.

As the manufacturers of wireless receivers are now giving instruction to their agents in the repair and maintenance of this type of work, it would be, I think, of considerable value to the manufacturers of accumulators to do the same for their agents.

I quite realise that the answer will be: "But we never appoint an agent unless he knows his job," but I could quote very many instances (my own in particular) where the recognised agents for first-class batteries have no more been able to charge (``electrically'') H.T. batteries than they have been able to fly to the moon.

I give you two cases in point.

1. When it was suggested that a small charge for a long time would be much better than a big charge for a short time, the answer came from one of the agents: "But I would never get through all my work if I was to do that." 
2. It had actually to be explained to one electrician (!) that a charge of 5 amp. for two hours was not the same as 5 amp. We were putting a charge of 5 amp. into a 5,000 milliamp. H.T. battery!

And there are still many of us who live so far out "in the wilds" that there are no mains available.

As my last letter to you caused so much unpleasantness between the local garage owners and myself, I beg to sign, without any clue as to name or district.

H. SO.

POWER DETECTION.

Sir,—I am glad to see, in various recent articles in The Wireless World, that the writers have realised that (so long as it is called "power detection") grid rectification gives less distortion than anode bend.

Messrs. Denman and Breton, in your issue of July 30th, for example, say that they began to investigate the possibilities of the indirectly heated valve as a grid detector, with good results.

I should like to state that as far back as 1928, at which time I was in charge of the Technical Department of Graham Ameldon, Ltd., I was aware of the superiority of grid rectification. In the spring of 1929 I proved it quantitatively and embodied it in the design of the Ampilon standard sets. In August of 1929 I submitted to Experimental Wireless a short article proving the point, which, unfortunately, was not published till July, 1930; and in Fig. 4 of that article I gave three sample rectification curves, two of A.C. valves and one of the 6 6.1A directly heated type; the latter is almost identical with the curve in Fig. 1 of Messrs. Denman and Breeton’s article, except that I took it up to 2 v. input only.

In September of 1929, I again dealt with the matter in a pamphlet describing the Ampilon Standard sets. This was only semi-technical, but I again explained that the grid rectifier there used gave only 2 per cent. second harmonic as against 7 per cent. for the best anode bend I had found, and I also exploded the myth of excessive "top cut-off." Further, I remember an interview between Mr. Denman and myself—somewhere about July or August, 1929—in which, after some discussion on other matters, I gave him full details of the valves I was using (Mullard 164 V), and the arrangements which gave me pure rectification; if I remember rightly it was at that time his intention to use Kirke diode rectification for the South Kensington set, and the discussion arose because I stated my view that it was unnecessary. Therefore, until someone puts in a prior claim, I hold that I was the first in this country to find that grid rectification, properly arranged, is superior to anode bend. It was discovered independently and at about the same time as in America; but I have no knowledge as to priority as between the two countries.

It may be of interest to set out very briefly the conditions for good-quality grid rectification:

1. The valve must be of low impedance; the type very popular to-day, of Ra=7,000, μ=12-16, is satisfactorily. Indirectly heated valves are better than filament valves, but the latter case used by the manufacturer.

2. Plenty of anode voltage must be used—at least 150 v. and preferably 180-200, and the anode current must be kept down—say 5-7 mA. for the above type.

3. The anode-coupling resistance must be kept low; 10-15,000 ohms a suitable value for the above valves.

4. To avoid top cut-off, both leak and condenser must be small; 0.0005-0.001 μF. and 0.1-0.25 MO are suitable values; and a filter must be used in the anode circuit, not simply a by-pass condenser.

5. The amount of H.F. and L.F. amplification must be arranged to keep the detector input within certain limits; the optimum input is such as to reduce the detector anode current to about ½ of its value in the absence of input.

Marconi House, London.

P. K. TURNER.

SPECIAL B.B.C. TRANSMISSION.

SIR,—In the description of the new Science Museum receiver in the issue of August 6th reference is made to a special B.B.C. transmission on June 4th for the purpose of obtaining a modulation-amplitude curve showing the overall performance of the whole receiver.

It is unfortunate that this special transmission was not advertised beforehand, as many of us would have liked to tune similar curves for our own receivers; a Moulin voltmeter across the loud speaker terminal is the only addition to the receiver required.

Is it too much to hope that the B.B.C. will repeat this transmission at intervals? It should surely not be beyond possibility to find, say, one hour a month for technical transmissions, and I would suggest that, say, every three months each station should give such a transmission, outside the usual programme hours if necessary; the other two months might have some other type of transmission if desired. But, above all, it is necessary that these transmissions should be well advertised beforehand; they might even be fixed months in advance and advertised.

C. R. COSENS.

Cambridge.
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.


Coil Length and Diameter.

After reading the article entitled "Tuning Coils and Winding Data," I have a few questions to ask. The inductances of my H.F. detector.I.F. receiver, but am in a quandary as to what diameter to choose for the coils. I presume that this dimension should be as great as possible, but, unfortunately, there is available in the set. I am afraid that a greater diameter than 31/2 in. will be out of the question. There is space for coils of fairly considerable winding length: diameter is my chief trouble. Do you consider that it would be worth while to increase the size of the screening boxes so that 31/2 in. diameter coils could be accommodated?

J. C. T.

We rather think that you have overlooked the fact that the "goodness" of a coil is not entirely determined by its diameter. On referring to the article which you mention it will be found, for example, that a winding 3 in. in diameter and 2in.: in length will have a minimum dynamic resistance rather less than that of a coil of, say, 2in. in diameter and 3in. in length. Consequently, in this case the coil of smaller diameter is the better of the two.

It seems likely that, by applying the published information in this article to the best advantage, with due regard to the space available in your set, you will be able to find a suitable winding which does not necessitate any alteration to your screening boxes.

Comparative Tests.

I have been trying to make comparative sensitivity tests—without direct measurement—of two long-range receivers. Although this would appear to be easy enough, it seems very difficult to avoid errors, and I should welcome a few hints. Both sets are designed for working on an outside aerial, and switches have been arranged to change over the batteries.

T. McD.

Even when a complete equipment of measuring instruments is available, it is fatally easy to reach an incorrect conclusion; still more is it difficult to make a fair comparative test byural means, as the matter is complicated by the fact that the ear does not long retain its impressions. Changes from one set to the other should be made quickly, and it is all to the good that you have arranged for switching over your batteries.

A weak signal of constant strength is essential; these tests should always be made in the daytime, as night signals are liable to fading. Alternatively, a very short aerial is used, but here, again, there are pitfalls; if one of the sets has normally a weaker aerial coupling than the other, its H.F. input will be disproportionately reduced. In any case, the short aerial should be sufficiently effective to have a signal pick-up many times greater than the direct pick-up of either set; errors often arise in this way when comparing sets with widely differing screening systems.

If reaction is fitted, it should be set either at minimum or just below the point of self-oscillation; intermediate settings are bound to be responsible for misleading results. It is often a good plan entirely to disconnect the reaction circuits, and, if necessary, to join small fixed condensers between plate and filament of the detector valves to compensate for removal of reaction condenser capacity.

RULES.

The free service of THE WIRELESS WORLD Technical Information Department is only available to registered readers and subscribers. A registration form can be obtained on application to the publishers.

1. Every communication to the Information Department must bear the reader's registration number.
2. Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department:"
3. 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.
4. Designs or circuit diagrams for complete receivers or eliminators cannot ordinarily be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.
5. Practical wiring plans cannot be supplied or considered.
6. Designs for components such as L.F. choke, power transformers, complex coil assemblies, etc., cannot be supplied.
7. Queries arising from the construction or operation of receivers must be confined to constructive sets described in "The Wireless World" to standard manufactured receivers; an "Err" sets that have been returned used in their original form and not embodying modifications.

A Useful Formula.

Can you give me the necessary formula for calculating the ratio of the transformer output valve and the loud speaker?

M. E. J.

The formula is

\[ \text{Ratio} = \frac{\text{A.C. Resistance of output valve}}{\text{Loud speaker impedance}} \]

It should be pointed out that in the case of the use of more than one valve in the output stage the figure for A.C. resistance, which must be used in this formula, is that for the combined A.C. resistance values of all the valves in the output position.

If valves are used in parallel and they are all of equal A.C. resistance, it is necessary to divide the A.C. resistance of any one of them by the number of valves in use in the output position. If valves are connected in push-pull the value for A.C. resistance for the individual valves must be added together. The impedance figure for the loud speaker should be taken at the frequency of middle C. In most cases this information will not be forthcoming, and it is customary, therefore, to take 200 cycles per second as the basis of calculation.

You will probably remember that in our issues dated February 5th, 12th and 26th, 1930, we gave the impedance figures for a large number of commercial loud speaker units.

A.C. Valves or an L.T. Eliminator?

I have been successfully operating my 1-v-1 valve receiver for some time from an H.T. battery eliminator, and have now decided to hand my valves filaments from the mains, which are of the A.C. type. I am hesitating, however, whether to purchase A.C. valves or to retain my present valves and use a low tension battery eliminator. I have received very conflicting advice from my friends in this matter, and appeal to you to arbitrate. I should mention that the question of comparative cost must be taken into consideration.

B. G.

If possible we should advise you to purchase a filament transformer and a set of A.C. valves. We insert the proviso "if possible" because we have no knowledge of your receiver design. It must be remembered that A.C. valves are more expensive than H.T. valves.
efficient than other types, and in the case of some receivers screening may be only just sufficient to preserve stability with battery valves, and in such a case uncontrollable oscillation would be the only reward of fitting A.C. valves. It is true that in most cases it is a simple matter to put in extra screening, and probably this is so in your case, but there are some designs which it is almost impossible to modify in this way without the necessity of completely rebuilding. If, therefore,

owing to the fact that the metal shaft of the condenser—which, of course, comes into close proximity to the hand—is definitely earthed. It will probably be remembered that this modification of putting the control condenser at the low potential side of the reaction winding was eventually adopted in the original Reinartz circuit, this new arrangement being then known as the Weagent circuit. In Fig. 1 (c) will be seen the method of using differential reaction in the case

of, course, part of the tuning coil itself constitutes the reaction winding and the effect of putting the control condenser in series with the tuning coil would be not only to reduce the natural time period of the tuned circuit but also to bring about a drastic change in tuning every time that a change in the degree of reaction was observed.

It should be mentioned that in the case of the Hartley circuit the differential reaction principle is not an unqualified success, adjustment of reaction being rather critical.

Biasing Difficulties.

For some time past I have been using a detector-L.F. A.C. set for local-station reception only. Grid bias for the output valve (a L.S.5A) has been derived from a rectifier unit (Wen-

ning-hous type H.T.S) which gives a voltage of 220. I am only interested in local-station reception, and am redesigning my receiver so that it will give very large volume, indeed, and propose to use two L.F. stages, the output consisting of two L.S.5A valves connected in push-pull. My power transformer has a four-volt filament winding which I have hitherto used for supplying the indirectly heated detector and a six-volt winding which I have been using in conjunction with one L.S.5A valve, a 0.75 ohm resistance being used in each filament lead. I now propose to use a six-volt valve in the penultimate stage, and to heat its filament from the same winding as the proposed output valves. I wish to know whether you would recommend that I use my existing grid bias unit for supplying the penultimate valve, which will require a grid bias value of 40 volts (Wadon P.650), or whether I should take bias for both stages automatically' by the use of a balance in the common H.T. negative lead.

J. R. G. T.

Neither of your proposed methods of obtaining bias is at all feasible. As you apparently have only one filament winding, you cannot have a additive bias on your transformer which would add anything to your transformer, you would, if you employed 'automatic' bias for your valves, have to use a common bias resistance which might lead to trouble, even if both grid circuits were decoupled. Apart from this, however, it must be remembered that in order to give the correct bias to the L.S.5A valve at 400 volts H.T. you would have to drop 112 volts across the biasing resistance. This would mean that there would only be 288 volts left for H.T. supply to the L.S.5A valves, as we scarcely think it likely that your power transformer gives an output of between 500 and 600 volts, as it would have to do if your scheme were to be effective. This trouble would not, of course, be removed by employing the grid bias unit to supply the penultimate valve only. The best solution is to use the grid bias unit for supplying the output valves, and to obtain grid bias for the penultimate valve by means of a voltage-dropping resistance. In any case, you have ample volts to spare for this valve.
Make your Battery Set all-electric

The Six-Sixty A.C. all-mains conversion equipment is suitable for practically any battery operated receiver.

No internal wiring alterations. Equipment includes specially selected Six-Sixty A.C. valves—and Six-Sixty 4/5 pin valve holder adaptors.

Yes, we know how you feel about it—this question of scrapping a perfectly satisfactory battery set in order to change to all-mains—so we have produced the Six-Sixty all-mains conversion equipment. To start with, you need to alter nothing of the construction of your set—the special Six-Sixty valve-holder adaptors make your present valve-holders fit the 5-pin valves supplied. Then you are buying a unit, in the fullest sense, an eliminator and a set of specially selected A.C. valves, built by one manufacturer to co-operate and work perfectly together.

The Six-Sixty Unit can be supplied to operate from any A.C. house mains. H.T. tappings of 50, 75, 100, 120, 150 and 200 volts are provided and G.B. tappings of 1.5, 3, 4.5, 6, 15 and 20 volts, any three H.T. or two G.B. values being available simultaneously. Grid Bias is on the ultra modern automatic principle—all risk of overloading eliminated. The dimensions (13 x 3½ x 4) of the complete equipment are not larger than your present batteries—an important point—and the H.T. leads need never be removed from the set when once inserted. Isn't that what you've been waiting for? Of course it is—but why wait any longer?

Price:

A.C. Mains Conversion Equipment complete from £8.5.0
Mains Unit (H.T., L.T. and G.B.) only £6.6.0
Write for leaflet giving particulars of complete range, including new Six-Sixty Valves, Six-Sixty One Speaker Assembly and One Speaker Paper, Six-Sixty Turntables, Six-Sixty Valve and Set Tester, Six-Sixty Value Adaptors, Six-Sixty Gramophone Pick-up Attachments, Six-Sixty Grid Leads and Holders.

Made by the makers of the famous Six-Sixty Valves.

SAY SIX-SIXTY

(S.B.A. RADIO VALVES AND EQUIPMENT)


Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Make your own records—

Here is an opportunity to make permanent phonograph records of your children's voices, musical talents, poetry and monologues of your relatives and friends or of your own voice. The record will last for a single minute recorded on a waxed disc at a moderate price. Apparatus, with disc double sided, 10 record capacity.

**PRICE £4.12.0**

SIMPLE. INEXPENSIVE. FAITHFUL REPRODUCTION. PERMANENT. ENTERTAINING.

Write for full details and demonstration trial. Address the owner of Polyphonograph.

Caine & Morrison, Ltd., 33 Percy St., London, W.1
Telegram. - Motion. 6546.

MANCHESTER Radio Exhibition

STAND No. 60

PARFAIT

THE PERFECT EBONITE

SUPPLIED IN SIX FINISHES

Semi-Polished Black
Highly Polished Black
Matt

Semi-Polished Mahogany
Highly Polished Mahogany
Cuba Surfaces.

Obtainable from most wireless dealers.

Advertisements by B. B. Peter & Co., Ltd., Station Buildings, Ecclesall.

Darwin Cobalt Steel

Unrivalled for all WIRELESS & ELECTRICAL Purposes.

Write to Magnet Dept. for Latest Brochures.

DARWINS LIMITED, Fitzwilliam Works, SHEFFIELD.


MAGNETS

R & B MAINS TRANSFORMER

MODEL 34

Designed for the "BAND PASS FOUR" as specified in the June 25th issue.

PRICE £2.5.0

Please state Mains Voltage & Frequency.

Manufactured by

RICH & BUNDY, LTD.
13, New Road, Ponders End, Middlesex.

(Patents: Polyphonograph.


Your Opportunity—

SEE REDfern's EBONART RADIO PANELS & COIL FORMERS

including the well-known W.W. (Deep Rilled Type) and other Radio Accessories at

STAND NO. 33

MANCHESTER RADIO EXHIBITION, CITY HALL, DEAN'S YARD.

OCT. 8th to Oct. 13th, 1930.

Every Motorist and prospective car buyer should make sure of obtaining copies of

**PRICE 6d**

OLYMPIA SHOW NUMBERS OCT. 10 – 17 – 24


EF INSIST ON HAVING EBOBONITES BECAUSE IT IS BRITISH MADE & RELIABLE.

LOOK FOR RECOL TRADEMARK.

Sole Manufacturers:

THE BRITISH EBONITE CO., LTD.,

HANWELL, LONDON, W.7.

"RED DIAMOND" SWITCHES

New Patterns with "Dead" Spindles.

"RED DIAMOND"

REGF

AS SPECIFIED FOR USE IN "FERRANTS" NEW CHARTS.

RD 473 point 1/6, by post 1/9
RD 492 . 1/3, 1/6

Of all high-class Radio Dealers, or Stockists.

JEWEL PEN CO., Ltd.

41-42, Grosvenor St., LONDON, W.1.

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

Follow our example and take no risks with your reputation. Hydra Condensers are never placed into stock without being tested at twice their rated voltage. Hydra Condensers are never fitted to sets without giving absolute satisfaction.

LOUIS HOLZMAN LTD.
37, Newman St., W.1.
Telephone: Museum 2641.

SOLD with a 12 Months' Guarantee
LAMPLUGH LEADS AGAIN
with this ALL-BRITISH SPEAKER

DEFINITELY
ABOLISHES
ALL PAST AND
PRESENT TYPES
OF SPEAKERS.

The verdict of Olympia.

Manufactured under FARRARD and LAMPLUGH PATENTS and PATENT APPLICATIONS.

LAMPLUGH INDUCTOR
Dynamic SPEAKER

This is the latest conception of the Inductor principle, patented by the American radio pioneer Farrard, and is to give a step up in efficiency in all wireless work. The Inductor—whether balanced condenser or moving coil—the original which went over the true type. It possesses all the advantages of a moving-coil speaker, has a better response at the lower frequencies, and has none of the disadvantages associated with those.

ADVANTAGES.
There is no moving coil to pick up field currents. There is no field excitation coil, therefore no interference of hum from that source.

There is no heat generation. Requires no Rectifier, Transformer, Smoothing Condenser associated with Moving-coil Speakers on A.C. Operated sets.

Only a quarter the weight of a M.C. Speaker.

AMATEURS
will realise at once the economies saving to cost that the Lamplugh Inductor Dynamic offers without sacrifice of performance—which is indistinguishable from the old type. The Inductor will not be confused with the many balanced Armour Inductors on the market. The term 'Inductor' is the term designed to give Moving-coil effect without the methods of other scientific methods.

There is nothing to go out of order; it is hermetically finished and of robust construction.

The GREATEST ORCHESTRAL SPEAKER of all times.

Ask your dealer for a demonstration.

S.A. LAMPLUGH LTD.,
KINGS RD., TYSELEY, BIRMINGHAM.

The TONEX Co., WALKER ST., BLACKPOOL.

PRICE
30/-
FROM ALL RADIO DEALERS.

TONEX UNIBOX
SCREENED GRID UNIT

Make your Det. I.F. Set up to date—no day—with S.G. Get a "TONEX UNIBOX"—the complete S.G. Unit. Enclosed in the crystalline enamelled metal case are coils to cover long and short waves controlled by a switch. The Valve is placed in the most correct position for efficient sheding. Plainly-marked terminals are provided for easy hooking up. The very thing you have been waiting for.

Send for diagrams and details of this and other Tonex Products.
**NOTICES**

**ADVERTISEMENTS.**

**THE WIRELESS WORLD.**

**OCTOBER 8TH, 1930.**

**MISCELLANEOUS ADVERTISEMENTS.**

**NOTICES.**

**THE CHARGE FOR ADVERTISEMENTS in those columns is 12 words or less, 2/6 and 2/4 for every additional word.**

Each paragraph is charged separately and name and address is charged separately. **SEVERAL DISCOUNTS are allowed to Trade Advertisers and to customers for consecutive insertions provided a contract is placed in advance, and in the absence of instructions the valuer will compute charges on the following scales:**

- Previous issue: 12 consecutive insertions, 15% off; 26 consecutive, 20% off.
- Previous years: 12 consecutive insertions, 25% off; 52 consecutive, 30% off.

**ADVERTISEMENTS for these columns are accepted up to FIRST POST on THURSDAY MORNING (postmark) on the date, or at the Head Offices of "The Wireless World," 27, Ebury Street, London, S.C. 4, or on WEDNESDAY MORNING at the Branch Offices, 68, Merford Street, Coventry; Goldhill Buildings, Euston Road, London, N.W. 1, December, 17, St. Vincent Street, Glasgow, G. 2.**

Advertisements that arrive too late for a particular issue will automatically be inserted in the following issue unless instructions to the contrary. All advertisements in this section must be strictly typed.

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

**Postage Order and Cheques must be payable for advertisement in the name of & Co. Ltd., and endorsed**

- To bearer
- To order

All letters relating to advertisements should quote the number, name, and date of the issue of each advertisement, and the date of the issue in which it appeared.

Advertisements appearing in the Wireless World are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

**NUMBERED ADDRESSES.**

For the convenience of the Gas advertisers, advertisements may be addressed to numbers at "The Wireless World" Office. When addressed in this manner, the sum of 6d. is to be paid to the secretary of the Depository to cover the cost of registering advertisements, but it includes any amount payable for postage or other charges. The address should be complete, and it should be remembered that the wireless world cannot be held responsible for any errors in addresses and that the subscriber pays any additional postage charges which may be incurred.

**DEF DEPOT SYSTEM**

Readers who wish to send money to unknown persons may do so in perfect safety by availing themselves of the Depository System. If the money is 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 does not receive goods, they are returned to the vendor. If a sale is effected, buyer instructs us to remit amount to seller, but if seller instructs us to return amount to depositor. Credit is passed by the buyer, less commission, and subject to a minimum commission of £1.20. The commission is charged on transactions over £10 and under £2, the fee is 1/6; over £25, 2s. 6d. Advertised matters are dealt with by a separate agency.

**SPECIFIED NOTICE.**

Readers who reply to advertisements and receive no answer to their enquiries are requested to report the fact to the Managing Editor, who will take further steps. Advertisements have already been disposed of by advertisers. Advertisers often receive many enquiries that it is quite impossible to reply to each one by post.

**RECEIVERS FOR SALE.**

SCOTT SESSIONS and Co., Great Britain: Radio Receivers and Repairing under Amendment.

**HUGHES McMichael Portable Set, by day or week.**


**STRAIGHT 5 Portable, makers' 12-month guarantee, 2 years running, complete—Mosley, 507, Market Road, Sheffield.**

(B116)

**BUCKET 5 Portable Set, in white, 2 years' guarantee, complete—Compton, 18, North St, Lewes, Sussex.**

(C185)

**CUSEY 2 portable Set, 2 years' guarantee, complete—£7.10s.—Birrington, 186, St. James's, Great Britain.**

(1100)

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

**BONiface TRADESMAN'S GUIDE.**

Send for our comprehensive Illustrated List. QUICK SERVICE. QUICK SERVICE.

**THE QUALITY HOUSE.**

PEREUS MFG. CO. (Dept. W.W.) BRANSTONE RD., HURSTON-ON-TRENT.

**APPLEBY'S**

Where Radio Art Exchange began, a service of safety to 25,000,000 people, in harmony and perfection of all the world which has accurately balanced the reputations of all the world, of which we have reported their first transmission.

**HENRY SERVICE TO FOLLOW.**

We supply practically all the leading lines of radio apparatus on the market at current free prices; we do not like to accept in part exchange, the reputable makers of the following apparatus: Receivers (domestic and portable), radio-granulators, loud-speakers (bone and other types), tube units and chassis, battery apparatus, components, transformers, and other apparatus. This list is subject to change, but we will endeavor to supply any apparatus that is wanted and that meets the requirements of the customer. We also supply for further information, most of the apparatus and manufacturers' names, as well as the guaranteed performance and cost of the same.

**IN VIEW OF THE DIFFICULTY OF MAKING Fair and Firm Terms for Material or Oils, we have been induced to limit our advertising to first-class material only, and to discontinue any advertising that is not of the highest character, or that cannot be guaranteed to be of the highest quality and durability. Where we have been able to publish such advertising, we have endeavored to do so in the most satisfactory manner possible, and to maintain the highest standard of reliability and service.**

**REPAIRS**

All repairs dispatched within 48 hours. ONE MONTH'S GUARANTEE with each repair.

**TRANSFORMER REPAIR CO.**

**552, GARRATT LANE, TOOTING, LONDON, S.W. 17.**

**BONAFE TRADING HOUSE.**

FOR QUICK SERVICE. FOR QUICK SERVICE.

**APPLEBY'S**

Chapel St, St. Marylebone, London, S.W. (Central 2891). 

**RECEIVERS FOR SALE.**

APPLEBY'S.

**POWER CHÖKES guaranteed**

power choke wire, as made for L.F. Transformer, Loudspeaker or Headphone. All repairs dispatched within 48 hours. ONE MONTHS GUARANTEE with each repair.

**Note change of address**

**ADDRESS CHANGE**

**TRANSFORMER REPAIR CO.**

**552, GARRATT LANE, TOOTING, LONDON, S.W. 17.**

**BONAFE TRADING HOUSE.**

FOR QUICK SERVICE. FOR QUICK SERVICE.

**APPLEBY'S**

Chapel St, St. Marylebone, London, S.W. (Central 2891). 

**RECEIVERS FOR SALE.**

APPLEBY'S.
Receivers for Sale.—Contd.

YOUR Old Receiver or Component Taken in Part Exchange for New.—Please visit us before purchasing second-hand and obtain expert advice from wireless en-

Bignall 18 years, master in wireless experience; send a list of components or the components them-

By the power of motor, Woodruffe pick-up and spring tension—P.A. microphone and a separate speaker, powerful

tself, and we will quote you by return post thousands of satisfied clients.—Scientific Development

[0216]

SUPER Power, 240V R.C. mains, 3-valve, 6 valve,知名度.Grammeho amplifier, including built-in revised

Super 7800, early edition. We do not buy second-hand.

40w, Super 7800, early edition. We do not buy second-hand.

PHILIPS 2551 All-electric 4-valve Receiver, 2900.

[s] cost £7.10.10s., price £9.10.10s., cost £9.10.10s., price £9.10.10s., cost £9.10.10s., price £9.10.10s.,

Electric traction charger, 50v. G. B. Ferri battery, full working order: the last cheap for quick

8.12.—Will take 211.—Bloomfield, S4, shrewsbury.

PYREXMAN Four, perfect condition ; cost £3.2s. 3d. —Owner leaving for India.

R E. S. D.—Woolworth Av., Addiscombe 1649.

FOE Sale at Emi of October, McMichael super range portable loud, excellent condition. New Batteries.

Models. —Owner leaving for India.

Barnole, [1665

58-1.1.—All-electric Three, latest model, complete with

PHILIPS Type D.Q. Super Power Ampli-

Superhet.—Box. 7707, c/o The Wireless World.

WAT OFFER.—Jiguar Superhet.—Box. 7707, c/o The Wireless World.

D.R. 4-VALVE Electrode Graphophone, oak cabinet.

MARCHPHONES Type D.Q. Super Power Amp.

Valves, as new.—Dawley 617.

$5.—A,—Box. 7707, c/o The Wireless World.

Philips 8-valve Set. 240-volt A.C. Little used.

PHILIPS 2551 All-electric A.C. maker's

9 months uncorrected. new, unboxed valves;

on sale.—Box. 7707, c/o The Wireless World.

MARCHPHONES Portable Model 55. with con-

complete system.—Applied Cree, South Hackney, London

MARCHPHONES Portable Model 55, with can-

15 guineas. no offer. 15 guineas; hard by our knowledge.—Box 7704, c/o The Wireless World.

C.E. Mullard Organs Senior, with valves: £5

MARCHPHONES Portable Model 55, with can-

15 guineas. no offer. 15 guineas; hard by our knowledge.—Box 7704, c/o The Wireless World.

ACCUMULATORS.—BATTERIES.

ZINC.—Best-quality (wires), No. 1. 6d. per doz.;

No. 2. 4d. per doz. for order of 5 or more; price 5l. carriage paid, otherwise 5s. for postage.—British Battery Co.,


[0258]

ACCUMULATOR HIRE

DON'T Buy Dry Batteries, join our service: we keep

on continuous supply with fully charged

B.C. high tension accumulators, by regular ex-

posed, anywhere within 12 miles of Charing Cross for

less than the cost of unreliable dry batteries:

nothing in bay—no deposit, payment on each delivery or by quarterly subscription: if your dry batteries have

been in use for one month or more we deduct guaran-

guarantee will give better and more selec-

tive reception; we also give the same service with in-

tension accumulators or maintain your own at equally

dreadful terms. From this smallest, portable size

upwards, over 10,000 satisfied users. Write or phone

your London's latest, most efficient and complete

models, to our London or branch addresses, or

To:-British Battery Co., Ltd., 53, Hargreaves St., Manchester, A.C. 7, Gumbert Rd., N.W.5. Phone: North 4 250.

CHARGERS AND ELIMINATORS.

P HILIPS'S Safety H.T. Supply Units are Famous

is whether for Reliability and Best Working.

Our New Prices Again Make Them Famous for

[1679]

[1685]

[1689]

[1697]

[1701]

[1705]

[1709]

[1713]

[1717]

[1721]

[1725]

[1729]

[1733]

[1737]

[1741]

[1745]

[1749]

[1753]

[1757]

[1761]

[1765]

[1769]

[1773]

[1777]

[1781]

[1785]

[1789]

[1793]

[1797]

[1801]

[1805]

[1809]

[1813]

[1817]

[1821]

[1825]

[1829]

[1833]

[1837]

[1841]

[1845]

[1849]

[1853]

[1857]

[1861]

[1865]

[1869]

[1873]

[1877]

[1881]

[1885]

[1889]

[1893]

[1897]

[1901]

[1905]

[1909]

[1913]

[1917]

[1921]

[1925]

[1929]

[1933]

[1937]

[1941]

[1945]

[1949]

[1953]

[1957]

[1961]

[1965]

[1969]

[1973]

[1977]

[1981]

[1985]

[1989]

[1993]

[1997]

[2001]

[2005]

[2009]

[2013]

[2017]
**TANNYOS PRODUCTS**

"ALL-ELECTRIC" RADIO-GRAMophone

(See WIRELESS WORLD REVIEW, Sept. 10, 1930.)

**PRICES**

from 45 Gns.

INCORPORATING H. G. SPEAKER

SENIOR MODEL

(on quartered walnut cabinet)

All Electric H.T., G.H.B. walnut transformato.

Cupped moving coil speaker with sealed bass tube.

Pure valve tone, made in two styles-3½ in. H.T. power transformer; 5½ in. H.T. and 10 Watt power output, fitted with illuminated dials.

*Tannoy Products, 1-7 Dalton St., S.E.27*

---

**MAGNUM SHORT WAVE CONVERTOR**

Explore the Short Wave regions. This Unit is adaptable to any set (except Mains Sets) and requires no extra whatever.

**£3:15**

Full particulars include list of leading short wave stations and nearest service centres and components free on request.

**BURN-E-JONES AND COMPANY LIMITED,**

"Magnam" House, 236 Bury Street, High Street, London, S.E.1 Telephone: W.6351.4650.

---

**PURITY OF TONE**

The Lotus L.F. Inter-valve Transfor-

mator is designed to redact low capacity to uniformity. It is housed in a real bakelite case with one of the typical moulding cylinders connected to the core for earthing.

Price... 12/6

From all Radio Dealers.

---

**SOVEREIGN PRODUCTS LTD.,**

52-54, Rosebery Avenue, London, E.1.

Telephone: Chelsea 1011.

---

**CONTROL VOLUME**

**THE "SOVEREIGN" WAY**

Here is a splendidly de-

digned and extremely efficient Volume Control. In Bluetooth Case. Totally enclosed resistance. Pre-

tected from damage, dust and damp. Absolutely constant. Noiseless. Gives perfect control. One hole fixing. Three terminals. Waterproof. 50,000 ohms, 500,000 ohms, 1 megohm. 4/6

---

**RECEIVERS**

**SOVEREIGN:**

Panel Mounts. High-

Frequency Chokes. Wire Wound Re-

sistance. Type Condensers.

Illustrated leaflet describing these products free upon request.

---

**L.L.F. TRANSFORMERS**

Write for illustrated Catalogue to

GARRISON, WHITTLEY & CO., LTD., LIVERPOOL.

---

**CABINETS**

**CABINET**s to Your Own Requirements; quotations by return—H. M. MANN, 1 Stratford St. N.

---

**DIGBY’S CABINETS:**

- **Table models in solid oak and mahogany**—from £4.10s.

- **Pedestal model, with separate battery compartment,**—from £4.12s.

---

**DIGBY'S CABINETS Made to Customers’ Own Designs.**

---

**DIGBY’S CABINETS—Write for new 16-page art cata-


---

**THE WIRELESS WORLD**

October 8th, 1930.
PILOT!

See Pilot Components at the Manchester Exhibition. Don't forget to visit
STAND 126!

PILOT TRANSFORMERS


THE PILOT RESISTOGRAD

A variable resistance with a range from 40 ohms to 10 megoehms, 5/-. Also Condensers, Dials, Grid Leaks, Volume Controls, Switches, Chokes and all Lines. Manufactured by the Pilot Radio and Tube Corporation of St. Lawrence, Mass.

THOMAS A. ROWLEY LTD.,
59, SKINNER LANE, BIRMINGHAM.
Sole Agents for Great Britain and Ireland.

Cabinets.—Contd.
BEAUTIFUL Portable Cabinets, fancy wood and plain, some inlaid. Plumbing under cost, size.

BAND-PASS Coils, complete set; 2/-; c.o.d.
BAND-PASS Three Coils, 47/-; Band-Pass Four, 70/-; Regional One and Band-Pass unit, coils, 17/- each; All D.C. Three, coils, 32/-; D.C. Foreign Lithium's Four, gauged coils with links and condensers, 22/-; coils for all "Wireless World," and other receiver; complete lists post free; trade supplied.

GRAMOPHONES, PICK-UPS, ETC.
LATEST Gramophone Pick-up, new condition. 37/6-1, King's Rd., Birmingham, 1852.

PICTURE RECEIVER APPARATUS.
BAIRD Televisor Kit, month old, used very little, perfect condition, £5. 10/6, T.R. House, Smethwick.

VALVES.
AMPLIFIER Valve.—If you require power you cannot do better than larger size of these (or matched in pairs), £5 15/-.

GRAMOPHONES, PICK-UPS, ETC.
LATEST Gramophone Pick-up, new condition. 37/6-1, King's Rd., Birmingham, 1852.

PICTURE RECEIVER APPARATUS.
BAIRD Televisor Kit, month old, used very little, perfect condition, £5. 10/6, T.R. House, Smethwick.

LOUD-SPEAKERS.

REALISTIC SPEAKERS.—All wood diaphragm in chassis, 20/- each, 17/- each; send today for particulars "How to Build a Wonderful Speaker"; we plan manufacturers complete speakers, ranging from £5 10/- to £25.—"Realistic Speakers," 72, Pennoy rd., London, S.E.1.

MARCONIPHONE Moving Coil, 5-watt type, in complete cabinet, complete with accomodating and switch, £5 (cont. 32/-).—Church, Weston, Vic., Simba Ltd., Simba St., Manchester.

CELESTION CIG. oak, perfect, 5/-—North. 97, Chase Ed., Bromyhal.

CELESTION 5/5 high-grade in cabinet, £5. 10/6, £7, £10.-Village, 12, South Gardens, 1849.

ARXON, later, power, chassis, nearly new; £5.—Jackson, Gardenia, Garage, 6, Unsworthshire.

USED Demonstrator Tubes Only.—Magnavox Moving Coil 100-250 D.C. with 224-500 8-cyl. builder, £3 15/-.—Grosvenor P.E.O. valves, \£1/6 each.—Tealby, 9, Prince of Wales Ter., London, W.C. 3.

SOUND SALES—Magnavox bargains; we have a limited number of recent models, all A.C. 200-volt, complete with rectifier, mains transformer and input transformer, at the amazing price of £5 15/-, nearly 50% off list price; interested partiers will decide not to purchase, c.o.d. if required, subject to being unsold.

SOUND SALES Will Give You the Highest Price for Your Old Speakers for a new Magnavox; all the latest Magnavox speakers at list prices.—

SOUND SALES—Special 25-cycle 100v. transformers, made by Perakore for Sound Sales, who can supply all Tannoy speakers for 25-cycle mains, 30/- extra on limited prices.£.—

SOUND SALES—Special rebuilt Magnavox all A.C. 200-240-volt, complete and fitted with British major transformers, 50-cycle; £2.—Sound Sales, Trevelin Grove, Highgate.
**EPOCH** Moving Coil Speakers.

**EPOCH** — Everybody who heard the Model 90 agreed with the "Observer" that it was the finest speaker on the market. This agreement is based on that it has been the ideal installation in the homes of many satisfied customers. In the opinion of the "Observer," it is the ideal speaker for the home, and has every feature you would expect from a manufacturer who has made it their business to make the best moving coil speaker. The price of $40 makes it possible for you to own a fine speaker for your home. The EPOCH Model 90 is the ideal speaker for every home. The EPOCH Model 90 is the ideal speaker for every home. The EPOCH Model 90 is the ideal speaker for every home. The EPOCH Model 90 is the ideal speaker for every home. The EPOCH Model 90 is the ideal speaker for every home.

**EPOCH** — Everybody who heard the Model 100 agreed that it was the finest speaker in the world. This agreement is based on that it has been the ideal installation in the homes of many satisfied customers. In the opinion of the "Observer," it is the ideal speaker for the home, and has every feature you would expect from a manufacturer who has made it their business to make the best moving coil speaker. The price of $80 makes it possible for you to own a fine speaker for your home. The EPOCH Model 100 is the ideal speaker for every home. The EPOCH Model 100 is the ideal speaker for every home. The EPOCH Model 100 is the ideal speaker for every home. The EPOCH Model 100 is the ideal speaker for every home. The EPOCH Model 100 is the ideal speaker for every home.

**EPOCH** — Everybody who heard the Model 125 agreed that it was the finest speaker in the world. This agreement is based on that it has been the ideal installation in the homes of many satisfied customers. In the opinion of the "Observer," it is the ideal speaker for the home, and has every feature you would expect from a manufacturer who has made it their business to make the best moving coil speaker. The price of $125 makes it possible for you to own a fine speaker for your home. The EPOCH Model 125 is the ideal speaker for every home. The EPOCH Model 125 is the ideal speaker for every home. The EPOCH Model 125 is the ideal speaker for every home. The EPOCH Model 125 is the ideal speaker for every home. The EPOCH Model 125 is the ideal speaker for every home.

**EPOCH** — Everybody who heard the Model 250 agreed that it was the finest speaker in the world. This agreement is based on that it has been the ideal installation in the homes of many satisfied customers. In the opinion of the "Observer," it is the ideal speaker for the home, and has every feature you would expect from a manufacturer who has made it their business to make the best moving coil speaker. The price of $250 makes it possible for you to own a fine speaker for your home. The EPOCH Model 250 is the ideal speaker for every home. The EPOCH Model 250 is the ideal speaker for every home. The EPOCH Model 250 is the ideal speaker for every home. The EPOCH Model 250 is the ideal speaker for every home. The EPOCH Model 250 is the ideal speaker for every home.

**EPOCH** — Everybody who heard the Model 500 agreed that it was the finest speaker in the world. This agreement is based on that it has been the ideal installation in the homes of many satisfied customers. In the opinion of the "Observer," it is the ideal speaker for the home, and has every feature you would expect from a manufacturer who has made it their business to make the best moving coil speaker. The price of $500 makes it possible for you to own a fine speaker for your home. The EPOCH Model 500 is the ideal speaker for every home. The EPOCH Model 500 is the ideal speaker for every home. The EPOCH Model 500 is the ideal speaker for every home. The EPOCH Model 500 is the ideal speaker for every home. The EPOCH Model 500 is the ideal speaker for every home.
COMPONENTS, ETC., FOR SALE

BELLELINE Panel Pots are designed to give excellent, high and low home-constructed set.


FREDK. ADOLPH, Actual Maker, 27, Fitzroy Street, London, W. 1. (under subscription)

FREDK. ADOLPH, Actual Maker, 27, Fitzroy Street, London, W. 1. (under subscription)

SUSTENIC MICROPHONES

For addressing a large audience out-of-doors or indoors through Loudspeaker (via Valve Amplifier or L.F. Singers of Wireless Set), for announcing Gramophone Records through connections of Pick-up, for relaying speech and Musical Entertainment to any distance, and for recording Gramophone Records.

Powerful SPEECH and MUSIC Reproduction with perfect Purity.

Hand Type.

Bendable distance-microphone, yet guaranteeed electrically. Ideal for distant home-construction. Permits absolutely flat background. No matter if distance to microphone or Wireless Set.

Microphone Transmitter, for use with Valve Amplifier or Wireless Set at Operator Reception. Sports Grounds, select parties, in Churches, Theatres, or public hall. Operates at 300 h.p. of L.F. Accumulator through Microphone Transmitter.

Microphone core consists of two levels of electrically connected wire, with a diaphragm. In one end of the diaphragm, a battery is placed. The circuit is completed by a connecting cord. The membrane is made of silk, or silk protected.

Microphone includes replaceable diaphragm; metal or nickel plate; a filter; an adjustable head; a coupling head; excitation, etc.

Powerful Microphone, type No. 16/6.

Pedestal Type.

Bendable Microphones, are absolutely dust-proof, made with a crosswise beaded diaphragm. Made with a crosswise and longitudinal diaphragm; equally, in the form of the Pedestal Type, or Valve Amplifier; Best Transmitting quality of Microphones. Full directions for use of Microphones and diagrams of connections free. Send by return post.

“COMPACTUM” MICROPHONE COUPLER.

Price of召唤 Mahogany box 51 x 4 x 3 inches.

For broadcasting Speech and Music, and for making Announcements by Microphone through Loudspeaker working from Valve Amplifier or Wireless Set. WITHOUT ANY OTHER ACCESSORIES, EXCEPTING MICROPHONE.

If a Valve Amplifier or a Wireless Set is provided with connecting cables, it is possible to establish a microphone system to connect one pair of leads of the “COMPACTUM” Coupler to a good microphone, and the other to the Pick-up terminals of the Amplifier (or Wireless Set) in order to broadcast Announcements right away.

By fixing a Stand Microphone on top of the “Compactum” Coupler, an excellent self-contained SPEECH AND MUSIC RELAY is obtained.

The “COMPACTUM” Coupler comprises a Microphone Transmitter, a Volume Control, a small toggle switch, and a “Compactum” battery of about 600 working hours. If desired, a 2-volt Accumulator can be placed in the box instead of the dry battery.

Price, complete for immediate use-with any good Carbon Microphone, inclusive plugs for the Microphone cord and for connections to Amplifier or Wireless Set.

FREDK. ADOLPH, Actual Maker, 27, Fitzroy Street, London, W. 1. (under subscription)

ADVERTISEMENTS

THE BEST SPEAKER THAT SKILL AND BRAINS CAN PRODUCE

A loud speaker that gives a living interpretation of the Light and Shade of every sound. Luxurious tone and realism in the craftsmanship of its exquisite cabinet.

A loud speaker so inexpensive yet so wonderful, that you will proudly ask all your friends to see and hear.

Your local Bel-Canto dealer can demonstrate it on your own set at home. Illustrated booklet of all Speaker models, Constructors Kit, and the Bel-Canto Radiograms on request.

Director of Sales: Bel-Canto Radio Ltd., Warple Way, The Vale
Acton, W.3. Telephone: Shepherds Bush 1653

Northern Branch: 2 Offices, Market Place, Huddersfield
Telephone: Huddersfield 1653
A RANGE OF MAINS UNITS FOR EVERY REQUIREMENT

**Model W.1.D.**

- Output: 120 V, at 15 mA.
- Price: £3.7.6

**Model W.3.**

- Output: 350 V, at 100 mA.
- Price: £7.10

**Model W.4.**

- Output: 720 V, at 253 mA.
- Price: £10

---

**EXCHANGE.**

S.NAPPY Port Exchange Bureau; send list of your make, stating new requirements, for rack quotations.—3, Blue Hill Mansions, W.6. [1865]

17 (Greece) Anon Chronoscope, and Models from Powerful Modern Battery Operated Set; letters only.—P. 241, Aldershot Rd., E.E.1. [1637]

WE will accept Your Surplus Apparatus (make you a high allowance) in part payment for any new equipment; your enquiry will be dealt with promptly.—Bustock and Sonnill, 1, Westbourne Terrace, B.3.E.22. [1469]

**WANTED.**

STAMPING and Machining Contracts Wanted by N.J.Well Equipped London Factory, brass or aluminium condenser plate, etc., complete plating plant, available.—Apply Jones, 21, Northumberland Ave., London, W.C.4. [1874]

WANTED copies of "The Wireless World" for borrowing dates, May 12, May 19, December 1, 1926, also April 15, 1927—Horns, Blackwood, Hir.-head. [1645]


WANTED, a Brown H.I. loud-speaker unit, 4,000 ohms.—Brinson, 62, Cornish Av., Caversham, Reading. [1490]

**FINANCIAL PARTNERSHIPS.**

SOUTH Coast Established Wireless Business (2 Machines) Needs Partner, to take over management of rapidly growing concern, splendid opportunity for ambitious, capable to invest £500. Salary £25 per week plus share of profits.—Box 7710, c/o The Wireless World. [1685]

**SITUATIONS WANTED.**

SERVICES (Offered to London Retailer, in exchange for small wage, by wireless student, age 22, anxious to learn trade.)—Anderson, 14, Clitheroe Rd., Eastcote, Middlesex, Mon. [1654]

DYESTUFFER, having car and telephone, would undertake work in the South, or near London. —Box 7696, c/o The Wireless World. [1440]

YOUNG Man, aged 24, requires situation, past experience as assistant designer, tester, service engineer, and demonstrator.—Box 7695, c/o The Wireless World. [1637]

YOUNG Man, 25, keen, seeks change, good practical knowledge L.F. amplifiers, would accept nominal wage to 30/- per week, in London, to secure post and experience in wireless trade.—Box 7689, c/o The Wireless World. [1652]

CURTISMAN'S Son, age 18, height 5ft. 10ins., seeks employment, anything, issued Public School, holds U.M.B. certificate in radiotelegraphy.—Box 7680, c/o The Wireless World. [1651]

YOUNG Man, 21, public school, member R.S.O.H., keen amateur transmitter since 1926, desires post, would accept low wage to demonstrate ability.—Box 7708, c/o The Wireless World. [1415]

**BOOKS, INSTRUCTION, ETC.**

FREE: System of Power Transmission by A. A. [1677]


"WIRELESS MASTERS" (BE edition) By Capt. T. Frost. [1677]

A popular practical manual for radio amateurs, technicians, ship and station engineers; how to erect and maintain. Book 1, Insulation, Rs. 10, post free; Book 2, Insulation, Rs. 25, post free. Holmes Park Rd., Rainworth, W.C.2. [1145]

**WIRELESS AS A CAREER.**

FULL TRAINING FOR POST MASTER GENERAL'S CERTIFICATE AND STATION ENGINEERS' WORK. Company recognised equipment including Auto-alarm. Modern laboratories. Low fees. Prospectus free. Apply: TECHNICAL COLLEGE, PARK ST., HULL.

**YOU MUST HAVE ROTOR OHM**

if you want the most perfect Volume Control yet made. Rotor Ohm incorporates all the latest features—Smoothisness—Smoothness, Silence, Accuracy—and are constantly specified by the Technical Papers for all circuits, and standardized in the best receivers of to-day.

**ROTOR ELECTRIC LTD.**

2.3, Upper Rathbone Place, London, W.1.

---

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

**REGENT RADIO SUPPLY CO., Regent House, 21, Bartlett's Buildings, Holborn Circus, London, E.C.4.**

*Phone: Central 3773 (5 lines).*

---

**October 8th, 1930.**

---

PDF compression, OCR, web optimization using a watermarked evaluation copy of CVISION PDFCompressor
Now that Dubilier Condensers have been reduced in price—there's no excuse for not using the best.

Increased demand has made it possible to reduce the cost of producing the world-famed Dubilier Condensers and grid leaks, an advantage which we are handing on to you!

Use also DUMETOHMMS—They've been reduced too!

From 2/6 to 1/9

When you listen to radio with a B.T.H. Cone it is hard to believe you are not hearing the real thing. Throughout the whole range its reproduction is perfect—its tone mellow. Its fidelity makes radio live.

**PRICE £3**

**have a B.T.H. Cone**

The extreme accuracy and constancy of Dubilier Condensers is well known and users are assured that the standard will be maintained. There is now no excuse for using inferior Condensers in your set.

**PRICES**

<table>
<thead>
<tr>
<th>TYPES</th>
<th>00006 to 00009</th>
<th>003, 004, 005</th>
<th>2/3</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 and 002</td>
<td>2/-</td>
<td>006</td>
<td>2/6</td>
</tr>
<tr>
<td>01</td>
<td>-</td>
<td>-</td>
<td>3/-</td>
</tr>
</tbody>
</table>

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

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
EVERY BATTERY BOUGHT gives you a FREE MONTH'S H.T. SUPPLY

A MAGNET Triple Capacity Battery at 13s. 6d. is equivalent in capacity to three standard unit batteries at 7s. 11d. each. This means a reduction in H.T. cost equivalent to at least a whole month's supply absolutely free of charge. All modern high-power receiving sets make a heavy demand on H.T. current. This is why the new wonder battery means so much—a real economy and months of steady power and vigorous life, even under strenuous usage.

WRITE for Folder L.566, which gives full particulars of MAGNET Wireless Batteries and L.T. Accumulators. Sent free on request.

Price 13/6 for the Triple Capacity Unit

The complete range of "MAGNET" Wireless Batteries includes:

TRIPLE CAPACITY TYPE
L.4903, 60 volt Price . . . 13/6

STANDARD UNIT TYPES
L.4920 . . . 60 volt Price . . . 7/11
L.4922 . . . 100 volt Price . . . 12/11

GRID BIAS BATTERIES
L.4995 . . . 6 volt Price . . . 1/3
L.4996 . . . 9 volt Price . . . 1/9
L.4908 . . . 16 volt Price . . . 3/3

TRIPLE CAPACITY GIVES A MONTH'S FREE H.T.

Manchester Show.

The Wireless World

The Paper for Every Wireless Amateur

Wednesday, October 15th, 1930.

Transformers

Look for the new season's models of the World famous Telseu Transformers. They have been entirely redesigned embodying new windings and fitted with earth terminals and shrouded in Genuine Bakelite Mouldings. Ask your dealer for the New Teleen Transformers NOW:

- New Model Radiogrand Ratios 34 & 5-1 Price 12/6
- New Model Radiogrand Soper Ratio 7.1. Price 17/6

Advt. of TELSEN ELECTRIC Co., Ltd., Harborough.


TUNGSRAM

A Quality Valve at a Cheaper Price

Lyons "B.A.T" 750-Watt "Q.M.B." Power Switch

Now Down to 2/-

(Type 730-Terminals - 2/3)


Free

Send a postcard to-day for our free and post free Art Booklet—12 Illustrations—20 Circuits describing uses of this and our many other AC Snap Switches. Many problems solved. All types ready for delivery.

Claude Lyons, Limited,
Head Office—76 Oldhall St., Liverpool.
London:—40 Buckingham Gate, S.W.1.

Burton

Self-Locating Valve Holder

1/- each

Manfactured by C.F. & H. Burton

Progress Works Walsall, Eng.
£650 in cash prizes
Great Free Competition

The makers of the famous Exide Batteries are offering prizes to the value of £650 in a simple Free Competition. The competition, which is open to all, begins and ends with Exide Fortnight - the great annual Battery-buying opportunity when dealers all over the country make special displays of Exide Batteries. Read the rules carefully, then send in your entry.

SEND YOUR ENTRY IN TO-DAY

to "Competition," Publicity Dept., The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
13 Electrical Instruments in ONE

DIRECT READINGS

in AMPERES
-1 milliampere to 12 amperes
0 - 1.2
0 - -0.1

VOLTS
1 millivolt to 1200 volts
0 - 120
0 - 12
0 - -12

OHMS
1 ohm to 1 megohm
0 - 1,000,000 ohms
0 - 100,000
0 - 10,000
0 - 1,000

NO CALCULATIONS OF ANY KIND
NO EXTERNAL SHUNTS OR MULTIPLIERS

The ‘AVOMETER’

COIL WINDING

Those interested in Coil Winding will be glad to know that we are now producing an entirely new range of ‘Douglas’ Automatic Coil Winding Machines. These can be supplied for hand or power operation. They incorporate the most up-to-date improvements for speedy and profitable production. Write for illustrated leaflets or call and see the machines at work.

‘Douglas’ Coil Winding Machines may be purchased on EASY TERMS.

THE AVOMETER is a British first grade instrument giving—at the turn of a single switch—thirteen ranges of readings in Amps, Volts and Ohms. It gives you direct readings, using only one pair of terminals, without external shunts or multipliers, without the need for calculations of any kind.

There is one AVOMETER only. It is portable, precise, complete and self-contained. It measures $7\frac{1}{2} \times 6\frac{1}{2} \times 4$ inches and weighs 5 lbs. It is the best and handiest complete measuring instrument. The AVOMETER is low-priced yet priceless. It will be invaluable—and indispensable to you.

Price £8.8.0. Deferred Terms if desired.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDEP HOUSE, DOUGLAS STREET, LONDON, S.W.1.


Advertisements for “The Wireless World” are only accepted from firms we believe to be thoroughly reliable.
Battery eliminators do away with all the trouble caused by H.T. Batteries. They ensure an absolutely constant H.T. supply and faultless reception. Their initial outlay is their last expense, for the cost of running is practically negligible. Philips Battery Eliminators are made for both A.C. and D.C. mains and are absolutely reliable.

- Type 3005 for D.C. mains - Price £3.17.6.
- Type 3002 for A.C. mains - Price £5.10.0.
- Type 3009 for A.C. mains - Price £5.15.0.

Or on easy hire purchase terms for 10/- deposit.

PHILIPS BATTERY ELIMINATORS

Made by the manufacturers of the famous Philips Argenta electric lamps, all-electric radio receivers, commercial and industrial fittings and neon signs.

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
OCTOBER 15TH, 1930.

TRADE v MARY
accurate reproduction
at a popular price. Almost every home in England can now have its Blue Spot Speaker. Housed in a beautiful walnut case, this fine speaker costs fifty shillings.

Blue Spot 41K This speaker's arrival on the market is a great event in wireless history—accurate reproduction at a popular price. Almost every home in England can now have its Blue Spot Speaker. Housed in a beautiful walnut case, this fine speaker costs fifty shillings. 50/-

71R This new and splendid speaker represents all that is highest in loudspeaker reproduction. The walnut case is a perfect piece of the cabinet maker's art and the driving unit is 66R, the finest unit in the world. Price 95/-

Meet us at:
MANCHESTER RADIO SHOW, OCT. 8-18—STAND NO. 26, MAIN HALL.

THE BRITISH BLUE SPOT COMPANY LTD.
BLUE SPOT HOUSE, 94/96, ROSOMAN STREET, ROSEBERY AVENUE, LONDON, E.C.1

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
THIS SET FOR
£11.15.0
INCLUDING OSRAM VALVES,
GECophone COMPONENTS
AND POLISHED HEAVY OAK
CONSTRUCTOR'S CABINET.

HIRE PURCHASE TERMS.
You can buy your "OSRAM MUSIC MAGNET 4" for cash or on
these attractive HIRE PURCHASE
terms: £1. 3. 6 deposit and 12
monthly payments of 18/6.
Sold by all Wireless Dealers.

STOP WONDERING WHAT TO BUY
THIS IS THE SET FOR YOU!

SEND COUPON TO-DAY FOR POST FREE Constructor's
Instruction Chart. It is full of information—hints and tips—
results of practical tests, and full-size Assembly Charts.
Your H.T. will cost less if you use the Amazing Mazda Rectifying Valves

A Mazda Rectifying valve is the generating station for your Radio equipment. There is a Mazda Rectifier for every purpose; from the small battery eliminator to the power supply unit of a public address amplifier. Designed to take care of the voltage variations which exist on all supply mains, these valves are fitted with the famous Mazda indirectly heated Cathode, thus ensuring extremely long life and preventing the possibility of a short circuit due to a burn out under overload.

**THE AMAZING**

### FULL-WAVE RECTIFIERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Filament Volts</th>
<th>Fil. Ams</th>
<th>Max.R.M.S.</th>
<th>Anode Volts</th>
<th>Max. Output Current</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>UU.30/250</td>
<td>4</td>
<td>1.0</td>
<td>250</td>
<td>30</td>
<td>12/6</td>
<td>£30</td>
</tr>
<tr>
<td>UU.2</td>
<td>4</td>
<td>1.0</td>
<td>250</td>
<td>60</td>
<td>7/6</td>
<td>£4</td>
</tr>
<tr>
<td>UU.60/250</td>
<td>4</td>
<td>2.0</td>
<td>250</td>
<td>60</td>
<td>17/6</td>
<td>£6</td>
</tr>
<tr>
<td>UU.120/250</td>
<td>4</td>
<td>2.0</td>
<td>250</td>
<td>120</td>
<td>22/6</td>
<td>£12</td>
</tr>
</tbody>
</table>

### HALF-WAVE RECTIFIERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Filament Volts</th>
<th>Fil. Ams</th>
<th>Max.R.M.S.</th>
<th>Anode Volts</th>
<th>Max. Output Current</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.30/250</td>
<td>4</td>
<td>1.0</td>
<td>250</td>
<td>30</td>
<td>15/-</td>
<td>£3</td>
</tr>
<tr>
<td>U.75/300</td>
<td>4</td>
<td>2.0</td>
<td>300</td>
<td>75</td>
<td>15/-</td>
<td>£7</td>
</tr>
<tr>
<td>U.60/500</td>
<td>4</td>
<td>2.0</td>
<td>500</td>
<td>60</td>
<td>17/6</td>
<td>£10</td>
</tr>
<tr>
<td>U.65/550</td>
<td>7.5</td>
<td>1.25</td>
<td>550</td>
<td>65</td>
<td>17/6</td>
<td>£15</td>
</tr>
<tr>
<td>U.120/500</td>
<td>4</td>
<td>2.0</td>
<td>500</td>
<td>120</td>
<td>22/6</td>
<td>£20</td>
</tr>
</tbody>
</table>

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

THE WIRELESS WORLD

October 15th, 1930.

Telsen Components now embody greater performance, smarter appearance, but there is no change in price.

Look for the new Earth Transformer on all Telsen Transformers.

Perfected in every detail, Telsen Transformers now represent the embodiment of the very latest practical principles of R.F. Transformer construction. Built to give years of safe and reliable service, the Telsen Transformer is fully guaranteed. Its high efficiency and low cost make it not only a valuable but a considerable saving. Its reliability is a guarantee of its long life.

ALL "TELESEN" TRANSFORMERS ARE NOW FITTED WITH AN "EARTH" TERMINAL.

While this new feature will improve the quality of the reception and greatly extend the range of the receiver, it will be seen to be of immense value in home work, where the grid is reversed in use, to produce lower capability circuits.

Telsen M.F. Chokes described in text. Available in core sizes from 1000 to 4000,000 milliamperes, with cores of iron or copper, also in cored and noncored. Also available, 250 watts, 12 core, 12 each No. 1 core. Price 250 each.

Telsen Fixed Mica Components, housed in genuine Bakelite, in all capacities 75 to 6000, 9 to 7500, 600 to 60000, 6000 to 300000, available in iron and copper. Grid Chokes, 6 to 60000, 6000 to 30000, also available with and without iron cores. Price each 10.

NEW TELSEn COMPONENTS

TELESEN VALVE HOLDERS.

Patent No. 580814.

Valve Holders, embodying powerful metal spring contacts, allowing valve to be inserted or withdrawn easily, with an excellent spring support. Suitable for valves of all types.

Also in a molded and price.

Telsen Electric Co., Ltd., Birmingham.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The General Electric Company can fairly be called pioneers of the indirectly heated valve.

*Wireless World*, Sept. 17th, 1930

**The FIRST indirectly heated valve—was an OSRAM**

The LATEST OSRAM Indirectly Heated Valves still lead because they combine all the essential points of an A.C. valve—

- Absolute Reliability.
- Ample and LASTING Electron Emission.
- Stability in use.
- High Electrical Efficiency.
- No hum.
- Absence of parasitic noises.

Write for Booklet "OSRAM VALVES for A.C. Mains & Rectifying Valves"

OV 5568.

USE THESE HIGH VOLTAGE CONDENSERS—THEY NEVER LET YOU DOWN

DUBILIER

How often have you wished for an R.K. which would work without extra power? Now you can have it—the new R.K. Permanent Magnet Model. Just connect it to your set and it will give you reproduction of the tone and quality which have made R.K. models famous ever since their introduction.

There are two other R.K. Reproducers, both obtainable complete in handsome cabinets of polished oak, mahogany or walnut; the Senior with built-in rectifier for use with A.C. mains from £20, and the Standard Senior from £16 16s., as well as the Junior Model, without cabinet, £4 15s., all of which are obtainable through your radio dealer.

Ask your dealer for particulars of hire purchase terms.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
SOLVE
Your Power Supply Problems

For RECEIVERS requiring
150 v. 15 m.a. 300 v. 50 m.a.
200 v. 40 m.a. 400 v. 40 m.a.
Etc., Etc.

M-L ANODE CONVERTERS

<table>
<thead>
<tr>
<th>Operate from</th>
<th>for</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 v.</td>
<td>The Mains-less Radio User</td>
</tr>
<tr>
<td>12 v.</td>
<td>Country Houses</td>
</tr>
<tr>
<td>32 v.</td>
<td>Ships</td>
</tr>
<tr>
<td>50 v.</td>
<td>Yachts</td>
</tr>
<tr>
<td>100 v.</td>
<td>Radio Users with D.C. Mains</td>
</tr>
<tr>
<td>200 v.</td>
<td></td>
</tr>
</tbody>
</table>

Write for “The Book of the M-L Rotary Transformer,” which deals with all machines of our manufacture.
THE M-L MAGNETO SYND. LTD.,
Radio Dept., COVENTRY.
Telephone: 5091.

For RECEIVERS, AMPLIFIERS, RADIO-GRAMS requiring
300 v. 120 m.a. 400 v. 150 m.a.
500 v. 100 m.a. 600 v. 40 m.a.
Etc.

M-L D.C. to D.C. ROTARY TRANSFORMERS

<table>
<thead>
<tr>
<th>Operate from</th>
<th>for</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 v.</td>
<td>Public Address Work</td>
</tr>
<tr>
<td>24 v.</td>
<td>Large Country House Installations</td>
</tr>
<tr>
<td>32 v.</td>
<td>Ships</td>
</tr>
<tr>
<td>50 v.</td>
<td></td>
</tr>
<tr>
<td>100 v.</td>
<td></td>
</tr>
<tr>
<td>200 v.</td>
<td>Installations in D.C. Districts</td>
</tr>
</tbody>
</table>

Write for Illustrated Lists describing above; also—
M-L Machines for Transmitting; M-L Machines for Telecasting; M-L Hand-driven Transformers; M-L D.C. to A.C. ROTARY TRANSFORMERS.


Advertisements for “The Wireless World” are only accepted from firms we believe to be thoroughly reliable.
Non-inductive Condensers

the Latest
T·C·C
Development

Here's the latest T.C.C. development—a Non-Inductive Condenser at no extra cost. The advent of the Screened Grid Valve has emphasized the need for a condenser having the minimum of impedance in order that small high frequency currents may be readily passed. How the new T.C.C. Non-Inductive Condenser achieves this result is shown on the curve above. The ordinary 1 mfd. condenser has a resonant point at about 900 metres whereas in the new T.C.C. Non-Inductive Condenser this has been reduced to nearly 500 metres. Be wise: always use

VARLEY ALL-ELECTRIC RADIO-GRAMOPHONE (A.C. or D.C.)
Price 85 Guineas.
(Complete with Valves and Royalties.)
Available on hire purchase terms.
Write for Section A of Varley Catalogue for full particulars of Varley All-Electric Radio-gramophones and Receivers.

Always ahead in Condenser Design

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
THE RADIO SENSATION OF THE YEAR

TESTS EVERYTHING!

VALVES
FILAMENT
ANODE & GRID
COMPONENTS
AND CIRCUITS
AS WELL AS
L.T., H.T. AND
MILLIAMPS

Here is the All-in-One Radiometer at a price that makes it an investment. A fool-proof instrument that tests every single thing on your set, and gives you the solution to the most baffling problems. A real Sherlock Holmes, this wireless aid.

Ask your dealer to show you the All-in-One Radiometer. See him demonstrate how simply you can test your own components. Watch him plug in a valve. See the finger on the dial say "O.K." or "Dud." Notice how the simple attachment of the leads provided will find that weak spot in the circuit. Have him couple up the All-in-One to a battery. The reading is as clear as clock time.

Now is the time to buy the All-in-One Radiometer. An accurately calibrated instrument that will save you pounds in cash and hours in time. Ask for our booklet or write direct to Pifco Ltd., Pifco House, High St., Manchester

OBTAINABLE THROUGH ALL GOOD WIRELESS DEALERS.

Advertisement for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
INSPIRED LEADERSHIP!

For All Condensers

- Precision
- Epitomised Ingenuity
- Perfect Balance
- Exquisite Craftsmanship

FORMO

THE INTELLECTUAL LEADERSHIP

PRESCIENCE

PRACTICAL ACCURACY

PERFECT BALANCE

EXQUISITE CRAFTSMANSHIP

FOR ALL CONDENSERS

Easy Readin'

No Crackle

A truly phenomenal drum and illuminated type condenser with internal metal.

Dial...

With one condenser...

With two condensers...

BRITISH LEADERSHIP

SUPPLIERS TO THE

LEADING SET MAKERS

OF THE COUNTRY

CATALOGUE FREE.

GERRARD 1863.

Golden Sq., Piccadilly Circus, London

TILTRACK

STEEL STORES SYSTEM

THIS YEAR-NEXT YEAR

Sometime,

NEVER!

Is that the kind of stores yours is?

Why not install TILTRACKS - the stores where goods can be found instantly, and handled with ease and rapidity? They are a big advance on old-fashioned dark and dismal wooden shelves. They save many pounds per year.

THE "BENCHRACK" (Tiltrack Principle)

A real help for storing small parts such as Terminals, Nuts, Washers, Insulators, etc. Used on the work bench, it enables small parts needed for jobs in progress to be stored where they are immediately to hand. All the trays are tilted, so that the smallest parts can be seen at a glance, and the front faces of the trays are rounded so that the smallest parts can be swept up the slope with the fingers of one hand. Each tray is provided with patent hinging partitions which can be moved quickly to make larger or smaller compartments. Being all steel, they greatly facilitate stocktaking and being all steel there is no danger of fire. The Experimenter will do his jobs much quicker and with greater pleasure, and the Factory will save many pounds per year by installing this Benchrack.

30/- F.O.R.

"TILTRACK JUNIOR"

This all-steel rack is designed to hang against a wall or other convenient position, and is a most excellent rack for storing small parts. It is supplied complete with white canvas protective cover to keep out the dust. All the trays are tilted and have movable partitions.

30/- POST FREE.

THERE ARE MANY MORE STYLES OF "TILTRACKS." PLEASE SEND FOR LISTS.

Particulars from Manufacturer & Patentee:

BERTRAM THOMAS, Worsley Street, Halton, MANCHESTER.

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

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

Advertisements

First

The Amazing Pertrix Non-Sal Ammoniac Dry Battery

Now...

The Improved Pertrix Accumulator

You have already been introduced to the Pertrix Dry Battery—and NOW, the Pertrix Accumulator is here—here to give you the same sterling service as its well-known stable companion. The makers of Pertrix Accumulators have 40 years’ experience behind them in the manufacture of storage cells, and these super life accumulators embody all the most up-to-date features—features that were originated by the designers, and have since become standard practice.

Ask your dealer, or write for complete list—it gives full particulars of all types.

THE IMPROVED

PERTRIX

Super Life Accumulators

"Built for Service"


"The batteries you can trust"

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

Type: PXG2.
Capacity: 20 a.h. at 20 hr. rating. Price 9/6.
And more than 100 other types—complete list on application.
OUTSTANDING MAINS UNITS

UNRIVALLED ANYWHERE for OUTPUT, SIZE and PRICE

OUTSTANDING MAINS UNITS

MAINS UNITS

ANYWHERE

for

OUTPUT, SIZE

and

PRICE

MADE ANY SET

ALL-MAINS,

standard or

portable.

This remarkable new Model A.C. 188 ensures constant High and Low Tension power entirely free from hum. It is as simple to use and as compact as an H.T. Battery and just as safe. The output is the highest of any Unit at anything like the size and price. This fine instrument ensures ALL-MAINS economy and quality with any type of receiver.

Tappings: 2 Variable - 0/100 and 0/120 Volts; 1 Fixed - 150 Volts. Output 25 m/A. Combined trickle charger for 2, 4 and 6 Volt L.T. Accumulators. Incorporating the Westinghouse Metal Rectifier. PRICE £6. or 10/- deposit and the balance in easy monthly installments.

MODEL A.C. 72. This efficient H.T. Battery Eliminator incorporates the Westinghouse Metal Rectifier and is suitable for any three-valve set. Three fixed tappings of 90, 150 and 120/150 Volts. Output 15 m/A. PRICE £3. 17s. 6d. or 10/- deposit and the balance in easy monthly installments.

MODEL A.C. 16 is the old favourite H.T. Battery Eliminator and employs Full-Wave Valve Rectification. Suitable for any Set from one to five valves. One fixed tapping of 150 Volts and two fixed of 150 and 100 Volts. Output 15 m/A. PRICE £4. 10s. or 10/- deposit and the balance in easy monthly installments.

ALL UNITS GUARANTEED FOR 12 MONTHS.

ASK YOUR DEALER OR WRITE THE MAKERS for FOLDER 55.

DUAL ASTATIC H.F. CHOKE

will make your speaker reproduce all the stations broadcast which your set is capable of receiving. There will be no more unaccountable missing of parts of the programme, or of complete loss of distant stations on certain wavelengths. Every programme will be a big hit without misses or "blind spots," and the "Dual Astatic" will ensure this more than any other H.F. Choke can.

See the "Dual Astatic" leaflet for technical proof—ask your dealer or us for a copy.

Designed to overcome energy absorption on Broadcasting wave lengths. Particularly effective with screened grid valves: affords avoidance of low frequency feedback: gives ease of bias voltage application to second valve. Absolutely free from resonant peaks: effective choking uniform over Broadcasting wave lengths 200 - 2,000 metres.

Resistance, D.C. 650 ohms. Inductance, 60,000 microhens. Dimensions: Base 2" square; 3½ high.

List No. 7/6

"MADRIGAL" WORKS, PURLEY WAY, CROYDON.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
HERE IS THE OFFER
YOU HAVE BEEN WAITING FOR
NEW RADIO FOR OLD
WE WILL BUY YOUR OLD SET

IMAGINE the finest 3-valve Set you have ever heard—then add the advantages of Short Wave Reception and you have some idea of the enjoyment you will derive from the possession of an "Empire Link" Short Wave Receiver. The "Empire Link" Receiver employs a wonderfully efficient circuit which covers all wavelengths so that you can tune in every broadcasting wavelength in the World. In addition to the normal and higher wavelengths you can enjoy programmes from the wonderfully efficient Short Wave Stations all over the World. And—you can buy your "Empire Link" now. No need to wait. We will take your old Set in part exchange. Just fill in and post the coupon below and we will send you full details of our generous part exchange offer of new radio for old.

The "Empire Link" Short Wave Kit comprises every part necessary to build the complete Receiver. Cabinet, Components, Valves and Coils for all wavelengths from 15 to 2,000 metres.

Complete details for construction and operation accompany every "Empire Link" Short Wave Kit, and it is so easy to build that you can undertake it even if you have no technical knowledge whatever.

Cash price of the "Empire Link" Short Wave Kit complete is only 11 guineas, and we will buy your old Set in part exchange. Or if you wish you can purchase your "Empire Link" by easy monthly payments of 21/-.

Just fill in and post the coupon now.

This is the complete Receiver when built in accordance with our easy-to-follow plan.

To Ready Radio (R. R. Ltd.),
169, Borough High Street, London Bridge, S.E.1.

I wish to purchase one of your new 1931 "Empire Link" Short Wave Kits for which I enclose
(a) 11 guineas for complete Kit.
(b) £3. 6. 6 for complete Kit (except for valves).
Please send me full particulars of
(c) Your Part Exchange System.
(d) Your Hire Purchase Terms.
(Cross out whatever of the above does not apply.)

Name
Address

* Note: Part Exchange does not apply to Hire Purchase System.

Advt. of READY RADIO (R. R. LTD.), 169, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.

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

The popularity of the C.A.V. Jelly Acid Battery is not explained by the mere fact that it contains jelly electrolyte—there are other jelly electrolyte batteries! There are three reasons why the C.A.V. is the most effective non-spillable battery yet produced:

The Jelly Acid. Its composition is unknown outside our own laboratories. It maintains perfect contact with the whole of the plate surfaces, yet allows unrestricted gassing when on charge. It is chemically pure, and allows maximum conductivity.

The Container. Of special construction, contains a baffle plate and moistening pad, which serves the triple purpose of arresting acid spray during charge, feeding the electrolyte with moisture to maintain an even consistency, and definitely confines the jelly to the plate chamber.

The Plates. These have been specially developed to give the utmost possible capacity when used with C.A.V. Jelly Acid.

The Whole. The C.A.V. is the lightest, cleanest, and most compact non-spillable on the market. By avoiding cumbersome acid traps, the greatest possible capacity for bulk is obtained.

ACTON.

Obtainable from our Depots and Battery Agents throughout the country and from all Radio Dealers.

TO TRACE
DISTORTION

It requires the accuracy and sensitivity of a Weston Mil-Ammeter to tell you exactly at which particular stage in your receiver distortion begins.

Try it in your H.T. leads in turn. Should the needle kick strongly either backwards or forwards when signal strength varies, it indicates transformer distortion, over-saturation of the valve, incorrect grid bias, filament temperature or H.T. Potential.

A Weston Mil-Ammeter is the only instrument sufficiently accurate to be of any value to you when making readings. Weston Instruments are standard throughout the world over, and since 1888 have been unrivalled for scientific precision, uniform accuracy and unvarying reliability.

Weston Model 585 Mil-Ammeter Price £3 10s.

WESTON ELECTRICAL INSTRUMENT CO., LTD.,

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

Magna vox

at a Lower Price

Once again Magnavox sets the pace in design, quality and performance. Hear either the new Senior Model with 10 1/2" cone or the Junior Model with 7 1/2" cone and you will be convinced that Magnavox gives the finest reproduction and the utmost in value. Remember that Magnavox originated the moving coil speaker and that Magnavox engineers have produced in the new Senior and Junior models speakers which outclass all other types and a new realism in tone and full frequency response.

You have the choice of models for either A.C. or D.C. field excitation both with 7 1/2" or 10 1/2" cones. WHEN THERE IS ANYTHING NEW AND OUTSTANDING IN DESIGN MAGNAVOX WILL ALWAYS BE FIRST IN THE FIELD.

Junior Models

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>110-190 D.C.</td>
<td>£5.76</td>
</tr>
<tr>
<td>118</td>
<td>150-300</td>
<td>£5.76</td>
</tr>
<tr>
<td>210</td>
<td>6-12</td>
<td>£8.76</td>
</tr>
<tr>
<td>410</td>
<td>105-120 v. 50 cy. A.C.</td>
<td>£8.96</td>
</tr>
<tr>
<td>414</td>
<td>220-240</td>
<td>£8.96</td>
</tr>
</tbody>
</table>

Senior Models

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>110-190 D.C.</td>
<td>£6.10</td>
</tr>
<tr>
<td>119</td>
<td>150-300</td>
<td>£6.10</td>
</tr>
<tr>
<td>211</td>
<td>6-12</td>
<td>£6.10</td>
</tr>
<tr>
<td>411</td>
<td>105-120 v. 50 cy. A.C.</td>
<td>£9.15</td>
</tr>
<tr>
<td>415</td>
<td>220-240</td>
<td>£9.15</td>
</tr>
</tbody>
</table>

The Rothermel Corporation Ltd.
24, Maddox St., London, W.1.
Phone: Mayfair 0578/9.
Continental Sales Office: 27, Quai du Commerce, Brussels, Belgium.

Better to Buy a Magnavox Now than to Envy one Later
ADD RANGE & POWER TO YOUR SET—FIT

A.C. VALVES
at half the usual cost!

Fit A.C. Valves in your Receiver and its sensitivity, range and volume will increase enormously. There is no need to pay high prices—fit Dario. Highest quality and longest life at lowest cost!

<table>
<thead>
<tr>
<th>Type</th>
<th>Indirectly Heated Screenodian (Screened Grid)</th>
<th>Indirectly Heated Super H.F.</th>
<th>Directly Heated Mag. Power (low impedance Output Valve)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplification Factor</td>
<td>1,000</td>
<td>40</td>
<td>8.5</td>
</tr>
<tr>
<td>Mutual Conductance</td>
<td>1mA/V</td>
<td>2mA/V</td>
<td>3.8mA/V</td>
</tr>
<tr>
<td>Price</td>
<td>18/6</td>
<td>10/6</td>
<td>10/6</td>
</tr>
</tbody>
</table>

Send for full list of Dario Valves.

IMPEX ELECTRICAL LTD., Dept. C, 538, High Road, Leytonstone, E.11.

THE ELEMENTARY PRINCIPLES OF WIRELESS TELEGRAPHY AND TELEPHONY

By R. D. BANGAY.


For many years this volume has been the standard book of instruction for wireless beginners and students. The progress of wireless during recent years has made necessary the New Edition, which covers the whole subject in a clear and simple style and deals thoroughly with modern developments. Attention is given to the theoretical elements of electricity and magnetism, the dynamo and the properties of waves.

Many new chapters have been added and descriptions of modern circuits have also been included.

A leaflet giving full particulars of the volume and a synopsis of chapters will be sent on request.


From all leading Booksellers or direct from the Publishers:


Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Here are some features of last year's outstanding success—the J.B. Universal Log Condenser.

It is exceptionally rigid, with frame and vanes of extra hard brass. Its insulation is highly efficient, and stray capacities and eddy-current losses are minimised by cutting away all surplus material.

A special feature lies in the steel Centre Spindle, which is adjustable for length. This is particularly useful for ganging and for attaching to J.B. Thumb or Drum Dials. The bush is specially designed to enable any panel from 1/8" to 1" to be used.

Ball-Bearing centre spindle. Pigtail connection to rotor.

**PRICES:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.005</td>
<td>9/6</td>
</tr>
<tr>
<td>0.0025</td>
<td>8/9</td>
</tr>
<tr>
<td>0.0015</td>
<td>8/-</td>
</tr>
<tr>
<td>0.0005</td>
<td>9/-</td>
</tr>
</tbody>
</table>


**Advertisements**

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Electric Gramophone Motor
for better Music in the Home!

No winding
Just switch on!

Why keep on laboriously winding that clockwork gramophone, when, with the aid of the B.T.H. Electric Gramophone Motor, you can easily convert it into a first-class electrically-operated instrument? Easily fitted—only one hole to cut, will operate from your lighting supply, even speed—never runs down, plays 900 records for one unit of electricity. Costs only £3-3-0 from all high-class dealers.

The British Thomson-Houston Co. Ltd.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The British Champion beats all comers!

The ORMOND
4 POLE ADJUSTABLE LOUD SPEAKER UNIT

In performance this Ormond Unit is a recognised triumph. It reproduces music and speech with life and sparkle which gives vivid reality, and handles big volume without the least distortion.

All working parts are enclosed in a beautifully polished Bakelite cover of Walnut colour and the terminals are heavily plated. The care taken in its design and manufacture result in an extraordinary degree of sensitivity, yet it is produced by modern methods at an extraordinary low price.

Remember it is an Ormond production and worthily upholds a great and proud reputation.

The ORMOND CHASSIS & CONE
Constructed of aluminium, ribbed to give absolute rigidity, and incorporating a cone of specially selected material.

Two sizes are available:
- Small Chassis and Cone, 11½ inches diameter, Price 7/6
- Large Chassis and Cone, 16½ inches diameter, Price 11/6

THE ORMOND ENGINEERING CO. LTD.,
Ormond House, Rosebery Avenue, London, E.C.1
Telephone: Clerkenwell 5334/56 and 9344/5/6
Telegrams: "Ormondegi, Smith."

We are exhibiting at the MANCHESTER RADIO EXHIBITION, STAND 64, Main Hall.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
When buying Valves - Remember!

THE B.B.C.
Metropolitan Police—
Imperial Airways —
Empire Wireless
Communications —
Trinity House Light-
ships and Beacon
Stations — Croydon
Control Tower, and
Large Passenger
Liners—all use
Marconi Valves.

MARCONI
VALVES
BUY THE VALVES THE EXPERTS USE!

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

A German Experiment.

ONE of the German broadcasting stations has recently conducted an interesting experiment which provides material for reflection by our own B.B.C. Stuttgart arranged a mixed programme of gramophone music and items broadcast by studio artists, and listeners were asked to distinguish between the two types of transmission. Of 16,274 listeners who participated in the test and sent in their results, only 52 were able to distinguish correctly between the transmissions, all the remainder having failed to sort out consistently the items reproduced from records from those by living artists.

We would suggest that, without necessarily making any announcement to the effect, the B.B.C. might from time to time introduce records in their programmes in order to see whether the public is able to distinguish the difference, and we are inclined to think that the majority of listeners would often prefer a gramophone record performance by first-class musicians to a first-hand rendering by such poorly qualified amateurs as sometimes appear in the present programmes.

Perhaps we should add that the B.B.C. would have to be a little more careful in their methods of transmitting records than at present if they were to hope to avoid detection of the experiment by the listener. It would be necessary, for instance, to see that the pick-up was not dropped on the record; needle scratch would have to be eliminated more effectively, and we would particularly recommend that the gramophone motor should not be allowed to run down whilst a record was being played.

The "Wireless World Four."

In this issue a description is included of The Wireless World Four, a receiver to which we would like to draw special attention. Readers of The Wireless World are familiar with a number of new features in receiver design which have been introduced or popularised through the columns of The Wireless World during past months, and it will be found that in this new set an endeavour has been made to incorporate all the more important of these features, the result being a receiver of unusually attractive design and having a performance which should satisfy the most fastidious as regards selectivity, range, and quality.

Single-dial tuning with band-pass circuits is incorporated, and we believe that, in particular, the set will prove a revelation to those who take an interest in quality reception of distant transmissions.

The complete design has been produced in the form of a radio gramophone, including the turntable and loud speaker, and the equipment is entirely mains operated. Those who may want to build the chassis of the receiver apart from the gramophone can do so, as the design is self-contained and lends itself admirably to separate construction.
Modern Principles in Practice.

ALL that is modern in radio practice has been brought together and embodied into this receiver. Since last winter some half-dozen new features have been theoretically, and, in some cases, practically, exploited by the contributors to the pages of this journal. This set represents a practical interpretation of all these new principles working as they should, and is put forward at a time of the year when longer evenings and better conditions give added interest in foreign-station reception.

While the set was developed during the summer months publication was delayed until after the Show in order that new components might not be overlooked and to be quite sure that the design was entirely up to date, and that no feature would be rendered obsolete by new developments revealed at the exhibition. A preliminary notice of the set appeared in the exhibition issue (page 316, September 24th), and no change has been made in its specification.

A brief summary of the advantages resulting from the inclusion of the many new features is given in support of the various details shown in the circuit diagram.

Band Pass.

Proof that band-pass tuning is an essential to modern receiver design is very convincing when one first operates a set in which it is included. At no point over the condenser scale do we find excessively sharp tuning, neither does any station occupy more than about two and a half divisions of the dial. The condition of a steadily declining signal as we detune is not met with, and in its place a sudden disappearance of the signal occurs as soon as a limited band is passed. As regards station getting and interference, the set is one of great selectivity without noticeable sacrifice of range, and, what is more important, without producing a sharp, peaky tuning where the quality of reproduction with a loss or accentuation of bass depends so much upon the precise setting of the tuning condenser when listening to a distant station.

Band-pass tuning consists of a loose coupled aerial circuit in which the extent of coupling is governed by the value of a capacity or inductance common to both circuits. Capacity coupling is chosen in this instance primarily because it facilitates ganged control of the tuning condensers, and does not entail the possibilities of the differences in inductance value which would be fatal to the successful ganged tuning. Reference to the circuit diagram will reveal that condensers are, moreover, essential in connection with grid biasing of the H.F. valves. In order that the wave-range covered will extend from 150 to just over 570 metres, the inductance value of the tuning coils was adjusted to 200 microhenrys.

While several values of coupling condensers were used between the two circuits for the purpose of test it was found that the best results were obtained with a capacity of 0.01 mfd. This value, combined with tuning coils of 200 microhenrys, places the 10 k.c. peak separation in a central position of the tuning scale. Using log-law tuning condensers as the most convenient, and in which the relationship between frequency change and dial divisions is slightly greater towards the zero end of the scale, than the maximum, an apparent sharpening up of the tuning occurs as the zero end of the tuning scale is approached. This observation is made bearing in mind that the peak separation becomes less as the wave-
**Pre-H.F. Volume Control.**

Disastrous interference results in the H.F. amplifier when a certain limited value of signal voltage applied to a screen-grid valve is exceeded. This is due to the fact that, unlike the triode, the plate current of the screen-grid valve is only proportional to the grid voltage within a very limited value of grid swing. When the anode current is no longer proportional to the grid voltage, rectification occurs, resulting in the modulation of other carriers, and interference between the frequencies is created. It is essential, therefore, to give no more input to the H.F. valves than they can handle without appreciable rectification, bearing in mind, also, that greater signal input will overload the detector.

Pre-H.F. volume control is essential, and, while the first valve may be capable of handling the input signal, no provision is made in a second H.F. stage for a magnified signal input to be dealt with. While it might seem an exceedingly simple matter to regulate the amount of signal passed from the aerial to the set, the problem is one most difficult of solution. True, a small variable series condenser in the aerial regulates the input, but this upsets the ganging of the filter, while zero on this volume control condenser by no means gives an extinction of signal. A differential condenser in the aerial which links the first tuned circuit to a varying extent between the aerial capacity and a condenser equal in capacity to that of the aerial gives a good control of input, but here, again, calculation reveals a small change in the capacity value thrown on to the tuned circuit sufficient to influence ganging near the minimum position of the tuning condenser. A potential divider, as shown in the circuit diagram, is the only alternative method. Such a potentiometer suffers from two drawbacks. It affects tuning, and loads the tuned circuit, but the magnitude of these effects is probably less than with other methods of volume control. The potentiometer must be as low in value as possible, or the ganged tuning will be upset as a result of suddenly removing the grid to earth capacity of the valve when the potentiometer slider is moved from the maximum position. The low value of 50,000 ohms chosen may be queried, but it is pointed out that the throwing of a 50,000-ohm load across the input tuned circuit made no audible difference to the reception of a weak station. This reveals the fact that the dynamic resistance of the tuned circuits is low, which, while being true, is not without its advantages, and, in particular, should it be mentioned that the valves are capable of handling a greater input without the selectivity being entirely crippled by valve overloading when the dynamic of the tuned circuits is kept within bounds.

Before going farther, it may be pointed out that this method of volume control functions admirably when receiving distant stations like Vienna, Budapest, and Katowice, so that its effect on gain, as well as on the tuning, must be insignificant. The potentiometer is noiseless in action, and to the ear the change of volume is linear.
over the range of control, while there is no variation of pitch.

A variable high resistance is sometimes connected in the grid lead as a means of regulating volume, so that a potentiometer is formed through the grid to earth capacity of the valve. This method does not give a position of zero signal, and demands the use of a very high resistance, which affects tuning.

**Regeneration Control.**

In addition to the volume control, another knob is brought on to the front of the set, which, although by no means essential, helps one to get that last ounce out of distant reception. Over a limited range it controls the screen voltage, and therefore regulates regeneration within the H.F. stages. The merit of the screen-grid stage is that the signal is always being augmented by reaction brought about by the interelectrode capacity. The lower the value of interelectrode capacity and the less the regeneration the better, in that the amplification brought about by the valves' characteristics can reach a greater figure before being obliterated by oscillation. On the other hand, the reaction which is ever present goes a long way to nullify any advantage resulting from the use of inter-valve couplings of high efficiency. It is curious to note that the signal voltage fed to the detector is almost unaffected by the substitution of what might be considered "bad" coils so long as precise inductance matching is maintained.

**Single Dial Control.**

Absence of trimmers across the tuning condensers may call for comment from those acquainted with the improvement that sometimes results when a little added capacity is thrown on to one or other of the tuned circuits. Assuming that the coils are all exactly matched, as may be checked with oscillator and anode-bend meter, if home-made, it only becomes necessary to introduce trimming capacities when the inter-valve couplings are sharply tuned and the stray capacities across the tuned circuits differ. The inter-valve couplings used are arranged for maximum amplification and the coils are not tapped down with the object of improving selectivity, this being taken charge of by the band-pass filter. In consequence, the H.F. stages will accept signals over an adequately wide tuning range to render the need for capacity trimming unnecessary. Incidentally, it is a fact that the stray capacities thrown across the tuned circuits by the aerial, the volume control, the screen-grid valves and their choke feeds, and the detector, with its tapped connection, are approximately equal, as was revealed by tuning up every stage to the best position and watching an anode current meter in the detector circuit. All condensers were found to have been set in identical positions.
The Wireless World Four.—

One-knob switch control introduced into the original Foreign Listener's Four is retained and has been simplified. By this means the coils are wired as easily as for single range tuning, the switch and its connections being part of each coil.

Screening is generous, but in every particular essential. Only so long as all the coil covers and valve covers are pressed right home is a strong loud speaker signal produced from well over a score of Continental stations. With a loose cover stations will still be heard, but reduced in strength, and it will be noted that maximum screen grid volts cannot be applied. A feature of the design is the complete barrier between H.F. and L.F. signals above and beneath the baseboard. Screening of the H.F. apparatus is rendered complete by including the coupling condensers within the coil compartments.

Power Grid Detection.

While grid detection is usually favoured for distant station reception owing to the fact that it is much more sensitive with small voltage inputs than the anode bend detector, it can be shown that power grid detection may be superior to the anode bend method on the score of both sensitivity and quality. Ordinary leaky grid detection results in a loss of the higher audio frequencies owing to the values of leak and condenser chosen; these being essential to good sensitivity. When the signal reaches more than certain critical values, however, anode rectification in opposite phase takes place, so that whatever the voltage input linear rectification never results.

Grid condenser and leak values of 0.0001 mfd. and 250,000 ohms are adopted in order that the resultant time constant may permit of the signal variations being correctly followed. In addition a voltage of 150 is applied to the anode of the detector in order to give a straight anode characteristic and permit of the valve delivering generous output. A departure is made from the customary practice of connecting the low-resistance leak across the grid condenser, owing to the condenser connected on the lower side of the coils, but the value of the leak, incidentally, is far too high in value to influence the tuned circuit.

Filter-fed Intervale Coupling.

With an initial voltage of nearly 300 adequate resistance decoupling and resistance feed may be introduced into the anode circuit of the detector while still maintaining a high voltage on the plate of the valve. Resistance feed to the intervalve transformer prevents its primary inductance being impaired, as would be the case if passing the heavy anode current of the power grid detector. By-pass condensers associated with an H.F. choke total to the value of 0.002 mfd. This considerably increases the detector efficiency by cutting down the out-of-phase feed. Power Pentode Output.

Maximum low-frequency stage gain results from the connection of the intervalve transformer as an auto-coupling. By this means a higher transformer ratio results than that as expressed from primary to secondary alone. At the same time, in addition to giving a higher input to the pentode a frequency characteristic is produced, slightly falling in the upper register. This is easily compensated for by the pentode valve which, with its brilliant output, normally augments the upper register. In the output stage a valve is chosen capable of an output of nearly 2,000 milliwatts (compare with a good triode, which handles the same signal input and gives an output of 900 milliwatts).

Compensated Output and Tone Control.

Owing to the fairly high working impedance of the pentode it is normally found that the transmission
The diagram shows dimensional layout of the components on the top and underside of the baseboard. Details are also given of the coil construction and the tubular valve screens.
becomes high-pitched. This is due to the fact that the impedance of the loud speaker only becomes comparable with that of the valve at the higher frequencies. For maximum transfer of power to the loud speaker the latter should have an impedance value about twice that of the valve at frequencies in the middle register. On the other hand, overloading of the valve, with consequent distortion and a limiting of its signal handling capacity, would result were an output transformer ratio adopted, which would excessively raise the loud speaker load.

It has been shown that the pentode behaves like a fairly high impedance triode, and that a two-to-one step-down ratio matches the valve to the average loud speaker, taking the impedance of the latter at its value in the middle register. Having thus obtained good reproduction of the lower notes, excessive momentarily anode voltages, dangerous to the pentode, may result at the upper frequencies, where the impedance of the loud speaker is excessive. This is remedied by shunting a condenser across the output auto-transformer, the impedance of which falls as the frequency rises. By this means excessive voltages are shunted away while the effectiveness of this condenser is regulated by a series resistance.

Complete Decoupling.

Assuming that audio-frequencies are unavoidable in the high-frequency amplifier, values of decoupling may be taken that will provide complete separation between all the valve stages. High value resistances and condensers effectively decouple grids, screens and anodes of the H.F. valves to an extent that the lowest audio frequency, without trouble, may be readily conveyed to other valves. The decoupling is adequate to prevent this difficulty, but it should be noted that the feed condenser to the interstage transformer is lower than the customary value. It can be made bigger without trouble, but tests with frequency records and valve voltmeter through the I.F. amplifier revealed that quality is unchanged. What is important is that its small value increases the effectiveness of the decoupling.

To save the purchase of unnecessary expensive components the other smoothing choke serves the dual purpose of smoothing as well as biasing the output stage.

The circuit arrangement, in general, has been developed from that of the Foreign Listener's Four as regards the arrangement of the single dial control, the H.F. stages, much of the decoupling and grid biasing, though the modifications just mentioned have been introduced into the detector and output stage to economise in the amount of apparatus required by the inclusion of power-grid detection and pentode.

(List to be concluded with constructional details.)

This receiver can be seen on "The Wireless World" stand at the Manchester Exhibition.

For a more detailed treatment of the various features which have been embodied the reader is referred to the following Wireless World articles:

- "The Decoupling is Adequate to Prevent This Difficulty," by H. F. Smith, Sept. 24th, 1930.
- "Quality Reception," by John Hamon, October 8th, 1930.
- "Main Operation and Single Dial Control," by W. T. Cocking, September 11th and 18th, 1929.
- "The Design of a C. Mains Set," by W. T. Cocking, September 11th and 18th, 1929.

Radio Gramophone Equipment.

- "Electric gramophone notes (General)," by F. H. Haynes, May 7th, 1930.
- "Single-pole two-position switch (Sphenon)

Radio Gramophone cabinets (Kableos)."
TOULOUSE NOT "ALL OUT." Radio Toulouse is already noticeably stronger to listeners in Britain, but we learn that the new transmitter's maximum power of 60 kW. will not be used until March or April next.

PARIS POWER INCREASE. Radio Vitas, the well-known Paris station, is in an increasing its power from 2 to 20 kW., though it will not begin operation until the spring. The station is now, controlled by R. Raussi's Pathé.

AMATEURS REMEMBERED ON NAVY DAY. The ceremonies attending America's Navy Day on Monday, October 27th, will include a special message to U.S. radio amateurs broadcast from Naval stations at New York (72.7 and 33.8 metres) and San Francisco (68.4 and 34.2 metres) at 7.30 P.M. E.S.T.

PARIS POWER INCREASE. Radio Vitas, the well-known Paris station, is in an increasing its power from 2 to 20 kW., though the change will not be effective until the spring. The station is now, controlled by R. Raussi's Pathé.

20 KILOWATTS FROM IRELAND? Until the Irish Free State with an aerial power of 20 kilowatts will be provided for in the apparatus about to be constructed by the Marconi Company at Chelmsford. The Irish Free State authorities require a transmitter capable of serving the whole of the State, and while the new transmitter will have a normal aerial energy of 60 kilowatts, arrangements will be made to enable the aerial energy to be doubled if necessary.

It is interesting to note that power to be furnished by the Marconi Company for use on tanks and armoured cars. The installation works on between 7 and 8 metres and is specially intended for communication over very short distances.

A SHORT-DISTANCE TRANSMITTER. The S.B.1a transmitter set developed by the Marconi Company for use on tanks and armoured cars. The installation works on between 7 and 8 metres and is specially intended for communication over very short distances. It is expected that the station will be ready to begin operation in the autumn of next year.

EASY TERMS. Heard outside the Paris Salon: A.: "I have scored a great bargain—one of the latest sets at 10 frances a month!" B.: "For how many months?" A.: "Great Scot! I forgot to ask!"

8-METRE TRANSMISSION ON TANKS. An ultra-short-wave portable installation—operating on between 7 and 8 metres—has been produced by Marconi's Wireless Telegraph Company, Ltd., for use on armoured vehicles such as tanks. Known as the Type S.B.1a, the combined transmitter and receiver are specially mounted in a shock-proof tank case. Power for the transmitting valves is supplied by a rotary transformer, driven by a 12-volt accumulator and delivery 600 volts to the anodes.

The aerial is almost invisible and consists of a copper-plated steel rod 12ft. in height and made in four sections. A feeder cable connects the transmitter to the aerial system, which is connected to the body of the tank, or to "earth" by a balancing coil so as to permit the maximum amount of energy to be transferred to the aerial for the wavelength in use.

POSSIBLE EXISTENCE OF BROADCAST TRANSMISSIONS FROM THE IRISH FREE STATE. It is understood that power to be furnished by the Marconi Company for use on tanks and armoured cars. The installation works on between 7 and 8 metres and is specially intended for communication over very short distances.
OCTOBER 15th, 1930.

New Sets and Components Seen at the Stands.

SIR JOHN REITH, Director-General of the B.B.C., on Wednesday last opened the Seventh Annual Manchester Radio Show in the City Hall, Deansgat. Organised by the Evening Chronicle, this year's exhibition is larger than any of its predecessors, and a record total attendance may be expected before the doors are closed on Saturday, October 18th.

Mr. R. M. Ellis, of the Radio Manufacturers' Association, presided at the opening ceremony. In his inaugural speech Sir John Reith reminded Mancunians that listeners in the whole of the northern region would soon be enjoying reception such as they had never had before, due to the radiation power of the new regional station.

Mr. E. G. D. Living, north regional director of the B.B.C., said that the Manchester exhibition was rapidly assuming the position of being the most important of its kind outside London. The present trend was for people to buy wireless sets in the same manner as they bought motor cars, substituting new for old every two or three years in order to keep abreast of the times.

The following Show Report deals principally with new apparatus not shown at Olympia.

AMPLION. (24)

The receivers on this stand are headed by the "Two Screen Grid Cabinet Radio," a pedestal cabinet model incorporating a chassis similar to that of the "Two Screen Grid Portable." Designed for A.C. mains only, the cabinet model has a self-contained frame aerial which can be rotated by a control on the tuning panel. Another receiver which is certain to attract attention is the "Two-valve A.C. Mains" model, which consists of an efficient detector-pentode circuit in a shallow walnut cabinet and is priced at £15 gns. Full descriptions of these and other models appeared in our Olympia Show report.

The well-known "Lion" loud speakers are continued, and several new models have been introduced for the coming season. The "Two Guinea" cabinet cone is a useful addition to the range and is suitable for use with low-priced two-valve sets, though the power-handling capacity is considerable. The standard Amplion cone unit forms the nucleus of the new A.B.6 model at £2 10s., but an entirely new unit of exceptional power-handling capacity has been developed for the special balanced armature speakers, types A.B.41 and A.B.45, at £5 15s. and £6 15s. respectively. Series-parallel connections are provided for the windings, so that the speakers are readily adaptable to either super-power or pentode output valves.

Graham Amplion, Ltd., Slough, Bucks, and 10, Dalefield, Manchester.

BAKER'S "SELHURST" (110).

This firm specialises in the manufacture of moving-coil loud speakers, and the 1931 programme is headed by the "Super-Power" model, which is available for 6-volt batteries, D.C. or A.C. mains. The A.C. model incorporates a Westinghouse rectifier and has a high-voltage field winding taking 100 mA at 200 volts. The moving coil is available in a variety of impedances, and the pentode model has a linen diaphragm to correct over-emphasis of the high frequencies. The price of the D.C. models is £6, and the A.C. model costs £9 10s.

A permanent-magnet model with cobalt-steel magnet is available at £8.


BEARDSALL. (2)

This firm are agents for Regentone mains apparatus and receivers, which were described in our Olympia Show report. They are also manufacturers of the "Xtra-Point" lampholder and plug.

W. E. Beardsall and Co., Ltd., Victoria Bridge, Manchester.
Manchester Radio Show.—

BELLING LEE. (7)

As they were shown at Olympia, the new Belling Lee products have already been described. Reference might, however, be made to the wander plug with enclosed interchangeable fuse. Its use is almost essential for providing complete protection of the valves from the H.T. supply.

Now in its second edition, a useful booklet entitled "Radio Connections" is available at the stand. It completely covers the choice and application of the many forms of connections.

Belling and Lee, Ltd., Queensway Works, Ponders End, Middlesex.

BLUE SPOT. (26)

Blue Spot loud speakers and units, now being manufactured in this country, are shown by H. C. Ravson, Ltd., who are northern agents for these products, which were described in our Olympia stand to stand report.

H. C. Ravson (Sheffield and London), Ltd., 100, London Road, Sheffield.

BRODERSEN. (106)

N. and K. inductor loud speakers, made under licence from the Farrant Corporation, are exhibited on the stand by the distributors. One of these instruments was recently reviewed in The Wireless World.

N. & K. Inductor loud speaker chassis. (Brodersen).

The loud speaker in chassis form, complete with cone, costs £5 10s.; mounted in cabinets of various designs, prices vary between 5 guineas and £7.

A. Brodersen, 11, Northampton Square, Goswell Road, London, E.C.1.

BROWN, S. G. (39)

Lack of space in our Olympia Show issues, but it should be noted that the volume control takes the form of a differential condenser in the aerial circuit and not the combined variation of grid-bias and screen-grid potentials as previously stated.

The principal receiver employing the new circuit is the "A.C. Receiver De Luxe." Type 1850, in console cabinet with self-contained receiver. A radio-gramophone on similar lines is also exhibited.

The "Universal Screened Five" is continued with numerous detail refinements, and other important exhibits on this stand include the "Needle Armature" pick-up.


C.A.V. (43)

This firm specialises in accumulators, and types for all wireless requirements are shown, including "mass" type cells, L.T. accumulators in glass and celluloid containers and H.T. batteries, both in moulded containers and air-spaced glass tubes.


CELESTION. (41)

The loud speakers for which this firm is noted have been supplemented for the coming season by a new permanent magnet stoving coil (Type D.100) and inductor loud speaker (Type D.50). There are also two new models representing very good value for money in the D.10 and D.12, which replace the old C.10 and C.12 types.

A new gramophone pick-up has been introduced, and judging from the measured frequency characteristic, is destined to take its place in the front rank of components of this type.

Celestion, Ltd., London Road, Kingston-on-Thames.

CLARKE ATLAS. (40)

The model 188 A.C. conversion unit, a very practical combination of H.T. eliminator and L.T. trickle charger, as described in our Olympia Show Report, is exhibited in chassis form, so that its internal construction may be examined. This instrument seems to offer good value at £5. A number of other eliminato,ne both for A.C. and D.C., are exhibited, together with components and accessories.


CLIX. (111)

Among the very many types of plug and socket connectors exhibited are new simple and inexpensive bag and holder used for screen grid valves. The new Clivix valve holder with self-aligning sockets with the minimum of diodelectric material is also shown.

Lectro Linx, Ltd., 254, Vauxhall Bridge Road, London, S.W.1.

COLLIE. (121)

Hydrometer manufactured under the trade name of "Colverstat," are exhibited by this firm. Simple instruments of the coloured hall type cost from 1s. 6d. upwards; some of these are designed to be left permanently in the vent-holes of small accumulators. Float type hydrometers, with a guide for the float to prevent its sticking, are made in both glass and celluloid.

J. H. Collie and Co., 10, Canning Place, Liverpool.

COLVERN. (146)

While the products of this firm were described in connection with their Olympia exhibit, one notes the inclusion on the stand of popular receiving sets. These demonstrate the application of Colvern products. In addition to the Foreign Listener's Four we find a new set developed by the Manchester Evening Chronicle, incorporating screened and ganged control coils, Colvern resistances, and the new wire-wound Colvernstat potentiometer. The use of Colvern gang-controlled coils is demonstrated in a band pass unit for the home constructor, a
Manchester Radio Show. —

A highly selective arrangement designed to meet the conditions produced by the powerful Regional transmitters and to provide high selectivity without loss of sidbands. A free 40-page booklet, which includes a resistance calculator, is of special interest.

CORANTO. (76)

Visitors should obtain the sixteen-page list of Coranto wireless cabinets. Its contents cover all requirements, the designs being distinctive and the cabinets of real furniture value. Prices are modest, while it is a once-only fact that a high-grade hand-polished finish has been obtained with avoidance of that high gloss surface sometimes met with and attributable to cheap spraying. A Coranto cabinet can form the basis of a radio set for the amateur who is given to modifying the interior from time to time.

Coranto Cabinet Company, 122, Leaf Street, Stretford Road, Manchester.

DULCETTO-POLYPHON. (79)

Electrically reproducing gramophones of generous design for home or dance hall are shown. High-grade cabinet work with quality amplifiers of the heavy-duty type are features of the apparatus shown at prices from £75 to £176 guineas.


CONCERTON. (67)

This stand is devoted to "Fotos" and L.F. transformers. The range of valves is unusually complete, and comprises twenty-five distinct types. Prices are very reasonable, and range from 8s. 6d. up to £12 1s.

"Fotos" L.F. transformers are made in two types, the "Nipper" at 8s. 6d., and the "Super" at 12s. 6d. Both types are available with either a 3:1 or 5:1 ratio.

Fotos "Nipper" and "Super" L.F. transformers. (Concerton.)

CONTINUOUS GRAMOPHONES. (106a)

This exhibit consists of electrically operated gramophones and radio gramophones with a special mechanism for changing records: up to thirty can be accommodated on the carrier at one time. The turntable is operated by a Kolster-Bradley motor, while another 3 h.p. electric motor of B.T.H. manufacture supplies energy for the record-changing mechanism.


COSSOR. (20)

Full details have recently appeared of all the new Cossor valves. At this stand one realises that Cossor must not only be looked upon as producers of valves but also as manufacturers of a complete range of modern receiving sets. The Cossor two-valve A.C. All-Electric receiver has the external appearance of a well-finished loud speaker. Under its hinged lid are the simple controls of reaction, wave change and tuning. The interior does not display an assembly of components, but rather a well-finished receiving unit in a moulded case. Battery output and valve rectification are included.

The Cossor Commander receiver is a good specimen of the class of receiver which has made its appearance this season. It has screened coils and valves, two H.F. stages, and single-dial control. It is chassis built and is obtainable for £12 2s. Battery eliminators with valve rectification and with correct decoupling between the various outputs are available at moderate prices in the form of units.

DUGGLE. (108)

"Reliance" motor-generator charging plants for wireless retailers, garages, etc. are shot under working conditions on this stand.

A. Duggle and Co., Jane Street, Rochdale.

DUBLIER. (15)

The name of Dublier is primarily associated with condensers, and, as some indication of the wide experience of this firm, a large condenser bank for mains power-factor correction is shown in contrast to the range of small paper-dielectric condensers for wireless receivers. Space does not permit a detailed description of the numerous types available, but visitors to the stand should not fail to inspect the new electrolytic condensers of both the single and differential types, and there are several additions to the already comprehensive list of toroid coils and H.F. transformers.

Finally, there are the three-valve All-Electric receivers for both A.C. and D.C. mains at £25, and a range of radio gramophones with two, three, and four-valve circuits from £42 to £80.

Dulcier Condenser Co. (1925), Ltd., Victoria Road, North Acton, London, W. 3.

DULCETTO-POLYPHON. (79)

Electrically reproducing gramophones of generous design for home or dance hall are shown. High-grade cabinet work with quality amplifiers of the heavy-duty type are features of the apparatus shown at prices from £75 to £176 guineas.


DUBLIER. (15)

The name of Dublier is primarily associated with condensers, and, as some indication of the wide experience of this firm, a large condenser bank for mains power-factor correction is shown in contrast to the range of small paper-dielectric condensers for wireless receivers. Space does not permit a detailed description of the numerous types available, but visitors to the stand should not fail to inspect the new electrolytic condensers of both the single and differential types, and there are several additions to the already comprehensive list of toroid coils and H.F. transformers.

Finally, there are the three-valve All-Electric receivers for both A.C. and D.C. mains at £25, and a range of radio gramophones with two, three, and four-valve circuits from £42 to £80.

Dulcier Condenser Co. (1925), Ltd., Victoria Road, North Acton, London, W. 3.

DULCETTO-POLYPHON. (79)

Electrically reproducing gramophones of generous design for home or dance hall are shown. High-grade cabinet work with quality amplifiers of the heavy-duty type are features of the apparatus shown at prices from £75 to £176 guineas.

Manchester Radio Show.

EMU. (123)

While gramophones are principally shown at this stand; mention might be made of a popular three-valve set of reliable design which, complete with loud speaker, batteries and valves, is priced at £3 10s. Loud speakers, complete in cabinets with reed and four-pole movements, are shown at prices from 12s. to 35s.

The Emu Gramophone and Furnishing Company, 31 and 31a, Bridge Street, Manchester.

Ferranti electrostatic voltmeters.

EPOCH. (103)

No change has been made in this firm's products since Olympia, moving-coil loud speakers for all requirements being shown, with particular attention to permanent magnet and public address models.


EXIDE. (27)

No additions have been made to the Exide range since Olympia, but the visitor to this Exhibition is reminded to visit the Picture Theatre in the Gallery operated by British Talking Pictures. Here a talkie is being demonstrated in potential, A.C., and audio-frequency differences of making calculations and applying corrections can be read directly without the need for transformers. This sort, which gives a voltage reading without drawing current, is unnecessary to lay stress on the many applications of an instrument of this type.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.

FERRANTI. (51 & 52)

An important addition to the range of Ferranti measuring instruments has just been made; this is an electrostatic voltmeter, similar in size to the standard productions, and selling at £3 15s. It is unnecessary to lay stress on the many possible applications of an instrument of this sort, which gives a voltage reading without drawing current. Its use solves the problem of eliminating voltage measurements, and, further, the actual voltage impressed on the shaft of a valve can be read directly without the need for making calculations and applying corrections. As the meter gives readings of D.C., A.C., and audio-frequency differences of potential, it could be used to measure L.F. voltages developed across a loud speaker; although the minimum reading is on the high side (the lowest range is from about 100 to 450 volts), it can be extended in a downward direction by connecting a bias battery in series. Magnetic damping is provided, and the instruments are stated to be accurate within 2 per cent. at full-scale deflection.

There are also two-valve detector-l.f. sets, both for battery and A.C. mains supplies. These sets employ the new R.F.S input-circuit tuning-coil assembly, which is fitted with a magnetic reaction coil with switchgear mounted on its control shaft; this is arranged so that the appropriate range of changes is reflected by rotation of the reaction coil on each side of its "off" position. This coil unit is sold at £2 6d. complete.

Ferranti, Ltd., Hollinwood, Lancs.

FONTENY. (10)

"Gifel" mains transformers and chokes, battery chargers, and inter-valve transformers are important features of this stand. The majority of components shown are of Continental origin, and are offered at extremely competitive prices. A wide range of pocket voltmeters and testing instruments is also shown, and one of these—the "Multi-meter"—should be of special interest to the experimenter. Of the moving coil type, this instrument has a knife-edge pointer and parallax mirror which facilitates accurate reading of the scale. Terminals arranged round the outside of the case give the following ranges: (1) 0-6 volts, (2) 0-120 volts (or 0-240 volts if specially ordered), (3) 0-3 mA., (4) 0-12 mA., (5) 0-120 mA., (6) 0-6 amps. The sensitivity of the instrument (3 mA. for full-scale deflection) ensures a high internal resistance when used as a voltmeter, an important factor when testing H.T. batteries of low capacity, or the output from H.T. eliminators. The price of 5s. is very reasonable for a precision instrument of this type.

This year a range of "Gifel" receivers are also exhibited, the prices varying from £3 16s., excluding valves and batteries for the 3-valve "Midget" model, to £37, including valves, for the "All-Mains Radio-granophone" in a Queen Anne design cabinet.


Interior of the Osram Music Magnet Four, a set for the home constructor.
Manchester Radio Show.

G.E.C. (47)

Complete details of the new season's products were revealed and reported on at the Olympia Show. The Oram Music Magnet Four is being featured, and since its introduction last year has firmly established itself as a well-designed easy-to-build receiver of the long-range class. Its construction in a few hours by an apparent tyro in radio is demonstrated in a most amusing talkie which is being shown in the Picture Theatre of British Talking Pictures in the Gallery.


GOLTONE. (16)

The new "No-Mast" aerial consists of a capacity plate of perforated zinc mounted in a frame, and fitted with a long insulated lead-in wire. It is intended for fitting in any convenient elevated position, either indoors or outdoors.

Ward and Goldstone's new set.

A new A.C. mains-driven receiver has just been produced; it employs an H.F.-det.-L.F. circuit with pentode output and a valve rectifier for H.T. supply. The tuning controls are gauged; capacity-controlled reaction is fitted, and there is provision for the use of a gramophone pick-up. Three jacks are mounted on the back of the cabinet, so that aerials, leads, loud speaker, and pick-up may be easily and quickly connected.

There is also a display of accumulators and H.T. batteries, together with wires and flexibles of every sort. Tuning coils to special designs are a speciality of this firm.

Ward and Goldstone, Ltd., Pendleton, Manchester.

GRAMO RADIO. (116)

An electric gramophone design to play sound films is certain to attract a good deal of attention on this stand. The sound head, comprising a film gate, source of light and photo-electric cell, is a modification of a standard design at present in use on cinema projectors. It is proposed to produce special films for use with this instrument in the form of a continuous band with the sound track in the form of a spiral. Making use of the standard width of film, as many as twenty sound tracks can be accommodated. It is also possible to make use of sound records printed on bromide paper strips, the light in this case being reflected. A further development is promised in a recorder for attachment to any standard broadcast receiver, so that a permanent record may be kept of transmissions of outstanding interest.

Gramo Radio, Ltd., Commercial Works, Church, nr. Accrington.

GRESLEY RADIO. (76)

This firm are showing a range of inexpensive receivers, including a 3-valve console model with a detector-L.F. circuit, priced at £8 17s. 6d., complete with valves, batteries, and a built-in loud speaker of the balanced armature type. The detector of this set, which is also available as a mains-driven outfit at £13 17s. 6d., operates on the anode bend principle.

Ward and Goldstone's new set.

Gresley Radio cabinet receiver.

The Gresley "Grame-Radio Minor" is of similar external appearance, but has an H.F.-det.-L.F. circuit, separate tuning controls, and reaction, with a pentode output valve. It is fitted with a Garrard double-spring motor and a B.T.H. pick-up, and costs 16 gns. The same set, with an H.T. eliminator, trickle charger, and B.T.H. electric motor, is sold at 19 gns. There are also two- and three-valve upright cabinet sets with built-in loud speaker; these are completely self-contained except for aerial and earth, and are sold at very low prices.

Cabinet making is one of the main activities of this firm; their exhibits range from an ornate burr walnut bureau down to small receiver and loud speaker cabinets.

Gresley Radio (Garrett's), Islington Works, Salford, Manchester.

HALLWELL. (88)

In the de luxe class is the receiver shown by J. R. Halliwell, which was one of the few commercially built sets found in the Exhibition incorporating band-pass tuning. The set is specially designed for ready change over from D.C. to A.C. supply, and makes use of the new 34V.A.-valves in its two H.F.

Ward and Goldstone's new set.

HARLIE. (113)

The redesigned Harlie pick-up is on view on this stand, together with a new constant speed induction motor for 50 cycle A.C. mains.

Harlie Bros. (Edmonton), Ltd., Bitham Road, Lower Edmonton, London, N.9.

HYDE. (122)

An ingenious wire-stripping tool which should prove invaluable to the home constructor as well as to manufacturers and service agents, is shown on this stand. It resembles an ordinary pair of parallel cutters, but the simple operation of closing the jaws performs three operations in the correct sequence. The blades are interchangeable and will deal with cables from 3 mm. in diameter down to 2mm. A test on a specimen piece of Glazite showed that the wire is not nicked as often happens when the wire is bare by a knife.

J. B. Hyde and Co., Broadheath, Manchester.
Manchester Radio Show.

**IGRANIC.** (49)

Like most of the large exhibitors, this firm are showing products already seen at Olympia.

It may be mentioned, however, that among Igranic components are all the requisites for the inexpensive home construction of H.T. eliminators. Igraníc components for the home construction of battery eliminators. The new Igranic dual range coil.

**IMPEX.** (120)

In addition to the well-known battery-heated Durio valves, types for A.C. mains operation have been introduced comparatively recently. All these have heater elements consuming one ampere at 3.5 to 4 volts, and are fitted with standard 5-pin bases. The screen grid valve has a voltage factor of 1,000 and an A.C. resistance of 1 megohm, giving a mutual conductance of 1 mA per volt, while its “general purpose” counterpart is rated at 40 and 20,000 ohms—a slope of 2 ma. per volt. There is also a third valve of lower impedance (7,500 ohms) with a voltage factor of 15, which is recommended for use as a detector or first-stage L.F. amplifier. A corresponding output valve, with a directly heated filament consuming 0.3 amp, at 4 volts, has a voltage factor of 8.5 and an A.C. resistance of 2,200 ohms. All these valves cost 10s. 6d. each, with the exception of the screen grid H.F. amplifier, which is sold at 13s. 6d.

**JUNIT.** (69)

Terminal strips and valve-holders of this well-known type are shown, together with the chassis-built interiors of the new Junit battery eliminators. The Junit Manufacturing Co., Ltd., 2, Ravenscourt Square, London, W.6.

**LAMPLUGH.** (71)

The “Silver Ghost” Inductor Dynamic loud speaker is the centre of interest on this stand. The principle of operation, which was fully described in this journal in connection with the Olympia Exhibition, is illustrated by a large-scale working model, and demonstrations are being given in an adjoining room. Since Olympia, it has been decided to produce a special model for use with pentode output valves; the standard unit must be used with valves of A.C. impedance from 1,500 to 3,000 ohms.

**LEWCOŚ.** (68)

The new “Twin Two-pin Base” is arranged to take two pairs of plug-in coils (tuning and reaction), and embodies a built-in switch arranged so that either

**KALISKY.** (10)

As well as being factors and trade distributors, this firm handles a number of specialised products under the names of “Sopranist” and “Eskay.” A simple and inexpensive accumulator tester of the floating bead type would seem to be attracting interest. An extensive variety of both British and Continental components are to be seen offered at competitive prices; and in particular the well-known French products of Sutra, which include chokes, intervale, and mains transformers suitable for many requirements. Low-priced battery testing meters are also shown, as well as various types of load speaker design.

**NEW IGRANIC MOVING-COIL SPEAKER WITH RECTIFIER.**

**LEWCOŚ.** (68)

The new “Twin Two-pin Base” is arranged to take two pairs of plug-in coils (tuning and reaction), and embodies a built-in switch arranged so that either
Manchester Radio Show.

Coil Type D.W.A. is a dual-wave tapped aerial inductance assembly, also with a built-in switch. A reaction winding is included, but may be ignored when this coil is used, in an H.F. receiver, in conjunction with the corresponding H.F. transformer (Type D.W.G.), which also carries a reaction coil.

Lisson (12 & 13)

A new Lissen four-valve A.C. radio-gramophone has been introduced since the opening of the Olympia Exhibition. The circuit arrangement comprises one H.F. stage, a grid detector, and two L.F. magnifying valves, and the set is normally intended for operation with a built-in frame, although an external aerial may be connected. Tuning controls are separate, and there is capacity-controlled reaction. This instrument costs £2 2 guineas in oak cabinet, or £4 7 guineas in walnut; its turntable is driven by an induction motor. Pre and post-detection volume controls are fitted, the latter being operative for gramophone reproduction. The built-in loud speaker is of the moving-coil type.

A new mains transportable set, with a balanced armature loud speaker, embodies the same circuit, and is sold at 12 guineas.

Loud Speaker Co. (12)

A new set, which has made its appearance since Olympia, is a portable of the suitcase type, arranged for all mains operation and fitted with a self-contained moving-coil loud speaker. The complete outfit, incorporating Mazda valves, is priced at 30 guineas.

A new Lissen mains transportable.

Wireless World

The new Lissen mains-operated portable fitted with moving-coil loud speaker. (The "Loud Speaker" Co. Ltd.)

McMichael. (83)

At this stand one finds the same receivers as those recently described at Olympia. The Majestic Three receiver is the principal exhibit, with its seven-grid H.F. stage, pre.H.F. volume control and super-power pentode output valve, and incorporating all those features which illustrate strict conformity to modern theoretical considerations. The Super Range Portable Four, which has been slightly modified from last year, is still a leading portable. Loud speakers have been added to the range of McMichael products and include permanent magnet moving coil and balanced armature types.

L. McMichael, Ltd., Wexham Road, Slough.

A screen-grid valve, operating on the anode bend principle, acts as a detector; an H.F. filter is included in its anode circuit, and the rectified output is passed to a pair of push-pull output valves through a transformer, across the primary of which is shunted a resistance and condenser in series for tone-correction purposes. A moving-coil loud speaker is fed in the conventional way through an output transformer.

Pre-detection volume control is effected by the operation of a potentiometer which increases the negative bias of the first: high frequency valves, the first of which is preceded by a capacity-coupled band-pass filter, and is linked to the next by an untuned transformer. This valve is coupled through another band-pass filter to the third amplifier, of which the output is passed to the detector by means of an ordinary tuned transformer. It will thus be seen that there are five tuned circuits in all; their tuning condensers are ganged, and are not fitted with external trimmers, although a compensating condenser is connected in series with the aerial.
Manchester Radio Show.—
A Majestic superheterodyne has just been introduced; full details of this model are not yet available, but it employs a total of seven valves and a rectifier; has a stage of signal-frequency H.F. amplification, push-pull output valves, and a moving-coil loud speaker. An open aerial is used, and the set has single-knob tuning. The "feel" of this control during a hasty trial (without any aerial or earth) lends one to express the opinion that broadcast tuning must also be employed in this receiver, which is mounted in a console cabinet.

Both sets cover a wave range of 520 to 1,550 kilocycles (380 to 580 metres), and are calibrated in frequencies and on an arbitrary scale.

Majestic Distributors (Manchester) Ltd., 2, Victoria Bridge Street, Manchester.

Marconiphone. (38)
The exhibits on this stand are as at Olympia. Visitors should avail themselves of the opportunity of examining the chassis of the new "2-H.F." receiver, type 560, regarding which so many favourable comments have been made.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.

Mooroe. (8)
This firm of wholesale distributors are showing a representative collection of receivers and accessories, among which were noticed the products of such firms as Bulgin, Ready Radio, and Garrard. Northern readers will have an opportunity of examining the Sheffield Magnet Co.'s new loud speaker drive units and triple-diaphragm loud speaker chassis, as described in our Olympia Show Report.


Mullard. (45 & 46)
A description of the new Mullard Valves and of the "1931 Orgola," kit set have already been published. The new four-valve Orgola receiver, similarly designed for home construction, is a much more ambitious piece of apparatus: it has two H.F. stages, linked by transformers, and followed by a grid detector, which is coupled by a parallel-feeding stage. The ganged tuning is an important feature of the set; there is a trimming condenser, controlled by an external knob, in shunt with the aerial-grid circuit.

This set is normally intended for A.C. mains operation, although it is convertible for battery feed by making a few minor alterations. In both cases battery bias is employed. Pre-detection volume control is effected by variation of screening grid voltage through a potentiometer. In spite of its ambitious nature, it would appear that this receiver should be quite easy to build.


National. (92)
The products of Peto and Radford and the Hart Accumulator Co., who have now pooled their combined resources, are exhibited on this stand. As stated in our Olympia Report, most of the L.T. cells are supplied with "Tell-Tale" indicating beads showing the state of the charge.


Ormond. (64)
A new type of variable condenser has been added to the already extensive range of Ormond condensers. This new component (Model No. 4) is rigidly constructed and has stout bearing supports of high-grade bakelite. Since the latter model.

Mullard "2-H.F." kit set.

Parfait. (60)
Ebonite sheets with a variety of surface finishes are shown. A leak-free surface is claimed with a high polish in black, and a well-cased mahogany Mosaic and cube surface designs are also shown. Parfait ebonite is all-British, and it was learned at the stand that this firm is now back in full production following the recent destruction of their premises by fire.

H. B. Potter and Co., Ltd., Station Buildings, Rochdale.

Partridge, Wilson. (23)
A well-prepared 88-page booklet by H. G. Wilson is available at the stand, which gives in brief all the essential details bearing on commercial accumulator charging. Partridge, Wilson and Co. manufacture Davenset charging equipment, which are generously designed and employ rectification. The majority of other exhibits are as at Olympia.

Partridge, Wilson and Co., Davenset Works, Evington Valley Road, Leicester.
Manchester Radio Show. -

PEGASUS. (107)

Two portable sets are exhibited on this stand. The first embodies the conventional 5-valve circuit (two anode, one H.T. stages, detector, and two L.F. magnetrons). It is fitted with an Ever-Ready H.T. battery and C.A.V. accumulator. Anode feed resistances are fitted, so there are only two H.T. connections. In spite of its low price (£9 guineas), this receiver is neatly and solidly built.

The second Pegasus portable is more highly finished and embodies more costly components, but employs a similar circuit arrangement; it costs 15 guineas.

Pertrix. (38)

High-tension batteries and grid batteries of every description are exhibited on this stand. Special emphasis is given to the fact that the electrolyte does not contain sal-ammoniac, and it is claimed that the zinc elements are less liable to local corrosion.


PHILIPS. (19 & 20)

Philips' receivers show no great change since the introduction over a year ago of those receivers which set a standard for high amplification and single-filament control. Being early in the field with all mains sets of easy operation, this year's design maintains reliability rather than actual novelty of principle. There are, however, several new models—a two-valve set, the type 2233, which operates entirely from D.C. supply. It employs a special detector valve, whilst a considerable volume output results from the inclusion of a pentode. The set may be used as a gramophone amplifier, provision being made for a pick-up. The container is a well-finished moulded nylon. Another newcomer is the three-valve all-electric type 2531, being built as a chassis phone and set. The container is of polished bakelite.

Philex. Three-valve receiver type 2531.

This set is devoted to the Pifco "All-in-One" Radiometer, a neat multi-range meter and circuit tester. Although at first sight similar to the conventional pocket voltmeter, it should be noted that twin leads with universal connections are provided so that it is not necessary to hold the meter in the hand while testing, say, an H.T. battery. The movement, which is of the moving iron type, is practically dead-beat, and the internal resistance is 200 ohms on the 0-8 volt L.T. scale and 4,000 ohms on the 0-150 volt H.T. scale. There is, in addition, a current scale reading from 0-20 mA. In conjunction with the internal dry cell provided, the instrument may also be used for routine continuity tests. Perhaps the most interesting feature of the design is the provision at the back of the instrument of sockets for testing the continuity of valve filaments. The sockets are spaced to take the filament pins, and clearance holes are drilled for the other Valve sockets for testing filament continuity in the Pifco "All-in-One" meter.

REDFERN. (33)

Realising the present-day tendency towards the use of smaller—and perhaps one should add, of more carefully designed—tuning coils, this firm have extended their range of small wasp-shaped pentodes, which now includes sizes likely to meet almost any requirement.

Redfern's Rubber Works, Ltd., Hyde, Cheshire.

R.I. (53)

The activities of this firm during 1931 are to be concentrated in three main channels, viz.: (1) Radio receivers; (2) H.T. units; (3) L.F. transformers and chokes.

The "Madrigal" three-valve all-mains receiver is shown in its redesigned form with new type triple-gang tuning control, provision for a gramophone pick-up, and AC/PEN power pentode. The price of this receiver for either A.C. or D.C. is £20, and a handsome pedestal incorporating a moving-coil loud speaker is obtainable for an addition to the cost.

The second new mains H.T. units are of striking design, and include nickel-iron smoothing chokes and a Westminster rectifier in the A.C. model. The dimensions are such that the units may be used to replace the H.T. battery in portable receivers. The D.C. model costs £12 1s. 6d. and the A.C. model £4 15s.

Among the numerous examples of the use of nickel iron in transformers and chokes, visitors to the stand will find the following of special interest:-The "Hypermite" L.F. transformer with 50 Henry primary measuring only 2¼ in. x1 in.x2¼ in.; the "Hypercore" L.F. choke designed to carry 50 mA, and the "Penonite" tapped output choke for use with the new power pentode valve.


RALTON. (117)

An exceptionally interesting receiver chassis, of which an advance model is shown, has just been developed by this firm for inclusion in their radio-gramophone and sets. It is illustrative of present-day tendencies that, among other refinements, it should include a capacity-coupled band-pass filter circuit, which is followed by two tuned H.F. stages and a screen grid detector. A double H.F. filter is interposed between this latter valve and the first L.F. magnetron; resistance coupling is used for this stage, from which no attempt is made to extract any very high degree of amplification. Finally, there is a super-power pentode output valve, with 600 volts applied to its anode; as soon as the interstage coupling preceding this valve is increased, the choke is used in place of the usual ohmic leak in order to prevent choking due to atmospheric or other momentarily overloaded.
Manchester Radio Show.—

All four tuning condensers are linked together, and, further, it has been found possible to dispense with trimmers. Pre-detection volume control is provided in the form of an H.F. potentiometer.

The set is designed for either an open aerial or a frame: in the latter case H.F. couplings giving rather a higher stage gain—but less selectivity—are employed, so overall sensitivity remains constant, irrespective of the collector actually used.

This model is for A.C. mains feed; and is intended for operation with a moving-coil loud speaker; the field energising current is taken from the mains H.T. supply.


The Rialton chassis.

ROBERTS. (119)

Rotary battery charging equipments of the constant potential type are shown, together with the products of the Lancashire Dynamo and Crypto Electrical Companies. This stand is of interest to the radio retailer concerned with battery charging.

John Roberts, 1 and 3, Bridgewater Viaduct, Knott Mill, Manchester.

ROTHERMEL. (75)

The name Rothermel is very widely known in this country in connection with Magnavox moving-coil loud speakers. In consequence of the many years that the Magnavox moving-coil loud speakers have been in production, there is little doubt that the models of this year have reached a high stage of perfection. The various models are well finished and nothing has been spared in the cost of tools to permit of a strong assembly from metal pressings. Prices range from £5 7s. 6d. to £9 15s. in the junior and senior models carrying mains equipment. Full details are given of the output conditions of these speakers and their electrical characteristics, so that matching may be facilitated.

The principal attraction at the stand is the Peerless receiver chassis comprising three screen grid H.F. and two L.F. stages, the final stage amplifier being from a pair of valves of generous output connected in push-pull. Single-knob control with illuminated drum dial indicator operates the bank of tuning condensers, which are assembled on a common spindle. This is probably the only receiver of its class which provides reception on both wave ranges. As a distant station receiver with ease of control, it effectively fulfils its purpose, while its liberal equipment places it in the quality receiver class.

Complete with moving-coil loud speaker and arranged to obtain its field excitation current from the set, the price, at £35, including valves and royalty, represents good value for money.

Complete specifications can be had of an extensive range of public-address equipment, suitable for schools, dance halls, etc. In addition, there are rack and panel amplifiers specially designed for centralised radio systems to suit the needs of hospitals, flats and schools. There are...
Manchester Radio Show.—Many small components shown of particular appeal to the amateur—vernier geared and illuminated dials, electrolytic condensers, rheostats, resistances and small condensers—all possessing certain characteristics in their design which make a strong appeal to the enthusiast. Those interested in the operation of modern A.C. mains sets from D.C. supply might well investigate the suitability of the Janette rotary convertors shown at the stand. Thomas A. Rowley, Ltd., 59, Skinner Street, Brixton, London, S.1.

ROWEY, (126)

This firm is the sole British agent for "Pilot" radio components, which are manufactured in the U.S.A. A wide selection of representative types, including L.F. transformers, condensers and drum dials, switches and compression-type resistances, are displayed. The "Resistograd" is of the latter type, and has a range from 40 ohms to 10 megalohms. It is capable of dissipating 20 watts, and the metal case is finned to assist radiation.

Pilot "Vaultype" triple-gang condenser. (Rowley.)

The "Vaultype" screened variable condenser units are of interest in view of modern tendencies in circuit design. These are available from single up to quadruple types, and are fitted with built-in balancing condensers. British-made "Precision" wire-wound resistances are also on view on this stand.


SELECTORS, (6)

Portable, all-electric receiving and radio gramophones incorporating the Selector screened-grid circuit are shown on this stand. Since Olympia a new cabinet has been produced for the "Electric 42," which is, however, still available in the original standard cabinet.

Selectors "Model 42" in new-type walnut cabinet

The new design is executed in walnut and has tapering sides and a redesigned loud-speaker grill.

SQUIRE, (115)

The "Squire" moving-coil loudspeaker has a novel form of diaphragm suspension consisting of a serrated paper ring, the points of which are attached to the cone about 1 in. from the free edge. The moving-coil winding is self-supporting, and does not make use of the usual cylindrical form. The whole loud speaker is mounted on a swivel holder and cast base.

Magnavox moving-coil loud speaker type 415, shown by the Rothermel Corporation. A new component of British manufacture in the U.S.A. A wide selection of representative types, including L.F. transformers, condensers and drum dials, switches and compression-type resistances, are displayed. The "Resistograd" is of the latter type, and has a range from 40 ohms to 10 megalohms. It is capable of dissipating 20 watts, and the metal case is finned to assist radiation.


SOLID, (126)

"Sifam" pocket voltmeters and measuring instruments for panel mounting are already too well known to require detailed description, so also are the range of radio boxes displayed on this stand. A new component of British manufacture is the "Sifam" circuit Testing Adaptor. Essentially this consists of a single dry cell in an ebonite container which may be connected to any type of pocket voltmeter for the purpose of making continuity tests. A spring-loaded universal ball contact socket is provided which fits the case splice of most pocket meters. Contact with the battery is made through a special washer so that the cell can be reversed to suit meters with either a common positive or negative spike contact. The price is 2s. 6d.

Other components on this stand include Sovereign wire-wound anode resistance.


SIFAM, (116)

"Sifam" pocket voltmeters and measuring instruments for panel mounting are already too well known to require detailed description, so also are the range of radio boxes displayed on this stand. A new component of British manufacture is the "Sifam" circuit Testing Adaptor. Essentially this consists of a single dry cell in an ebonite container which may be connected to any type of pocket voltmeter for the purpose of making continuity tests. A spring-loaded universal ball contact socket is provided which fits the case splice of most pocket meters. Contact with the battery is made through a special washer so that the cell can be reversed to suit meters with either a common positive or negative spike contact. The price is 2s. 6d.

Other components on this stand include Sovereign wire-wound anode resistance.


SOLID, (126)

"Sifam" pocket voltmeters and measuring instruments for panel mounting are already too well known to require detailed description, so also are the range of radio boxes displayed on this stand. A new component of British manufacture is the "Sifam" circuit Testing Adaptor. Essentially this consists of a single dry cell in an ebonite container which may be connected to any type of pocket voltmeter for the purpose of making continuity tests. A spring-loaded universal ball contact socket is provided which fits the case splice of most pocket meters. Contact with the battery is made through a special washer so that the cell can be reversed to suit meters with either a common positive or negative spike contact. The price is 2s. 6d.

Other components on this stand include Sovereign wire-wound anode resistance.


SOLID, (126)

"Sifam" pocket voltmeters and measuring instruments for panel mounting are already too well known to require detailed description, so also are the range of radio boxes displayed on this stand. A new component of British manufacture is the "Sifam" circuit Testing Adaptor. Essentially this consists of a single dry cell in an ebonite container which may be connected to any type of pocket voltmeter for the purpose of making continuity tests. A spring-loaded universal ball contact socket is provided which fits the case splice of most pocket meters. Contact with the battery is made through a special washer so that the cell can be reversed to suit meters with either a common positive or negative spike contact. The price is 2s. 6d.

Other components on this stand include Sovereign wire-wound anode resistance.

Manchester Radio Show.

New loud speaker, with a 20in. double-cone diaphragm and mounted in a walnut cabinet, has just been introduced. There is also a new pick-up—the Wates Star—which is a new design in its large mahogany cabinet reveals an interior chassis of most generous design. Careful examination of the Tinol Eight transformers shows that separate grids enclose each limb of the filament. As a stand attraction, a model railway is in operation in which the trains are controlled by intercepting beams of light falling on Tungsram photocells.

**Telen Electric Co., Ltd., Miller Street, Birmingham.**

**NEW TYPES OF TUNGSRAM BARIUM VALVES.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Power</td>
<td>P.430</td>
<td>£4.40</td>
</tr>
<tr>
<td>Spec Power</td>
<td>P.440</td>
<td>£4.40</td>
</tr>
<tr>
<td>Rectifying Valves</td>
<td>V.440</td>
<td>£4.10</td>
</tr>
<tr>
<td>Rectifying Valves</td>
<td>V.450</td>
<td>£4.10</td>
</tr>
<tr>
<td>Se Grid</td>
<td>S.405</td>
<td>£4.05</td>
</tr>
<tr>
<td>&quot; A.C.</td>
<td>S.407</td>
<td>£4.10</td>
</tr>
<tr>
<td>H.F. R.C.</td>
<td>H.R.97</td>
<td>£4.00</td>
</tr>
</tbody>
</table>

**TRIOTRON.**

The most interesting feature of the Triotron range of valves for 1931 is the introduction of metal coated H.F. and d.c. valves. The metal is sprayed on the outer surface of the glass and is in electrical connection with one of the filament pins. The object of so coating the glass is to screen the valve electrodes from stray electrostatic fields which might otherwise produce instability in a multi-stage H.F. amplifier.

The list of battery valves has been augmented by a super detector valve (type SD2) with an amplification factor of 21, and an impedance of 10,500 ohms, and a power output valve (YD2) suitable for portables with an impedance of 3,400 ohms and an amplification factor of 8.5. The current consumption of the latter valve is 7.5 mA at 190 volts H.T. Triotron valves are also made for A.C. and D.C. mains. The A.C. valves are in-

**Wates' Star pick-up (Standard Battery Co.).**

**STRADE.**

The "Strad" A.C. radio-gramophone, with a built-in moving-coil loud speaker, includes one H.F. stage, a grid detector, and two L.F. magnifiers, with resistance and transformer couplings and parallel output valves. Various styles of cabinet work are available, and prices range from 47 guineas. A D.C. model is priced at 42 guineas.

**TELEN.**

There have been no additions to the range of Telen components since the Olympia Exhibition, but further technical data concerning the neat and extremely inexpensive H.F. choke manufactured by this firm are now available. Coating only 2a. 6d., this component is stated to have an inductance of 120 millihenrys and a power output of 400 ohms.

Red Star receivers are also shown on this stand.

**OCTOBER 15th, 1930.**

**TUNGSRAM.**

Details of the new-type Tungsram barium valves shown on this stand are given in the accompanying table. Examination of the data reveals that these valves are capable of good performance.

**TUTILLS.**

Careful examination of the Tinol Eight in its large mahogany cabinet reveals an interior chassis of most generous design. Three screen-grid H.F. stages are provided, giving stable single-gird control over the full wave range of 200 to 2,000 metres. Following the detector are two L.F. stages, the output being derived from a pair of power valves in push-pull coupling transformer (type "A") with a 3:1 ratio at 6s. 6d., and a neat trickle charger for L.T. accumulators at 17s. 6d. A small metal oxide rectifier in the form of a cartridge is housed in the base of the mains transformer, together with a current limiting "barrett" tube which also serves as an emergency fuse.

**TUTILLS.**

Details of the new-type Tungsram barium valves shown on this stand are given in the accompanying table. Examination of the data reveals that these valves are capable of good performance.
Manchester Radio Show.—

This output is delivered to a moving-coil loud speaker deriving its field excitation current from the main rectifying valve. There is one-dial tuning and volume control and simple switch-over to gramophone pickup. Complete with valves and enclosed in an attractive oak cabinet measuring 23in. x 26in. x 14in., this receiver is priced at £58 10s.

Moving-coil loud speakers in oak pedestal cabinets are also of moderate price, and one model for A.C. mains working, and including output transformer and rectifier, costs less than £7.

Considerable hobby interest attaches to the home recorder shown on the stand, which is a complete record-making equipment, including microphone, cutter and discs.

Tutills, Ltd., 7 and 9, Swan Street, Manchester.

Wireless World

VARLEY. (56 & 57)

Low-frequency transformers and chokes for coupling and output circuits are an important feature of the display on this stand. An interesting addition to the range is a tapped 3-henry choke for tone control circuits. This component provides inductances of 0.5, 1.0, 1.5 and 3 henrys and has a resistance of only 47 ohms.

All-electric receivers and radio gramophones are also shown. The "Senior All-Electric Transportable" has a three-valve circuit incorporating the latest practice and costs £25. The mains supply unit is constructed to facilitate conversion from D.C. to A.C. mains, and a pedestal containing a moving coil loud speaker is available as an accessory.

Varley (Oliver Well Control, Ltd.), 105, Kingsway, London, W.C.2.

WEARITE. (34)

Coils and components for home constructors and a new range of mains transformers for Westinghouse rectifiers are important features of this stand.

The new delayed-action switches are of exceptionally neat design. Another useful component is the type G26 combined series aerial condenser and switch. The switch is of the conventional push-pull type, and is surrounded by a concentric knurled knob which operates a compression-type condenser variable from 0.00005 mfd. to 0.00035 mfd. The vanes are circular and surround the switch spindle thus giving a compact form of construction. The series aerial capacity can be adjusted to give the required degree of selectivity on short waves or short-circuited on long waves.

Wright and Zeilin, Ltd., 740, High Road, Tottenham, London, N.17.

WELLWORTH. (63)

Amongst the range of apparatus which this firm, as factors, are exhibiting, one notes the Webson moving-coil loud speakers, manufactured by Star Engineering, of Didsbury. A new model was to be seen incorporating one of the latest-type high-flux permanent magnets. By a well-arranged method of coil suspension and including a high flux density, and hence a performance parallel with the electromagnetic type. The price is six guineas.

The Wellworth Wireless Co., 8, Wilby Grove, Manchester.

ULTRA. (74)

Referring to our description of the Ultra Electric Three, as shown at Olympia, it should have been added that the set is available in a form suitable for D.C. mains, as well as for A.C. and, moreover, that conversion from the former to the latter can be effected at a cost of about 50s.—an important point for potential users whose supply systems are shortly to be changed.


UNIVERSAL ELECTRIC SUPPLY.

(85 & 86)

A large section of this stand is devoted to the portables and radio gramophones of Electrical and Radio Products, Ltd. (E.R.P.), which were recently shown at Olympia, and referred to in these pages.

Universal Electric Supply Co., Ltd., 44, Brown Street, Manchester.

OCTOBER 15th, 1930.
£

Verstion in Aberdeen.

One of the B.B.C. stations, viz., Aber-
deen, now enjoys the distinction of hav-
ing no programme staff. The anomaly has
 arisen through the departure from the
B.B.C. of Mr. Neil MacLean, who has been
station director at Aberdeen since 1924.

Main or Relay?

The future of the station is very uncer-
tain. It is recognised that Aberdeen will
be on the very edge of the 100-mile radius
from the Scottish regional transmitters,
and the suggestion has been made, semi-
officially, that if regional reception should
prove unsatisfactory in the northern city,
the station should again be granted the
status of a main station, similar to that of
Newcastle.

Can Aberdeen Entertain?

It is still believed that Aberdeen can
produce its share of the only sort of talent
which can really appeal to listeners
in the far north, though on this point there
is a school of doubters.

A Traveller Speaks.

I see that "Travelled Scot," writing last week to one of the Aberdeen news-
papers, denounced previous programme
efforts at Aberdeen as "uncouth, un-
gainly, amateurish, and awkward," add-
ing that "only blood relatives of such per-
formers could have tolerated such stuff.
" Travellers have been known to exager-
ate, but, judging from accounts given to
me by independent listeners in the Aber-
deen area, there is probably a germ of
truth in the above charges.

A Hint to Scottish H.Q.

Feeling in Scotland is undergoing a
marked change towards broadcasting, and
the headquarters staff at Edinburgh will
have to organise new activity when the
regional station is working if they are to
satisfy not merely national aspirations,
but the aspirations of the good folk in
Aberdeen.

Scotsmen are patient at the moment, but
there is no doubt that they object strongly
to the preponderance of material coming
"through the pipe" from London.

Was Sir Walford at Winnipeg?

How many persons, broadcasting from
a sick-room, could have triumphed in the
manner of Sir Walford Davies last week?
Although indisposed, Sir Walford deter-
mind not to break the continuity of his
new series of talks; accordingly the moun-
tain came to Mahomet. A microphone
was installed at his home in Windsor and,
if the telephone lines had been kinder, we
should never have guessed that he was not
in the Savoy Hill studio.

The quality of transmission suggested,
not Windsor, but Winnipeg.

Dance Band Statistics.

Jack Payne has been counting the num-
er of dance tunes broadcast by his band
in the space of six weeks. The figures
are interesting.

From August 14th to September 26th no
tower than 573 items were given, selected
from 128 different tunes. Of these 82
were American, 3 were Continental, and
43 British.

What the Public Wants.

I notice, however, that broadcasts were
not in this proportion, some of the tunes
being repeated many times. Actually,
381 American items were broadcast; the
British numbered 120.

There is a discrepancy in the ratios, but
Jack Payne, who knows the likes and dis-
likes of his audiences, could probably tell
us why. Can it be that American tunes
are more popular?

When to Take Notes.

Readers who wish to compare the acous-
tic qualities of the new warehouse studio
with those of the studios at Savoy Hill
will be interested in the following table
giving the occasions on which the ware-
house will be used in the near future.

<table>
<thead>
<tr>
<th>Date</th>
<th>Programme</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 16th</td>
<td>&quot;Madame Butterfly,&quot;</td>
<td>7.15 p.m. (Regional)</td>
</tr>
<tr>
<td>October 17th</td>
<td>&quot;Madame Butterfly,&quot;</td>
<td>8 p.m. (National)</td>
</tr>
<tr>
<td>October 19th</td>
<td>Orchestral concert,</td>
<td>9.5 p.m. (Regional)</td>
</tr>
<tr>
<td>October 21st:</td>
<td>Orchestral concert,</td>
<td>7.45 p.m. (National)</td>
</tr>
<tr>
<td>October 26th:</td>
<td>Symphony concert,</td>
<td>9.20 p.m. (Regional)</td>
</tr>
<tr>
<td>November 1st:</td>
<td>Orchestral concert,</td>
<td>9.35 p.m. (National)</td>
</tr>
</tbody>
</table>

Too Good?

There is a danger that the warehouse
may be too good! During the blissful
twelve months or so that we are able to
enjoy its acoustic merits we may begin to
take for granted a beauty of reproduction
that even the studios of Broadcasting
House may fail to attain. For there will
be no room in the new headquarters for
any studio approaching the dimensions of the
warehouse.

£

AT THE PARIS SHOW. A general view of the seventh annual Radio Salon which
ended a successful fortnight's run last week. The exhibits suggested the partial
eclipse of the "superhet" by the straight H.F. receiver.

By Our Special Correspondent.

Scottish Broadcasting Troubles.—Those Dance Tunes.—" Warehouse Time-table."

October 15th, 1930.
Highest effective amplification

The effective amplification available with any Screened Grid Valve is largely controlled by its inter-electrode capacity. The lower this self-capacity the greater the effective amplification available. In the new Cossor 215 S.G. residual capacity has been reduced to the low order of 0.001 micro-microfarads. This is lower than any other Screened Grid Valve on the market. Due to this—and also to the absence of grid current—the new Cossor 215 S.G. permits a degree of effective amplification which, a year ago, would have been considered utterly impossible. Illustrated folder giving full technical details sent free on request.

**THE NEW Cossor 215 S.G.**

**Highest Actual Amplification**

<table>
<thead>
<tr>
<th>Amplification Factor</th>
<th>330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual Conductance</td>
<td>1.1 m.a.</td>
</tr>
<tr>
<td>Anode Volts</td>
<td>120</td>
</tr>
<tr>
<td>Positive Voltage on Screen</td>
<td>60-80</td>
</tr>
</tbody>
</table>

Price: **20/-**

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Convert your battery operated set to "A.C. Mains"...

Think of the added power and range! The scope - convenience - economy of running! It is all so simply effected with the SIX-SIXTY ALL-MAINS CONVERSION EQUIPMENT. No internal wiring alterations. Specially selected Six-Sixty A.C. Valves and Six-Sixty 4/5 pin valve holder adaptors are included. Dimensions only 13" x 5½" x 4". Made for every A.C. supply.

L.T. 4v. up to 5 amp. H.T. Tappings 60, 75, 100, 120, 150 and 200v. "Automatic" G.B. 1.5 to 20v. Any three H.T. or two G.B. simultaneously.

Write for latest Six-Sixty literature giving particulars of the complete range of Six-Sixty Valves, Mains Conversion Equipment, Valve Adaptors, Valves and Set Tester, Cone Speaker Unit and Cone Speaker Assembly, Cones, Speaker Paper, Turntable, Grid-Leaks, and Gramophone Pick-up Attachments.

NEW IGRANIC COMPONENTS

IGRANIC CHOKES

The new range of Chokes includes the following sizes:

Type C.15 - Price 10/6

Type C.30 - 15/6

Type C.60 - 21/-

Type C.150 - 25/-

IGRANIC Differential Condenser 00015 mfd. each side

The pigtail connection to the moving vanes of this compact condenser ensures perfect electrical and mechanical contact. A frictionless movement permits of the finest possible adjustment.

Price 3/9

Works: BEDFORD
The Menace of Advertising—and Other Matters.

By A. DINSDALE.

ONE has become accustomed, of late, to the frequent castigation in the British Press of American broadcasting, and the large amount of advertising matter with which it is riddled. These attacks have usually been made in conjunction with some laudatory pean of praise for our wonderful B.B.C., during which a pious prayer of thankfulness is sent up for the fact that (officially at least) our system admits of no commercial advertising.

Frankly, having been to America, I have hitherto always discredited these (to me) wild attacks, and championed the American system as being conducive to better programmes.

But to-day I am back in America again, for the first time for about three and a half years, and I must admit that I was not in the least prepared for the state of affairs which I find now.

When I was last here, the National Broadcasting Company had been in operation for about a year, and had lost a lot of money. There was a rumour that the Columbia interests were about to set up a rival broadcast chain. When I spoke about this rumour to Merlin Hall Aylesworth, President of the N.B.C., he replied characteristically: "All I'm worrying about is that they may not go through with it. I wish somebody would start some competition and keep us busy going one better all the time!"

Advertising matter over the microphone was then confined, in the case of the N.B.C., to something like this: "We are now about to commence the Blank Hour, which entertainment comes to you by courtesy of the Blank Company, Inc., makers of the world's finest coffee." No further advertising announcements would be made till the end of the programme, when a closing announcement, similar to the opening one, would be made.

That, however, is all changed. In New York to-day there are four leading stations whose programmes can always be depended upon to be of first-class quality. These are WEAF and WJZ, key stations for the N.B.C. Red and Blue nationwide networks, WABC, key station for the Columbia Broadcasting Company's network, and WOR, owned and operated by a large department store in Newark, N.J., a city of about two million inhabitants within twenty miles of New York City.
Broadcasting in America To-day.—

The N.B.C. programme technique has changed considerably since last I was here. It is now their policy to divide programme time into definite sections of 15, 30, or 60 minute periods. All items are planned to fit into one or other of these periods; there are no odd-length items such as the B.B.C. broadcasts. In the case of a programme lasting a full hour it will open with a descriptive announcement, followed by the sponsor's advertising announcement. This latter may last as long as two or three minutes. At the end of the first, second, and third fifteen minute periods, the programme is interrupted to enable further advertising announcements to be made, and these also may last two or three minutes. They are frequently direct advertising announcements, and not indirect, as formerly.

To-day the Advertiser Calls the Tune.

When I protested to Mr. Aylesworth about this excess of advertising, he replied that advertisers who sponsor programmes nowadays demand value for money, and as they pay the piper it is no longer possible to prevent them calling the tune. He endeavoured to turn a necessity into a virtue, however, by trying to convince me that listeners have now become educated to advertising announcements, and like them. He pointed out that those who want to be interested, amused or entertained by a magazine do not complain about the advertisements, the revenue from which enables the magazine to be produced. They don't read those which don't interest them, unless they have some special reason for doing so, whereupon the advertisements generally render some service. Mr. Aylesworth contends that the same does, or should, apply to broadcast advertising announcements, and like them. And the following is no doubt calculated to arouse all the devils of local jealousies:

"We have just received the following request numbers by telephone: Mrs. Schultz, of Bryant Avenue, wants the orchestra to play 'I'm in the Market for You.' Mrs. Campbell, of Yonkers, requests 'Kitty from Kansas City.' We regret we cannot play all the request numbers 'phoned in to-night, but we will play them the same hour to-morrow night.'"

Blatant Advertising Generally Detested.

It was this sort of thing in particular which Dr. Lee De Forest had in mind when, at the recent Institute of Radio Engineers' Convention at Toronto, he attacked broadcast advertising in his presidential address. He declared that broadcasting in America was headed for Government control, with taxation and possible censorship, unless this advertising evil was voluntarily cured. The use of broadcasting for direct and blatant advertising was a menace, he said, steadily growing greater, more ruthless, more deserving of suspicion, and more generally detested. He predicted that the day was coming when the entry of wired radio into American homes (at a price) would provide entertainment purged of all advertising.

Recorded Programmes.

When last I was in America, the announcer attended to the entire production of programmes, including the timing of items and rehearsals. All such production details in the N.B.C. are now handled by a producer, and all the announcer has to do is to announce, and even his announcements are written out for him beforehand. The only time the announcer now shines as an individual is in the reporting of outdoor events, boxing matches, etc.

Station WOR has recently created a furore by broadcasting what it calls recorded programmes. These are first-class programmes, produced in the ordinary way either in the studio or elsewhere at a public performance, which are recorded on gramophone records and then broadcast. In New York, such procedure is generally regarded as retrogressive, expensive, and utterly senseless. Certainly it is difficult to see the necessity for broadcasting such records from New York, but they have definite uses elsewhere.

For example, by shipping records of first-class programmes out to stations buried deep in the country,
Broadcasting in America To-day—

these latter can have the benefit of the finest programmes without incurring the expense of taking them by landline. There is also the factor of difference in time to be taken into account. Many excellent programmes which take place in New York early in the evening are being land-lined and broadcast through far western stations some time in mid-afternoon when business devotees from getting home in time for Amos 'n' Andy, or if that is impossible, then getting in range of somebody's loud speaker somewhere. Dinners are eaten early, or postponed till later so that everybody can listen. In making an engagement, "after Amos 'n' Andy," needs no single word of amplification.

Moving-picture theatre managers expect their houses to commence to fill up between 6.30 and 7, in the ordinary way, but since Amos 'n' Andy became so popular the houses remain empty till 7.30. So serious has the situation become that some managers have installed radio sets in their vestibules to induce people to listen to Amos 'n' Andy there before going inside. Still others interrupt the programme, tune in WJZ, and switch Amos 'n' Andy on to their talkie loud speakers.

Synchronised Radio.

And to cap everything, the New York Telephone Company reports a definite and otherwise inexplicable decline in telephone calls between 7 and 7.15 p.m.! Husbands whose wives are non-stop talkers please note.

An interesting development which is in the offing is called synchronised radio. The object of it is to relieve more channels by putting all chain stations taking the same programme on one wavelength. At present, with some 600 stations in existence in America, many stations have to share their wavelength with one or more other stations, and such stations have to "split time" by taking turn and turn about "on the air." As there may be, scattered all over the country, as many as seventy or eighty stations all taking the same programme from one of the chains, it is considered ridiculous that they should occupy seventy or eighty wave channels. If, when a part-time station had to shut down to allow another to use his wave, he changed wave instead and took a chain programme, it is argued that more and better alternative programmes would be available to listeners in the less thickly populated areas.

Experiments to this end are progressing favourably, the method proposed being to transmit, over a second landwire (the first carrying the chain programme) from the key station, a standard frequency, which, on arrival at the local broadcaster, would be sent through frequency changers and caused to keep the emitted wave of the station dead on the frequency assigned for synchronised chain broadcasting. This is reminiscent of the B.B.C. relay station idea, but its importance and interest is more far-reaching in such an extensive country as the United States. The transmission of the standard frequency by wireless is not considered feasible, because of difficulties due to atmospherics, fading, and interference. But a second landline might be eliminated if a satisfactory frequency outside of the audible range could be found which could then be filtered out of the programme.
The Harmful Effects of Valve Capacities.

By JOHN HARMON.

(Continued from page 416 of previous issue.)

In a set such as is shown in Fig. 17, where the pentode follows the detector, and where a grid leak and condenser are used for coupling, care must be taken in choosing the values of C and R. Since C and R are impedances in series to which an A.C. voltage $e$ is applied, the A.C. voltage $v$ which acts on the grid of the pentode is less than $e$ by an amount which depends on the ratio of the impedance of C to that of R. The ratio $v/e$, the efficiency of transmission of the coupling, is unaltered if we double R and halve C, for this operation results in doubling each impedance, their ratio remaining unchanged; similarly we might use $3R$ and $C/3$, and so on. Hence if RC is kept constant, the efficiency of the coupling is unchanged.

Fig. 18 shows a series of lines, numbered 1 to 5, along any one of which the product RC is constant. These lines are accordingly lines of constant efficiency of coupling. The actual efficiency plotted against frequency is given for each of these lines in Fig. 19. Let us choose, for example, $R = 0.2$ megohm and $C = 0.005$ microfarad, which give a point on line No. 5 (Fig. 18), then Fig. 19 shows that this combination transmits 31 per cent. at 50 cycles, and 90 per cent. at 400 cycles.

Evidently the low tones are seriously attenuated. For really good quality we must choose curve 1 or 2. We may say, then, that in Fig. 18 our choice is restricted to the region lying north-east of line 2, and if no other considerations arose we should have the whole of this region from which to choose the grid leak and condenser.

But, unfortunately, pitfalls lie all round us, ready to upset the balance of transmission, and we shall find that the available region in Fig. 18 is much smaller than appears at first sight. Let us examine these pitfalls in turn.

Figure 20 — Detector coupled to pentode by grid leak and condenser. Incorrect values of C and R will affect the quality of reproduction.

Blocking Effect in Power Valve.

Signals which are strong enough to overload the power valve cause the grid to swing to a positive potential so that grid current flows; as a result the next downward swing carries the grid to a negative potential much below its usual working range, and recovery can only take place by leakage of the excess charge on the grid condenser to earth through the grid leak. The process is illustrated in Fig. 20. Until this recovery is complete, the valve is working on the lower bend of its characteristic, and is practically out of action. The effect is often heard when a loud, sustained note is being played; the periodic blocking introduces a convulsive staccato which is extremely ridiculous.
Quality Reception.—

The time required for the charge on the grid condenser to fall to a given fraction of its original value is proportional to the product RC, so that we can guard against blocking by specifying that RC must not exceed a certain value. For triodes and pentodes working on a plate supply of 160 volts this value is about 0.0065 where R is expressed in megohms and C in microfarads.

The region where blocking is likely is shown in Fig. 18, and it limits our choice of R and C to the narrow strip lying between the region of blocking and line No. 2.

Input Impedance of Pentode.

The second pitfall is due to the fact that when the pentode is working with a plate load such as a loudspeaker, a large effective capacity appears between its grid and filament. This feed-back phenomenon is well known in the case of triodes; if the plate load of a triode (taken as resistive to make the formula simple) be equal to the valve A.C. resistance, this effective capacity is \( \frac{1}{2} \times (\text{voltage amplification factor}) \times (\text{grid-plate capacity}) \). With a power triode like the D.F.A.9 this becomes \( \frac{1}{2} \times 5 \times 5 = 12.5 \) m.m.f.—quite a small value.

In the case of the pentode, where the plate and grid are mutually screened by two fixed potential grids, it might seem that there can be no plate-grid capacity and consequently no feed-back. This would be true if the plate lead were brought out at the top of the valve; but actually it goes through the glass pinch, and the capacity of the plate-grid leads amounts to 3 m.m.f. Since the pentode is a high-magnification valve, the feed-back will be large compared with a power triode, but the formula given above cannot be safely used, as the curved characteristics of the pentode cause the valve magnification and A.C. resistance to vary considerably over the working path.

Accordingly some experiments have been carried out to settle this point, and will be briefly described later in this article. They give the result that with a P.M.26 pentode having a resistance plate load of 13,000 ohms the effective grid-filament capacity is no less than 90 m.m.f.

This capacity acts as a shunt to the grid leak, its reactance amounting to 0.33 megohm at 5,000 cycles, and, unless the grid leak is less than 0.2 megohm, the loss of high tones will evidently be serious.

Accordingly, in Fig. 18 the region which lies north of the horizontal line indicating a grid leak of 0.2 megohm is to be avoided owing to loss of high tones due to feed-back from the pentode.

High-tone Loss in Detector.

The available region in Fig. 18 has now been seriously diminished, but worse is yet to come. Reference to Fig. 17 discloses that the plate resistance of 0.1 megohm in the detector circuit is shunted by the following grid leak and condenser; this shunting is greater for high audio frequencies, since then the impedance of C is small. Hence high-tone loss will occur in the detector circuit unless R exceeds at least 0.2 megohm as indicated in Fig. 18.

Economy versus Quality.

What is now left in Fig. 18? We have been driven to practically one point of refuge lying at \( R = 0.2 \) megohm, \( C = 0.025 \) m.f. High-tone losses threaten us from north and south, paralysis lies north-east, and low tones suffer if we go south-west.

The fact is that the economy in price and space achieved by making two valves do the work of three has been obtained at the price of diminished quality. The insertion of a first stage of L.F. amplification between detector and power valve will ease the situation considerably; this intermediate valve need only have a small voltage amplification factor, say \( m = 10 \), and resistance-capacity couplings can be used to couple it both to the detector and the power valve.

The low value of \( m \) means that the feed-back capacity
Quality Reception.—

is now small, so that larger values of grid leak can be used in the detector-1st L.F. stage coupling. It follows that the plate resistance in the detector circuit is no longer heavily shunted by the grid-leak and grid-condenser combination, and high-tone transmission is improved.

Fig. 22 shows a schematic circuit for two L.F. stages. The grid leak of 0.1 megohm preceding the pentode is too small to be appreciably shunted by the feed-back capacity of the pentode, and yet is too large to shunt the plate resistance (0.02 megohm) in series with the 1st L.F. valve. Again, the feed-back of the 1st L.F. valve is small on account of its low amplification factor —too small to shunt the grid leak of 1 megohm which precedes it—while this 1 megohm itself is too large to shunt the plate resistance of 0.1 megohm in series with the detector.

Transformer Coupling.

In practically all commercial sets comprising a H.F. screen-grid stage, detector and pentode, a transformer is used to couple the detector to the pentode with the object of obtaining a large amount of L.F. amplification. It is true that any transformer mutilates transients, and so is to be condemned when really high quality is being sought, but if we restrict ourselves to the consideration of sustained musical notes from 50 cycles to 5,000 cycles, the transformer coupling turns out to be a remarkably good device, provided that a few simple rules are adhered to.

Fig. 23 illustrates this circuit, and the first point to notice is that no blocking effect can now take place in the pentode, since if the grid should happen to receive a large positive swing it can immediately discharge through the secondary of the transformer.

Care should be taken to use a transformer of high primary inductance in conjunction with a detector of low differential resistance, for otherwise the low tones are attenuated. Good inter-valve transformers with cores of nickel-steel have at least 50 henrys in the primary, giving impedances of 15,000 ohms at 50 cycles, rising to 1.5 megohms at 5,000 cycles. Detectors for anode bend operation are made with differential resistance as low as 15,000 ohms (Mullard PMD or Osram DEL class), even when working on the lower bend of the characteristic, and accordingly the transmission at 50 cycles is 70 per cent., rising rapidly with frequency to 100 per cent. This is the result which would be obtained if the secondary of the transformer were truly on open circuit. But, as already shown, the feed back through the plate-grid capacity of the pentode introduces a capacity of 90 mmf. across the terminals of the secondary.

This is shown in Fig. 24 (a).

It is well known that a capacity \( C \) across the secondary is equivalent to a capacity \( n^2C \) across the primary, where \( n \) is the step-up ratio of the transformer. Hence, if we choose a 1 : 3 transformer the equivalent picture is as in Fig. 24 (b), where the secondary has disappeared, and we have \( 3 \times 90 = 270 \) mmf. across the primary. In (c) and (d) the corresponding impedances are shown for 50 cycles and 5,000 cycles respectively. In (d) the capacity impedance has dropped to 40,000 ohms, and, since the differential resistance of the detector is 15,000 ohms, the transmission is

\[
\frac{\sqrt{40,000^2 + 15,000^2}}{\sqrt{40,000^2 + 15,000^2} + 0.94} = 0.94 
\]

or 94 per cent. Hence there is a slight loss of 6 per cent. at 5,000 cycles due to the pentode feed back.

In Fig. 25 (1) the trans-
Quality Reception.

mission curve is given for a 1:3 transformer with a 50 henry primary. The full line indicates the efficiency of transmission apart from feed-back effects, the loss due to the latter being indicated by the dotted curve (1).

If a step-up of higher ratio is used the characteristics of the transformer are impaired for two reasons. In the first place, more turns must be wound on the secondary, leaving less room for primary turns, so that the primary inductance is smaller. Secondly, the larger turns ratio means that the feedback capacity of the pentode must be multiplied by a larger number when it is being transferred back to the transformer primary. Thus, in Fig. 24 if a 1:6 turns ratio were used we should have $6^2 \times 90 = 3,240$ mmf. in (b) and 10,000 ohms instead of 40,000 ohms in (d). Curve 2, Fig. 25, shows the transmission curve actually obtained for a 1:6 transformer. With transformers of greater bulk, such as the Ferrari AF5, which is wound on a stalloy core a primary inductance of as much as 140 henrys can be obtained even when a current of 2 milliamperes is flowing through the windings. The transmission curve in this case is shown in Fig. 25 (3).

CORRESPONDENCE.

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

UNQUALIFIED STAFF AT THE SHOW

Sir,—I was interested in your remarks in the current issue of The Wireless World concerning the tendency of stallholders at the recent Exhibition to " take on a temporary staff with little knowledge of the apparatus displayed."

This was the first year that I have visited the Radio Exhibition, and I was very surprised at the number of attendants whose knowledge of the apparatus was limited to the information given in the accompanying leaflets or catalogues.

I must confess I expected to meet experts who knew their respective exhibits from A to Z. Instead, when I enquired for details concerning a certain eliminator or whatever the equipment was, the attendant could do nothing until he had consulted a catalogue; he then marked with pencil the model concerned, handed the catalogue to me, and then apparently expected me to go away! Instead I consulted the said "book of words" and informed the gushing gentleman that that was not the model about which I was enquiring! To which he replied that he knew nothing about that model, but that he had sold a large number and had no complaints. He expected us (a wireless friend accompanied me) to be impressed with his cleverness, apparently, when he told us how he had discovered a grid-bias lead plugged into the H.P. battery of a set he had had to repair.

On numerous other stands, too, the knowledge of wireless displayed by the attendants was barely equal to that of a fairly intelligent schoolboy who pursued wireless as a hobby.

Let us hope that the manufacturers concerned will realise the "bad business" of this state of affairs before another Show.

Newark, Notts.
S. W. P. HENTON.

PITCH OF THE HUMAN WHISTLE.

Sir,—I happened to see your paper this week and was interested in the article on Quality Reception, by Mr. Harmon. It is a pity, however, that the article which is so good on the whole should be marred by false premises evidently due to a not sufficiently perceptive ear. That this is so is shown by his making the usual mistake of placing the pitch of the human whistle an octave too low. Further, were his assumption, that no note less than 50 cycles is necessary, true, the expensive pedal pipes of an organ would be superfluous. These open wood pipes, far from lacking fundamental power, consist of little else, and it is due to these that the organ poses that heavy foundation that even a multitude of orchestral string basses cannot produce. I would suggest that Mr. Harmon finds some friend with what musicians call "absolute pitch" to advise him, and he may safely depend on his dictum where sound perception is required.

SEYMOUR PILE. Birmingham.

Sir,—Sir Richard Paget, in his recent book, "Human Speech," put the lower limit of the human whistle at upper C (512 cycles). As I was unable to re-concede this position with my own perception I invited four of my friends who possess absolute pitch and the same capacity to whistle a descending scale, accompanied on the piano, with the result that two of them put the lower limit at middle C, while the other two gave upper C.

During the next three months I tested 53 people of varying degrees of musical ability, with the result that in 45 cases middle C was preferred, only 8 votes being given for upper C. The observers stated that a low whistle is so complex that they had considerable difficulty in assigning the correct octave.

Were the majority of these people making what Mr. Pile calls a common mistake? Why should their interpretation be called a mistake in the absence of any absolute standard by which the pitch can be ascertained? It is probable that in some cases the complex sound is assigned to its loudest component, and to its lowest component in others. An oscillograph analysis would give the necessary data on which to argue the question.

Anyhow, the readers of The Wireless World are now presented with a controversial subject which should afford them entertainment during the winter evenings.

New Jersey.

S. W.

"THE GREAT F.R.S."

Sir,—I was very pleased to read Mr. Trevor-Potts' letter about Professor S. P. Thompson's classic, "Calculus Made Easy." Since first meeting it several years ago it has been a constant source of pleasure, and I have developed a great affection for it. There certainly ought to be a "S.P.T. Society" for its study and appreciation!

But we must also be grateful to Professor Perry for his "Calculus for Engineers," another delightful book which also turns the calculus into a "joy for ever" for all who can see the "thing of beauty" in even elementary mathematics.

Your readers will find endless pleasure in these two wonderful books.

L. OSWELL.
The production of a new Osram Music Magnet is becoming an annual event to which many of us look forward with considerable interest, for the very good reason that each receiver of the series has been not merely up to date but actually ahead of ordinary current technical practice.

In the matter of ganged tuning control the designers are pioneers, as far as "kit" sets are concerned. When the first model was produced the opinion was freely expressed that the inclusion of this admittedly valuable feature in a receiver intended for home construction by even unskilled amateurs would necessitate the sacrifice of a good deal of sensitivity and selectivity. These fears were proved to be groundless, as the performance of the receiver, in spite of its easy operation, was found to compare very favourably with that of many others in the H.F.-det.-L.F. three-valve class.

"Music Magnet No. 2" was similar to its predecessor in all essentials, but was considerably improved in detail: the subject of the present review, which is the third model to be produced, is a much more ambitious set, as it includes two H.F. stages. Those responsible for it have rightly decided, in view of present congestion in the ether and ever-increasing power of transmitting stations, that at least three tuned circuits are necessary for anything approaching satisfactory and consistent long-distance reception. The new set is infinitely more selective, and has an appreciably greater range than last year's model.

A preliminary announcement regarding the Music Magnet Four appeared in The Wireless World for August 13th, where brief details and a simplified diagram were published. The complete circuit arrangement is now shown in the accompanying diagram, from which it will be seen that double-wound H.F. transformers are used both for aerial-grid and intervalve couplings. Long-distance reception...
Kit Constructors’ Notes.—

and medium-wave windings are joined in series, the former being shunted by short-circuiting switches for waveband changing. A grid detector is followed by a single transformer-coupled L.F. stage, and reaction is controlled by a differential condenser, so arranged that its moving vanes may be earthed. Connected in this way, the condenser functions just as well as if it were used in the more conventional manner, and so this plan might well be adopted more widely, especially in the construction of receivers with metal panels.

An input volume control is provided in the form of a series aerial condenser. Each of the three ganged tuning condensers is fitted with a trimmer, and all switches are mechanically linked. The circuit is essentially simple and straightforward, without unnecessary complications, and values of components, etc., are chosen to suit the characteristics of the particular Osram valves which are specified in the instructional broadsheet, choice being given between those with two-, four-, or six-volt filaments.

Details of construction are particularly well thought out, and it is no exaggeration to say that the receiver could be successfully assembled by anyone with common sense, even if he did not know what a valve holder looked like! Components are separately wrapped in labelled packages, and clear instructions are given for each successive stage in the process of assembly and wiring.

With regard to screening, the essentially modern practice of providing separate compartments for tuning condensers and coils has been followed. The triple condenser assembly, which is supplied complete in an aluminium container, deserves a word of praise for its excellent design and robust though compact construction; the three linked rotors are driven through friction gearing by a knob protruding through the side of the containing cabinet.

Ingenious Wave-change Switch.

Each of the H.F. transformer assemblies is mounted, together with the associated valve, in a shallow tray, which in turn is bolted to the main aluminium base-plate. Removable screening covers are supplied for each unit.

All the coil formers are of 1/8 in. diameter, and, to ensure perfect matching of inductances, are threaded for the medium-wave secondaries, for which enamelled wire is used. The corresponding primaries are wound in a single narrow slot, and are coupled to the centres of their secondary windings.

The long-wave secondary coils are wound sectionally in grooves, with primary sections sandwiched between. Pairs of transformers are mounted together on a brass platform, which also carries the switch contacts; these are operated in a most ingenious manner by a rod rotating in bearings mounted under the base. This rod is drilled with three deeply countersunk holes, which engage with steel balls; on rotation of the rod the balls are forced upwards, and their movement is transmitted to the switch contacts in such a way that they are
Kit Constructors' Notes.—

Closed for listening to the medium waveband.

It has already been stated that the tuning condenser knob projects through the side of the cabinet; controls for the wave-range switch, the series aerial condenser, and the reaction condenser are similarly arranged, with the result that the front panel is quite bare except for an on-off switch and the tuning scale aperture. This arrangement makes it extremely easy to operate the set, even during a prolonged sitting in search of elusive distant transmissions, as the operator's forearms may be rested on the table.

The controls most frequently used—those for tuning and reaction—are in the most accessible positions; this is but one instance of attention to detail in the design.

When the screening covers are in position very few connecting leads are visible, as they are mostly concentrated under the base. The process of wiring is made easier by drawing the plan so that each wire passing through the baseplate may be traced to its proper terminal by holding the diagram to the light. Instructions as to the length and position of each wire are given.

A deliberate attempt to extract the utmost possible magnification from each of the H.F. valves of any set of this kind would be a mistake, and the conclusion has been reached, after an extended series of tests, both comparative and quantitative, that the best possible compromise has been made. Overall H.F. gain is not particularly high, but is ample for almost any conditions, and, as already suggested, the new set is vastly more sensitive than either of its predecessors; it may definitely be placed in the long-range class, in which, incidentally, very few three-valve receivers can legitimately be included.

It is gratifying to observe that the set is completely stable, and further, that in this respect there is an ample margin of safety; the insertion of high resistance in the common anode feed lead does not tend to produce self-oscillation, either at high or low frequency. This would suggest that the receiver could be fed satisfactorily from a source of comparatively high resistance, that is from almost any type of H.T. battery eliminator, provided that it includes an adequate smoothing system.

Selectivity is improved to an even greater extent than sensitivity, and is more than sufficient for ordinary conditions. It is but rarely that one has to resort to combined operation of the volume control and reaction condenser, in the manner advocated by the producers of the set, in order to avoid interference.

The ganged tuning system works very satisfactorily, and, when once the trimming condensers have been properly set for the medium band, this adjustment holds remarkably well on changing over to the longer wavelengths. The actual operation of 'trimming' each of the three separate tuned circuits is not really difficult, but it pays to take pains to see that it is done properly, and to make the necessary adjustments when listening to a naturally weak signal, and not to one made artificially weak by operation of the volume control, which introduces some slight change of aerial-grid circuit tuning.

Direct wavelength calibration is marked on the tuning condenser dial, which, in addition, has an arbitrary scale of o-100 divisions. This seems to be a most satisfactory arrangement, as it allows the setting corresponding to comparatively weak transmissions to be recorded accurately for future reference. Further, an extra pair of scales is provided, one of which is calibrated to correspond with actual stations, while the other is marked in condenser-dial divisions. When a station, known to adhere strictly to its proper wavelength, has once been identified, these scales are fitted together, and afterwards other calibrated transmissions can easily be found.

Anode consumption is on the high side for a battery set, amounting to some 15 milliamperes at least when a DEP.215 output valve is used with normal H.T. and screening grid voltages throughout. This figure can be appreciably reduced for local station work by reducing screening-grid voltages. Special high-capacity batteries are being produced by its makers, the General Electric Company, Ltd., Magnet House, Kingsway, W.C.2.

The complete set of parts, including valves and an oak cabinet in sections, but ready for assembly, costs £1 15s. This price seems to be remarkably low, particularly in view of the fact that all components are of high quality, and the chassis and details appertaining to it are beyond criticism with regard to their construction.

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.

A Question of Power Output.

The "Regional One" receiver makes a splendid set, but I have been deterred from building it because its output is stated to be 400 milliwatts, and I remember some months ago it was stated in "The Wireless World" that an output of 1,000 milliwatts was usually considered necessary if a tinned-mo...
An A.C. Band Pass Set.

It seems to me that the "Band Pass Three" receiver should be readily adaptable for A.C. mains supply for its filament and control circuits; if I am correct in this, will you please explain briefly what alterations are necessary. If possible, I should like to use a super-power indirectly heated pentode in the output stage. H. M. P.

This set can quite easily be arranged for A.C. mains operation, and the alterations involved are of a more or less obvious kind.

A skeleton circuit diagram showing points at which these modifications must be introduced is given in Fig. 2, from which you will see that we suggest the use of indirectly heated valves throughout. You do not say specifically if you wish to use automatic grid bias, but to eliminate the bias battery, at any rate connections for this are not shown: it would probably be convenient, however, to eliminate the bias battery, at any rate for the output valve, and this can be done in the conventional manner.

The chief advantage of the tuned grid system is that it is more easily switched, it only being necessary to use a simple loading coil with a single-pole short-cir-

cuiting switch in order to cope with both long and short wavelengths. In addition, the coil, if it is to be home-made, is easier to construct as no primary winding is needed. On the other hand, the H.F. transformer is less costly, as a few turns of fine wire for the primary should be far cheaper than an H.F. choke and coupling condenser. Undoubtedly the greatest advantage of the H.F. transformer, however, is the fact that it is possible to achieve extra selectivity—and, if necessary, to attain stability—by removing primary turns. It is true that a similar effect can be produced in the case of the tuned grid by tapping the connection from the coupling condenser down towards the low-potential end of the coil, but only by adding complications to the waveband switching system.

Fig. 2.-Skeleton circuit diagram of the "Band Pass Three" showing points at which modifications must be made for A.C. mains operation.

Referring to the diagram, the resistances $R_1$ and $R_2$, which form the fixed and variable elements of the screening grid potentiometer, may have values of 50,000 and 50,000 ohms. $R_3$ and $R_4$, are combined anode feed and decoupling resistances for the first two anode circuits, and their values, depending as they do on H.T. input voltage, must be estimated in the usual way. Similarly, $R_5$, the feed resistance for the final screening grid, will also depend on input voltage, but assuming the normal average figure at about 200 volts, a resistance of 15,000 ohms would be correct. $R_6$ and $R_7$, the grid decoupling resistances, will not be necessary unless you use automatic bias; if this addition be made, resistors of 100,000 ohms would do.

For the condensers $C_1$, $C_2$, $C_3$, and $C_4$, a capacity of 1 mfd. will be sufficient, while $C_5$, $C_6$, and $C_7$, should be of 2 mfd.

The grid condenser and leak ($C_8$ and $R_8$) are shown as being connected in parallel. This method is best if you adopt power grid detection, as you will then do if sufficient H.T. voltage is available.

To simplify the diagram, anode and grid circuit impedances are not shown, but are represented by the letter $Z$.

H.F. Transformer and Tuned Grid Compared.

I am constructing a new receiver and am undecided whether to use an H.F. transformer or the tuned grid method of coupling between the H.F. valve and the anode control detector, and I shall be glad if you will compare the relative advantages and disadvantages of the two methods for use.

R. G.

For the condensers $C_1$, $C_2$, and $C_3$, shunting $C_4$, and the anode bend detector, and of coupling between the H.F. valve and the anode control detector, and $C_3$, shunting $C_4$, and the anode bend detector, and $C_3$ the anode bend detector, and $C_3$, shunting $C_4$, and the anode bend detector, and $C_3$ should be of 2 mfds.

The grid condenser and leak ($C_8$ and $R_8$) are shown as being connected in parallel. This method is best if you adopt power grid detection, as you will then do if sufficient H.T. voltage is available.

To simplify the diagram, anode and grid circuit impedances are not shown, but are represented by the letter $Z$.

H.F. Transformer and Tuned Grid Compared.

I am constructing a new receiver and am undecided whether to use an H.F. transformer or the tuned grid method of coupling between the H.F. valve and the anode bend detector, and I shall be glad if you will compare the relative advantages and disadvantages of the two methods for use.

R. G.
WESTINGHOUSE METAL RECTIFIERS

HIGH-TENSION UNITS ARE NOW OBTAINABLE FROM 15/-

WHEN ASKING FOR METAL RECTIFIERS SPECIFY "WESTINGHOUSE," AND DO NOT BE PUT OFF WITH SO-CALLED METAL RECTIFIERS WHICH DEPEND UPON ELECTROLYTIC ACTION, AND SO HAVE A LIMITED LIFE.

WESTINGHOUSE METAL RECTIFIERS ARE PURELY ELECTRONIC IN ACTION.

Call at the Stand for a copy of "The All-Metal Way, 1931." 40 pages of circuits and technical data of great value to all mains users.

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

SEE THEM ON STAND 66 MANCHESTER RADIO SHOW.
The OLYMPIA Motor Car Show & The Autocar

ENLARGED SPECIAL NUMBERS

OCT. 17
“Complete Show Report”
Cars—Coachwork—Accessories all fully described and illustrated.

OCT. 24
“Olympia Show Review”
A Critical Analysis of the Trend of Car Design.

Price 6d.
Of all Newsagents.

Please order early from your newsagent as there is a great demand for these enlarged numbers and they will be sold out very quickly.


“CRESSIDA” RADIO RECEIVERS

The most advanced design on the market.
4-valve long range set.

Also supplied fitted with Automatic remote control of tuning and volume.
Please write for catalogue and further details.

ELECTRICAL REPRODUCERS LTD.,
102, W. Regent Street, Glasgow.

Make your own records

Here is an opportunity to make permanent gramophone records of your children’s voices, model’s voices, greetings and messages of your relatives and friends or of your own voice. The records are made by a simple device connected up to your radio set and gramophone. Complete apparatus, with six double sided records.

PRICE £4.12.0
Extra records 4d. each.

SIMPLE. INEXPENSIVE. FAITHFUL REPRODUCTION. PERMANENT. ENTERTAINING.

Write for full details and descriptive leaflet, explaining the secret of this wonderful home recording device to:

CAIRNS & MORRISON, Ltd., 33 Percy St., LONDON, W.1
Telephone - Museum 6564.

Experimental Wireless & The Wireless Engineer

The Journal for Professional Engineers and Advanced Wireless Experimenters
Monthly 2/6 net.
Annual Subscription 32/- post free.

A Cabinet of REAL MERIT and GREAT UTILITY
THE NEW "KABILOK" RADIO-GRAM CABINET.

The easy operating height of gramophone turntable, the removable back for inserting receiver, slots for lead-in wires and baffle board behind grille, make this a cabinet of real merit and great utility.

"KABILOK" QUALITY

Model R.G.2.
Overall Sizes:
Height 3ft. 3in.
Width 2ft. 6in.
Depth 1ft. 5in.

Prices:
OAK £5.19.6
Real MAHOGANY £7.12.6

A modification of this design can be obtained to your own specification.

W. & T. LOCK Ltd.
St. Peters Works, Bath.

New Price Lists
Free on Request.

E.D.C.C.
D.C. to A.C. CONVERTERS
FOR RADIO RECEIVERS

OUTPUT 40-500 WATS.

MECHANICALLY AND ELECTRICALLY SILENT

LISTS—ELECTRO DYNAMIC CON. CO., LTD., DEVONSHIRE GROVE, LONDON, S.E.15.

Also D.C. TO D.C. ROTARY TRANSFORMERS.

EXCEPTIONAL SELECTIVITY

The SELECTOR ELECTRIC "42"
For A.C. or D.C.

Complete 42 Gns. or £7 down
and 12 monthly payments of £3. 8. 0.

SELECTIVITY has been made the special concern of the designers of this Selector model and they have developed it to so high a degree of perfection that stations can be separated almost within sight of the aerial.

Reception of continental stations is exceptionally good, even under difficult conditions, the reproduction being delightfully clear and free from interference of any kind.

The "42" is contained in a handsome mahogany cabinet fitted with special smooth—action turntable which ensures the full advantage of the directional properties of the set.

Write for catalogue W.W.3 or ask your dealer to arrange a demonstration for you.

SELECTORS LIMITED, 286 Bedford Avenue, Slough Trading Estate, Slough, Bucks.

LONDON SHOWROOMS: 1 Dover St., W.I. Tel: Regent 4771.

ELECTRAD TRUVOLT RESISTANCES

Truvolt wire wound variable potentiometers simplify the construction of H.T. Eliminators and positively do away with all guesswork. The resistance element is a nickel alloy wire. There is no wire to rust or zinc to oxidise. Truvolt are air-cooled and give a positive and lasting service. All the units listed below are rated at 25 watts. Electrad originated the Truvolt. Note these reduced prices and ensure that the units you buy have the name Electrad stamped upon them.

<table>
<thead>
<tr>
<th>Type</th>
<th>Resistance Ohms.</th>
<th>Current Milliamperes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T.5</td>
<td>500</td>
<td>224</td>
</tr>
<tr>
<td>T.75</td>
<td>750</td>
<td>182</td>
</tr>
<tr>
<td>T.10</td>
<td>1,000</td>
<td>158</td>
</tr>
<tr>
<td>T.20</td>
<td>2,000</td>
<td>117</td>
</tr>
<tr>
<td>T.25</td>
<td>2,500</td>
<td>100</td>
</tr>
<tr>
<td>T.30</td>
<td>3,000</td>
<td>91</td>
</tr>
<tr>
<td>T.50</td>
<td>5,000</td>
<td>71</td>
</tr>
<tr>
<td>T.75</td>
<td>7,500</td>
<td>58</td>
</tr>
<tr>
<td>T.100</td>
<td>10,000</td>
<td>50</td>
</tr>
<tr>
<td>T.200</td>
<td>20,000</td>
<td>32</td>
</tr>
<tr>
<td>T.250</td>
<td>25,000</td>
<td>22</td>
</tr>
<tr>
<td>T.500</td>
<td>50,000</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Write for the Electrad catalogue—it's free.

THE ROTHERMEL CORPORATION LTD., 24, Maddox Street, London, W.I.
Phone: MAYFAIR 0578/9.

Continental Sales Office: 27, QUAI DU COMMERCE, BRUSSELS, BELGIUM.
SPECIAL ANNOUNCEMENT TO LONDON LISTENERS

You would doubtless like to enjoy the advantages of High Tension Accumulators—and so be spared the expense and unreliability of Dry Batteries. The problems of initial cost and re-charging need no longer trouble you. Our unique service offers you the famous CAV High Tension Accumulators fully charged and ready for immediate use. They are delivered to your door (anywhere within 12 miles of Charing Cross) at convenient intervals; and at an inclusive charge which represents a vast saving over your present expenditure, and definitely guarantees better reception than partly discharged Dry Batteries.

Over 10,000 London Listeners testify to the excellence of this unique High and Low Tension Accumulator service. Write for interesting Price List NOW.

RADIO SERVICE
(LONDON) LTD.
105/6, Torriano Ave., Kentish Town, N.W.5
Telephone: NORTH 0623.

GUARANTEED COMPONENTS
—the greatest values in Wireless Instruments obtainable. Stocked by all leading dealers. Illustrated List on request from makers.

NEW PATTERN ANTI-CAPACITY SWITCH
Combats oxidisation by SOLID SILVER CONTACTS.—Lever operated—one-hole fixing—very compact.

PRICE:
W.213/2 2-pole change-over 5/6
W.215/3 3-pole change-over 6/6
W.215/4 4-pole change-over 7/6
W.215/6 6-pole change-over 9/6

WILKINS & WRIGHT LTD
HOLYHEAD W.2, BIRMINGHAM

BUY ON DEFERRED TERMS

Britain's Best Battery with the Unique Semi-Oil Submerged feature. Absolutely prevents surface leakage, Double Capacity Type. 60 volts, 30 amp. price $5.00 per month for 4 months.

STAND NO. 33
MANCHESTER RADIO EXHIBITION, CITY HALL, DEANSGATE. Oct. 8th to Oct. 11th, 1930.

MENTION OF "THE WIRELESS WORLD," WHEN WRITING TO ADVERTISERS, WILL ENSURE PROMPT ATTENTION.
NOTICES.

THE CHARGE FOR ADVERTISEMENTS in these columns is-
10 words or less, 8½d. and 2d. for every additional word.
Each paragraph charged separately and name and address must be counted.

SPECIAL 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: 3 consecutive insertions 9%, 5 consecutive 10%, 8 consecutive 12%.

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," Dorner House, Tudor Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices, 1B, Horton Street, Coventry; Guildhall Buildings, Navigation Street, Birmingham; 260, Deansgate, Manchester; 181, 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.

receivers for sale.

scroiles, COINS, BAND-PASS KITS, BAND-PASS THREE, ALL D.C.3, foreign mains' 4, MAINS and BATTERY can be supplied at short notice.

H & B

magneto incandescent arc lamp, 6 X 6 X 6 X 5 1/2. aluminium Screening Boxes, 6 X 6 X 5 1/2. aluminite, 6 X 6 X 5 1/2.

in 18 wire gauge.

Any size copper or aluminium screen or box made within 12 hours receipt of order.

Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.

OCTOBER 15TH, 1930.

THE WIRELESS WORLD

ADVERTISEMENTS.

Receivers for Sale.—Contd.

APPLEYS

WHERE Radio Part Exchange Begins, a service which has no equal in these parts, and is carried on with the utmost good faith and honesty, and consequence all over the world which has accurately been examined and compared, the market at current prices; so desired we can accept the following apparatus: Receivers (domestic and portable), radio-trampliners, loud-speakers (tone and music), loud speakers and chassis, loud speakers and sub-woofers and mains equipment components, battery chargers, remote control equipment, pickup and carrier arms, electric gramophone motors, standard required value, 10/-. the maximum amount allowed to be drawn upon the deposit account is £200. Any size copper or aluminium screen or box made within 12 hours receipt of order. Workmanship Guaranteed. Trade Supplied. Cash with Order or C.O.D.

H. & B. RADIO CO., 34, 36, 38, Beth Street, Regent Street, W.1.
ALL MANUFACTURERS' GOODS
advertised in "Wireless World" can be obtained by post from Young's.

J. G. GRAVES LTD. SHEFFIELD

PRICES.

WATER'S DOUBLE CONE CHASSIS
Pat. No. 309214

WATER'S STAR UNIT

THE STANDARD BATTERY Co. (Dept. W.W.)

184/188, Shaftesbury Avenue, London, W.C.2.

M.B.

THE ONE
H.T. UNIT
WORTH WHILE.

Keeps automatically charged from the H.T. Accumulator or will work from a Trickle Charger. Inestructible Nickel and Iron Plates. Guaranteed for 12 months but will last a lifetime.

MILNES RADIO CO.

COTTINGLEY BRIDGE, BINGLEY, YORKS.
Compiled by the Staff of Claude Lyons Ltd and dealing with the varied uses of "CLAROSTAT" Products, etc.

IT'S FREE

BRIEF SUMMARY

"The Wireless World" is an essential reference book, both in the home and for use by Wireless Engineers and Students.

- "CLAROSTAT" is a transformer used in conjunction with "CLAROSTAT" products.
- "CLAROSTAT" Transformers are used in conjunction with "CLAROSTAT" products.
- "CLAROSTAT" Transformers are available in a wide range of sizes and specifications.
- "CLAROSTAT" Transformers are manufactured by "Claude Lyons Ltd.

Claude Lyons Ltd.
76 OLDHALL ST., LIVERPOOL.
40 BUCKINGHAM GATE, S.W.1.

TO BE RIGHT "UP TO DATE" IN RADIO YOU MUST HAVE THIS VALUABLE BOOK.
SEND NOW FOR YOUR COPY FREE, and POST FREE.

CLAUDY WIRED'S ""CLAROSTAT" BOOK""

Published and copyrighted 1930 by Claude Lyons Ltd.

COPIES AVAILABLE AT:
- Radio Stores
- Music Stores
- Bookstores

Claude Lyons Ltd.
76 OLDHALL ST., LIVERPOOL.
40 BUCKINGHAM GATE, S.W.1.

"CLAUDIO" WIRED'S ""CLAROSTAT" BOOK"

Advertisements:

1. **EPICH Moving Coil Speakers**
2. **EPICH—Everybody who heard the Model 99 agreed that it was the "Dream Speaker" that it was the finest speaker in Olympia.
3. **EPICH—Everybody who heard the Model 101 (Dynamite) agreed that the Super Cinema Model was truly named.
4. **EPICH—But those who managed to hear the new Model 103 (Dynamite) under fair working conditions will never forget it.
5. **EPICH—They will never rest until one of these speakers is in their own home.
6. **EPICH—The new 101 (Dynamite) cannot be adequately described.
7. **EPICH—All standards of quality reproduction must be exceeded.
8. **EPICH—Never before has such sensitivity and power been obtained in a Home Model.
9. **EPICH—Model 101—the speaker of no comparison.
10. **EPICH—Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.
11. **EPICH—First and foremost the Cabinet Models G12, G13, and G15; prices compete from £25/10/6.
12. **EPICH—These contain very powerful permanent magnet Moving Coil Speakers.
13. **EPICH—They are not just fitted into cabinets, but are specially balanced as Cabinet speakers.
14. **EPICH—No discernible, no box resonance, clear, sharp, marvelous reproduction.
15. **EPICH—Magnificent woodwork, very compact.
16. **EPICH—They cost less than some makes of inferior quality, and without the need.
17. **EPICH—Permanent Magnet Moving Coil Speaker Units for portable; £25/15/0, ready for use.
18. **EPICH—Standard Cross Type Permanent Magnet Speaker, price £4/14/6, the finest of its kind.
19. **EPICH—Permanent Magnet Speaker; they are 24/12/6.
20. **EPICH—Remember, the famous 66 and 99 speakers are heavily reduced in price.
21. **EPICH—The 296 is also further improved in sensitivity.
22. **EPICH—Range of Moving Coil Speakers is the largest in the world; a speaker for every requirement.
23. **EPICH—Send for booklet 65, the most interesting and accurate publication on the subject.
24. **EPICH—Send for the 7 days approval arrangement.
25. **EPICH—Send the H.P. terms.
26. **EPICH—Call for a demonstration.

EPICH RADIO MANUFACTURING CO., Ltd.
31-37 Fulham Road, London, S.W.3.

"CLAUDIO" WIRED'S ""CLAROSTAT" BOOK"

Claude Lyons Ltd.
76 OLDHALL ST., LIVERPOOL.
40 BUCKINGHAM GATE, S.W.1.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Olympia's Best!
Our 1931 model
SUPER POWER MOVING COIL SPEAKER

WRITE NOW
for free copy of 32 PAGE BOOKLET on REALISTIC REPRODUCTION

THE VERY BEST of all Electro-Magnet and Permanent Magnet Moving Coil Speakers are MADE BY

Baker's 'Selhurst' Radio

OFFICES: 89 SELHURST ROAD, S. NORWOOD, S.E.25.
WORKS & DEMONSTRATION ROOM: 42 CHERRY ORCHARD ROAD, E. CROYDON.

POWER CHOKES guaranteed twelve months

substantially built, for smoothing circuits in eliminators, dealing with currents up to 300 miliampere, inductance 30 henries, price 8/6 cost free

Note change of address

POWER CHOKES by to any make of eliminator in layouts, Loudspeakers, or Headphones.

All apparatus guaranteed

48 HOURS. TWELVE MONTHS' GUARANTEE with each repair.

TERMS: POST FREE.

Transformer Repair Co.

553, GARRATT LANE, TOOTING, LONDON, S.W.17.

EXIDE BATTERIES AT LESS THAN HALF LIST PRICE.

Stocked-alkali type, supplied fully charged and filled with acid. Inspection invited.

7-volt High Tension batteries consisting of 5 heavy capacity WH 10-volt units in Exide crates.

£1 6 0

An opportunity not to be missed for giving up noisy dry batteries and installing a really satisfactory source of high tension supply.

6-volt 30 amp. actual in Exide crates, type £1 0 3

4 volt D.T.G. batteries £2 6 0

2 volt D.T.G. batteries £2 3 0

10 unit sets, 2 volt tapplings, type W.H.G. £2 6 0

ditto type W.J.G. £2 7 0

terms-cash on order, seven day's approval.

Carriage forwarded.

J. Weaver, Britannia Works, King's Road, Camden Town, N.W.1.

Polar

The widest and finest range of British made CONDENSERS.


Wingrove & Rogers, Ltd., 189-9, Strand, London, W.C.2

Saxon 20 STRAND AERIAL WIRE INSULATED:

Each Piece Guaranteed to Resist the Pull of a Train AERIAL WIRE.

Saxon AERIAL WIRE.

5/6

Treble Duty Terminals

In 6 colours, and 40 indicating tops, red and black. Most suitable sample, pin, eye at point wire. (3/6) 14 line each. (12/6) plain top, 6d. each. Write for list X 13.


Bel Canto For Realism in Radio LOUD SPEAKERS, UNITS & RADIOGRAMS. Write for List X 13.

Eastley Way, the vale, Acton, W.3.

THE WIRELESS WORLD
OCTOBER 15TH, 1930.
There is a reason!

There’s a good reason for the growing use of Colvern Rotary Switches. Look at these new Colvern Rotary Switches, for example.

They work smoothly with a rotary movement, and spring action makes the contact faces self-cleaning and keeps pressure on the points in the “make” position.

The Single Pole type (price 1/3) is a straightforward off-and-on switch, but the Double Pole type (price 2/6) with four contacts has a variety of uses and can be adapted for ganging.

Both switches have one hole (5) fixing, operating knobs of pleasing design, and are mounted on bakelite mouldings with insulated spindles.

Your radio dealer has them in stock.

Colvern Radio
Advt. of Colvern Ltd., Mawney Road, Romford

THE COLLxVER BOOK IS FREE ON REQUEST

October 15th, 1930.

THE WIRELESS WORLD

Advertisements

EPOCH

Too BUSY!

Phew! In spite of our tremendously enlarged business and the great preparations we made for the season’s anticipated popularity of the sensational new Models of Epoch Moving Coil Speakers, the orders are pouring in at such a rate that much of our augmented order staff has been at times two days behind even on entering!

For this reason we ask our customers’ indulgence in any of the little delays that cannot be avoided at present. We beg to assure them that we are making titanic efforts to cope with the orders and that no lengthy delays are taking place so far. We rely on sound reasons for this great success.

Boobet W.S.J. please ensure this copy immediately.

EPOCH RADIO MFG. CO., LTD.,
Farrington Avenue, E.C.4.
Components, Etc., For Sale.—Contd.

P.M.8, 2 P.M.G.4, P.L.95A, all half price; 8 V.E.10, E.10, E.110 units, 6d.—Chainaum, 169, Victoria St., London, S.E.1.

GREAT Radio Sale—2 valve transmitting sets, new and second hand, 6/-; 4 valve receiving sets, new and second hand, 12/6; 6 valve spark coils, complete, 6/6; superheated motor for making Transmitters, 5/-; Condenser and microphone transformers, 2/6; television motors, electric, any voltages, D.C., 7/6; each; telephone sets, complete, 110v. D.C., 5/-; 75 V.A. charging dynamos, 3/-; 20v. 6a., 40/-; 100v., new special, complete, 1/-; portable microphones, 17/-; earphones, 1/5; telephone H.T. generating sets, 6/6; Morse tapping keys, 15/-; 1 M.F. Mandrake condenser, 1/-; hand telephones, 5/-; telephone dials, 1/-; junk required to carry 10 amperes, 1/-; other items, 2, 1,000 coil, 1/-; Ford locomotive crop, 1/-; broadcasting tom, 1/-; Hi-Brass crystal sets, slightly incomplete, 12/6; H.T. buzzers, platinum contacts, 5/-; Decca switchers, 1/-; 250 volt dynamo, 10/-; or 150 volt, 1/-; old car starters, 10/; new L.F. transformers, 5/-; cash with order only, all goods guaranteed; all lists answered; immediate delivery; full descriptive list now ready.—G.J. 1, Queen’s Rd., Peckham, London, S.E.15.

SPECIAL MICROPHONE TRANSFORMER for connecting Super-Microphones to Radio Telephones, Loud Speaker, Amplifier, or Wireless Set, 6d. per foot.

SMALL 10 OHMS EARPIECE for use with Super-Microphone as a HIGHLY EFFICIENT DEAF-AID, or Deafness, etc.; thin 3-ft. silk connecting cord, 9/-.

HIGHLY SENSITIVE SUPER-MICROPHONES. New, made on the latest principle, a vast improvement on the old, 27, Fitzroy Street, London, W.1. From bedroom to distant Loud Speaker, Experience, from Bedroom through distant Loud Speaker, Experience.

EQUAL SENSITIVENESS KNOWN; SUPER -MICROPHONES SELECTIVE to send set for immediate quotation.

NO OTHER MICROPHONE OF EQUAL SENSITIVENESS KNOWN; each instrument finely black enamelled and fitted with a 3-ft. silk connecting cord. By return of post to Capt. Robinson, Langmead, Pirbright, 1/9; 22x22, 1/6; 20x20, 6d.; all guaranteed, £2.2.0 to £20.

Patents and Trade Marks. British and foreign.—AMICE, A.M.I., and M.A.I.R., 1/6; Glaxey, London, 1/9; A.M.I., 1/6; all guaranteed, £2.2.0 to £20.

SPECIAL MICROPHONE TRANSFORMER for connecting Super-Microphones to Radio Telephones, Loud Speaker, Amplifier, or Wireless Set, 6/- per foot.

SELECrive TUNING

The Lotus Single Drum Vernier Dial is made with a needle escapement in heavy silver, oxydised silver, or Florentine bronze finish, or black or mahogany bakelite. The perfect machinery makes selective tuning simple and backlash impossible.

Price with 0055 Condenser 14/9
Without Condenser 9/-

From all Radio Dealers or


Phone: Museum 8329.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention. A44

PATENT AGENTS.


9/5.

Made by R.H. Glasscoe & Co., 71, Moorgate, E.C.2

Phone: Met. 1126.

PRICE 2/6 Post 3d.

"APUTS" DOPE

DOPE BRUSH 2/9

DOPE 1/6

IRISH LINEN for 22in. 7/6

SPECIAL MICROPHONES FIT ALL UNITS

COMBINED BRASS AND CELLULOID WASHERS. PREVENTS RATTLE.

EXPERTS SAY: — "The most Successful Centre yet devised."

SPECIAL MICROPHONE TRANSFORMER for connecting Super-Microphones to Radio Telephones, Loud Speaker, Amplifier, or Wireless Set

SMALL 10 OHMS EARPIECE for use with Super-Microphone as a HIGHLY EFFICIENT DEAF-AID, or Deafness, etc.; thin 3-ft. silk connecting cord, 9/-.

HIGHLY SENSITIVE SUPER-MICROPHONES. New, made on the latest principle, a vast improvement on the old, 27, Fitzroy Street, London, W.1. From bedroom to distant Loud Speaker, Experience, from Bedroom through distant Loud Speaker, Experience.

EQUAL SENSITIVENESS KNOWN; SUPER -MICROPHONES SELECTIVE to send set for immediate quotation.

NO OTHER MICROPHONE OF EQUAL SENSITIVENESS KNOWN; each instrument finely black enamelled and fitted with a 3-ft. silk connecting cord. By return of post to Capt. Robinson, Langmead, Pirbright, 1/9; 22x22, 1/6; 20x20, 6d.; all guaranteed, £2.2.0 to £20.

Patents and Trade Marks. British and foreign.—AMICE, A.M.I., and M.A.I.R., 1/6; Glaxey, London, 1/9; A.M.I., 1/6; all guaranteed, £2.2.0 to £20.

SPECIAL MICROPHONE TRANSFORMER for connecting Super-Microphones to Radio Telephones, Loud Speaker, Amplifier, or Wireless Set, 6/- per foot.

SELECrive TUNING

The Lotus Single Drum Vernier Dial is made with a needle escapement in heavy silver, oxydised silver, or Florentine bronze finish, or black or mahogany bakelite. The perfect machinery makes selective tuning simple and backlash impossible.

Price with 0055 Condenser 14/9
Without Condenser 9/-

From all Radio Dealers or


Phone: Museum 8329.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention. A44
**AN AMAZING PERMANENT MAGNET MOVING COIL SPEAKER**

**W.B.**

This new W.B. Permanent Magnet Moving Coil Speaker is most sensitive. The Permanent Magnet—which can be operated with D.C. or Low Selenium Wheatstone Bridge Circuit—does not require current from an alternating current. Geometrically designed, the Permanent Magnet Speaker is capable of reproducing accurately sound waves blended with all kinds of music, or in an alternative way as a means of communication. Available in Mahogany or Oak Cabinet, in a D.C. form with an 18 oz. buffer. Reduced price £5 6s. 0d.

Made by the Makers of the famous W.B. Valoeholders, Whiteley Bonham & Co., Ltd., Nottingham Road, Nottingham, Notts.

---

**THE WIRELESS WORLD**

October 15th, 1930.

---

**ADVERTISEMENTS.**

---

**THE TUNER THAT SELECTS!**

This is the WATMEL BINOCULAR H.F. CHOKE which gives maximum efficiency, very low self-capacity and an extremely restricted field.

**TYPE DX3**

Inductance - 200,000 m.H., D.C. Resistance - 1,000 ohms.

**PRICE £3.**

If you cannot get these WATMEL products at your dealers, send remittance and order direct to us, and the article will be despatched by return.

---

**WATMEL WIRELESS CO., LTD.,**

Imperial Works, High St., Edgeware.

Telephones: EDGWARE 9203.

---

**BURNS-JONES**

**AND COMPANY LIMITED,**

"Magnam" House, 280 Boro' High Street, London, S.E.1

Telephone: Box 6328 C.0.24

---

**SITUATIONS VACANT.**

**BARNES BRYANT in the Wireless World!** Become a trained salesman and radio expert. A short course training enables you to qualify for this position. Opening salaries £8 a week, with good salary, ending in an introduction to prospective employers. Write for 80 days' course of instruction at the evenings, commencing 1st October. The London Polytechnic Training College, Ltd., More House, Beca Court, L.W.3, E.C.4. (942)

**LONDON** ( sideways). Cabinet Manufacturers. Representatives to travel in the Western Hemisphere. Cabinets, mahogany, walnut and oak; must be well appointed with the best whole house apparatus available. Apply, in confidence, to Box 7220, c/o The Wireless World.

**RETAIL** Manager, H.W. London, experienced, salary and terms to suit. Well paid, particulars and copies of references, Box 7327, c/o The Wireless World.
NEW CLIX LINES

SOVEREIGN WIRE WOUND RESISTANCES

LOWER PRICE makes Columbia

even more economical

Columbia RADIO BATTERIES

SITUATIONS WANTED.

WIRELESS AS A CAREER.

WIRELESS WORLD, October 15th, 1930.
RECOMMENDED BY WESTINGHOUSE
IN EVERY CIRCUIT

In their "All-metal Way 1931"

THE REGENTSTAT

Extract from "The All-Metal Way 1931."
The "Regentstat" variable wire-wound resistance offers advantages not obtainable with the fixed type where it is not possible to calculate the resistance with reasonable accuracy. It is particularly useful where a fine adjustment of the voltage is required as in the case of a screen grid potentiometer tapping, etc.

REGENTONE TRANSFORMERS AND POWER CHOKEs are specified in every circuit. Regentone Mains Units are made in compliance with the first recommendation of the Institute of Electrical Engineers. They are built by specialists with six years' experience in mains radio. They give you better, cheaper radio, more reliable and more convenient.

Write for FREE Art Booklet giving full particulars of Regentone Products.

Tel.: Central 8745 (5 lines).

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

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.

THE WIRELESS WORLD

October 15th, 1930.

INDEX TO ADVERTISEMENTS.
BAYLISS TRANSFORMERS, CHOKES, Etc.

FOR THE MAINS

The illustrations show a few of our various types of Electrical equipment.

We manufacture Transformers up to 130,000 Volts, oil insulated, for Testing purposes, pressure testing outfits, self-contained apparatus for testing overhead porcelain insulators, etc., general Testing Transformers for the Electrical Trade, Converters, Generators, etc., to 10 K.V.A., all types of smoothing chokes, reactances, etc. Oil and air insulated. Converting equipment for operating Radio receiving sets as distinct from Audio amplifiers only, and Rotary Converters for operating from low voltage storage batteries. Test sheets, etc., are issued with each component where required, indicating its performance under final test, which are guaranteed.

Our Technical Dept. will be pleased to advise and give assistance where possible to retailers, service agents and others who care to avail themselves of this. We invite members of the Trade to our Audition room at any time, where we can demonstrate and show our products, and give useful information and help where required.

WILLIAM BAYLISS LTD.
Contractors to the Admiralty, War Office, Colonial Governments, etc.

Sheepcote Street, BIRMINGHAM

Telephone: Telegrams: Mid. 1409

BAYLISS ROTARY CONVERTERS
(D.C. to A.C.) for Radio & Gramophone Equipment

WILLIAM BAYLISS LTD.
Contractors to the Admiralty, War Office, Colonial Governments, etc.

Sheepcote Street, BIRMINGHAM

Telephone: Telegrams: Mid. 1409

BAYLISS ROTARY CONVERTERS
(D.C. to A.C.) for Radio & Gramophone Equipment
A low impedance valve for use as the output valve in battery-operated receivers, type P.M. 252 is the "super-power" valve of the Mullard 2-volt range. The large permissible grid swing permits the valve to handle big signal voltages while as a result of its low impedance (2,600 ohms) and excellent mutual conductance (2.1 milliamps per volt) it will give a large undistorted output sufficient for operating the average domestic speaker or radio gramophone.

The P.M. 252 is very economical in operation, the filament consumption being only 0.3 amp at 2-volts. It can therefore be employed in portable receivers without imposing too great a load upon the low tension accumulator.
RELIABLE RECTIFYING VALVES

Philips manufacture rectifying valves for voltages up to 4,000 and all currents up to 40 amps. Over a hundred types are specially manufactured for use in all-electric receivers, H.T. supply units, battery chargers, for all of which absolutely reliable rectifying valves are essential.

Type 1821 (shown above) is a full-wave rectifier with a maximum anode voltage of 250 and gives an output of 60 m/A. The filament takes a current of 1 amp. at 4 volts.

Price 17/6

Full details of complete range are available on request.

PHILIPS RECTIFYING VALVES

Made by the manufacturers of the famous Philips Argenta electric lamps, all-electric radio receivers, commercial and industrial fittings, and neon signs.

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

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

Never before has such exceptional value been offered in the Radio World. Designed, constructed and finished in the inimitable Burton way, you cannot buy a battery receiver which will give such wonderful results as the Burton Empire Two. Tuning is effected by a drum drive condenser, combined with a volume control. Two push-pull switches are fitted for changing wave range and turning “on and off.” Contained in handsome moulded Bakelite Cabinet. . . . Ask your dealer to show you the Burton Empire Two.

Creators of High Grade Precision Condensers

EXPERTS USE CYLDON

CYLDON Condensers cost more, but many outstanding constructional features amply justify it. Their mechanical fitness for the function they perform in the efficient working of receivers is designed down to the smallest detail. As a ‘moving part’ brought into action each time a set is tuned, condensers should be of the highest constructional merit. CYLDON attains it to a measure of success reached by no other condenser in the world. Build with CYLDON.

The small illustration shows the CYLDON Air-Dielectric Diel ser Condenser—the only Air-Dielectric condenser in its class. Air spacing is better than interleaving. Ask your dealer for prices.

SYDNEY S. BIRD & SONS LTD., CYLDON WORKS, SARNESFIELD ROAD, ENFIELD, MIDDLESEX.

Telex: Enfield 2071/2

FIVE YEARS GUARANTEE

D.C. to D.C

FOR RECEIVERS, AMPLIFIERS, RADIOGRAMS requiring 300 v. 120 m.a., 400 v. 150 m.a., 500 v. 100 m.a., etc.

M-L D.C. to D.C. Rotary Transformers operate from 12 v. to 200 v. and are suitable for Public Address work, large country house installations, ships, installations in D.C. Districts.

FREE!

M-L MAGNETO SYND. LTD., Radio Dept., COVENTRY.


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

GECOpHone

3 VALVE ALL ELECTRIC
for A.C. Mains — equal to many five valve receivers that cost twice as much

Here is an entirely new conception of radio value — delightful, eloquent broadcast reception from the new GECOpHONE All-electric Three-Valve Receiver for A.C. Mains—a set priced so low that all previous standards of value are swept aside! Here is the last word in trouble-free radio-from-the-mains—a set that will give you long range and sensitive, selective reception with surprising volume and purity—all for £18-0-0 including OSRAM VALVES. Indeed a set to be proud of—in its handsome case of black relieved with old gold.

Sold by all Wireless Dealers.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
TRUPHONIC, transportable cases, beautifully french combined reading meters.

MOTOR D.C. CONVERTERS, impact 200/250 volts, output 500 volts, 100 M.A. D.C. List 4/-, to clear 3/- each.

MOTOR CONVERTERS, D.C. Brand new, impact 12/20 volts, output 300/350 volts, 100 M.A. D.C. Knock out price, all guaranteed with smoothing condenser, 45/- each.

CAV SHUNT WOUND CHARGING DYNAMOS. 4 pole, ball bearings, output 30 volts 10 amp. or 6/15 volts, 20 amp., price 45/- guaranteed, automatic control 20/- each.

MEGGER, OHMETERS. Hand generator, beautiful scale 250-500 volts, brand new, 19/- each.

BROWN'S MAHOGANY CABINET LABORATORY BRIDGE CONDENSERS, ex Government, in teak case, with bridge, 8 various condenser, total capacity 31 M.F. 2,000 volt. For full details, ask the Manager.

Army, Navy, in teak case, with bridge, 8 various condenser, 45/- each.

D.C., Knock out price, all guaranteed with smoothing condenser, 15/- each.

DUXELL HIGH GRADE GALVANOMETERS. Makers, Pye, G.E.C., Silvertown, etc. New condition. List 4/-, to clear, guaranteed. 7/-, post 9d. Double Morse Key, 7/-.

PYE ELIMINATORS. Input 200/250 volts, output 130 volts 20 M.A. Fitted with Westinghouse metal rectifier, list price 5 Gns., clearance price, brand new in original box, 3 Gns.

D.T.I. CRAMPHONE MOTORS. Bankrupt stock. Universal A.C. or D.C., various voltages, 50, 100, 200 to 250, complete with turntable, list 6/-, our price 4/- each.

PETRO RADFORD ACCUMULATORS, having the very latest improved type plates at nearly half list price, type P.C. 2 volt 20/40 amp., 6/-, post 9d.; 2 volt 50/100 amp., 7/-, post 1/-; 2 volt 50/100 amp., 11/-, our guaranteed brand new goods.

PETRO RADFORD ACCUMULATORS, fitted with latest type gravity floats, nearly half list price. The floats are calibrated to take the acid and make it easy to ascertain the exact state of the charge. 2 volt 20/40 amp., 7/-, post 9d.; 2 volt 40/80 amp., 8/-, post 1/-. 2 volt 50/100 amp., 11/-, post 1/-; 2 volt 50/100 amp., 16/-, post 1/-. All guaranteed brand new goods.

WESTON AND TURNER'S MOVING COIL INSTRUMENTS, in original box, 3 Gns.

SPEAKERS, list price 6 Gns., clearance price, brand new, 45/-.

B.T.H. GRAMOPHONE MOTORS.

PYE ELIMINATORS. Input 200/250 volts, output 130 volts 20 M.A. Fitted with Westinghouse metal rectifier, list price 5 Gns., clearance price, brand new in original box, 3 Gns.

D.T.I. CRAMPHONE MOTORS. Bankrupt stock. Universal A.C. or D.C., various voltages, 50, 100, 200 to 250, complete with turntable, list 6/-, our price 4/- each.

PETRO RADFORD ACCUMULATORS, having the very latest improved type plates at nearly half list price, type P.C. 2 volt 20/40 amp., 6/-, post 9d.; 2 volt 50/100 amp., 7/-, post 1/-; 2 volt 50/100 amp., 11/-, our guaranteed brand new goods.

PETRO RADFORD ACCUMULATORS, fitted with latest type gravity floats, nearly half list price. The floats are calibrated to take the acid and make it easy to ascertain the exact state of the charge. 2 volt 20/40 amp., 7/-, post 9d.; 2 volt 40/80 amp., 8/-, post 1/-. 2 volt 50/100 amp., 11/-, post 1/-; 2 volt 50/100 amp., 16/-, post 1/-. All guaranteed brand new goods.

WESTON AND TURNER'S MOVING COIL INSTRUMENTS, in original box, 3 Gns.

SPEAKERS, list price 6 Gns., clearance price, brand new, 45/-.

B.T.H. GRAMOPHONE MOTORS.
WHY NOT LISTEN TO THE SHORT WAVE STATIONS OF THE WORLD?

Short Wave Stations are so efficient that programmes from the other side of the World can be listened to at full loud-speaker strength, free from interference as clearly as you can hear your own local station. Pittsburg — Schenectady — Manila — Bangkok — Eindhoven — New York — Sydney — Nairobi — these and many others can be tuned in at full loud-speaker strength. "World Radio" gives a list of over 70 Short Wave stations in all parts of the World.

The "Empire Link" Short Wave Receiver covers all wavelengths from 15 to 2,000 metres. Besides enabling you to receive the ordinary stations with which you are familiar, at beautifully toned full loud-speaker strength, it also opens the door to a new World of radio.

The "Empire Link" is supplied in Kit form and comprises a handsome art metal cabinet with all components, coils for all wavelengths, set of three British valves, connecting links, tools, plans and complete instructions for building and operating. No soldering required.

Construction is so simple that you can undertake it with complete confidence even if you have never before built the very simplest of Receivers. By building it yourself you save pounds.

Price £11.11s. (or 12 monthly payments of 21/-)

Write for full details and constructional plans of the

"EMPIRE LINK"
SHORT WAVE KIT
Sole Distributors Ready Radio

To Ready Radio (R. R. Ltd.), 159, Borough High St., London Bridge, S.E.1

1. I wish to purchase one of your new 1932 "Empire Link" Short Wave Kits for which I enclose
   (a) 11 guineas for complete Kit
   (b) £10 5:6 for complete Kit (except for valves)

2. Please send me free of charge complete constructional details and particulars of
   (c) Your Part Exchange System
   (d) Your Hire Purchase Terms

NAME
ADDRESS

* NOTE — Part Exchange does not apply to Hire Purchase System.

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

the Latest

T·C·C

Development

Here's the latest T.C.C. development—a Non-Inductive Condenser at no extra cost. The advent of the Screened Grid Valve has emphasized the need for a condenser having the minimum of impedance in order that small high frequency currents may be readily passed. How the new T.C.C. Non-Inductive Condenser achieves this result is shown on the curve above. The ordinary 1 mfd. condenser has a resonant point at about 900 metres whereas in the new T.C.C. Non-Inductive Condenser this has been reduced to nearly 500 metres. Be wise: always use.

T.C.C. CONDENSERS

Always ahead in Condenser Design

Another Triumph for

NIKALLOY!

the metallurgical marvel of the Nickel Age in Radio

"All that is modern in Radio Practice has been brought together and embodied in this receiver."


WIRELESS WORLD "FOUR"

RADIO GRAMOPHONE

includes the R.I.

"HYPERMU" & "PENTOMITE"

The fact that these components were specially chosen for inclusion in the circuit is proof positive of their efficiency, more so in view of the statements in last week's "Wireless World" that although the article was written long before the Show it was not published until it was absolutely certain that the components selected were the most up-to-date and efficient for their purpose.

HYPERMU

The famous L.F. Inter-valve Transformer with the nickel alloy core, which gives exceptionally high permeability.

Resistance primary 4,000 ohms.
Resistance secondary D.C. 8,000 ohms.
Resistance secondary A.C. 4 to 1.

PENTOMITE

The exceptionally high inductance values of this smoothing and output choke is due to use of the nickel alloy core.

Resistance D.C. 430 ohms.
Maximum 60 hours at 10 milliamperes.
Inductance 45 hours at 50 milliamperes.

21/-

Write for leaflets giving full description of the R.I. nickel alloy components—also complete catalogue.

MADRIGAL WORKS, PURLEY WAY, CROYDON.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
A Perfect Combination!

The LEWCOS H.F. CHOKE and L.F. TRANSFORMER PROVIDE PERFECT RECEPTION.

LEWCOS L.F. TRANSFORMER.—Treble notes respond admirably, while the bass notes are reproduced with an effect more nearly approaching the true musical tones than is possible with the majority of makes. A feature of the L.F. Transformer is the provision of a Centre-Tapping on the secondary winding which renders it adaptable for push-pull amplification. Scientific research, finest materials and sound workmanship make the L.F. Transformer a worthy addition to the Lewcos range.

LEWCOS H.F. CHOKE.—Tested values of the Lewcos H.F. Choke: Self-capacity—1.62 micro-microfarads (N.P.L. test). Natural Wavelength—5,200 metres (tested with Moulin voltmeter). These figures give assurance that there will be a minimum amount of H.F. Leakage through self-capacity, while the position of the terminals, one at the top of the coil and the other at the base, is arranged so as to eliminate the risk of additional self-capacity in the wiring of the receiver.

Radio Products or otter reception

LEWCOS H.F. CHOKE

Price Ratio 1-5. Ref. L.F.T5.
Price Ratio 1-3. Ref. L.F.T3. 20/-

LEWCOS L.F. TRANSFORMER

Price 7/-

GLAZITE Coloured Connecting Wire in 10 ft. coils. Price 6d, per coil.

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

TRADERS ONLY!

Your 1931 “Year Book” will be PUBLISHED SHORTLY

“THE Wireless & Gramophone Trader ‘Year Book & Diary.”’ cuts out wasted time and worry; provides the information you want as to stocks and trade suppliers; answers the technical problems that customers raise and, in short, gives you in readily accessible form an answer to each of the hundred and one problems that arise in everyday trading. The book is strongly bound in cloth covers and the 1931 edition, thoroughly revised, will be ready shortly.

HUNDREDS OF REVISIONS & ADDITIONS—ORDER YOUR COPY TO-DAY!

“THE WIRELESS & GRAMOPHONE TRADER” YEAR BOOK & DIARY,
Phone: Central 7713 (9 lines).

Mention of “The Wireless World” when writing to advertisers, will ensure prompt attention.
From 15/- upwards.

Nonsense? No! An accurate description of the Westinghouse Metal Rectifier, which is, in effect, a Diode Valve of very low impedance, having a cold cathode of inestimable life.

In this respect

THE

WESTINGHOUSE

METAL RECTIFIER

is unique.

Send 3d. stamp for "The All-Metal Way 1931," now enlarged to 40 pages, a valuable book for mains users, giving circuits, technical instruction, and components for all types of A.C. Units.

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

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
DUBILIER 4 MFD LSA VDC 1000 TEST

USE THESE HIGH VOLTAGE CONDENSERS—THEY NEVER LET YOU DOWN

DUBILIER CONDENSER CO. (1910) LTD., Ducan Works, Victoria Road, N. 1000, W. 3

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

GODWINEX MAINS UNITS
MAKE RADIO ALL ELECTRIC

Ask for Complete List.

The Eliminators for super-power. A.F.P. (illustrated) incorporates full-wave Westinghouse Metal Rectifier. A.H. and AP employ full-wave valve rectification.

Available for all voltages. Rich brown crystalline finish metal cases. Complete with fire and adapter, and fully guaranteed for 12 months' perfect service.

HEAVY DUTY A.C. MODELS.

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Positive</th>
<th>Millamp Tappings</th>
<th>Volt</th>
<th>Volts</th>
<th>Volts</th>
<th>£</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.F.P.</td>
<td>30</td>
<td>30</td>
<td>75</td>
<td>var.</td>
<td>var.</td>
<td>5</td>
</tr>
<tr>
<td>A.H.</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td>var.</td>
<td>var.</td>
<td>10</td>
</tr>
<tr>
<td>A.P.</td>
<td>60</td>
<td>60</td>
<td>75</td>
<td>var.</td>
<td>var.</td>
<td>15</td>
</tr>
</tbody>
</table>

J. DYSON & CO., 2 Coleman Street, London, E.C.2

Send for Particulars of our Special Agency Scheme.

"R & B" MAINS TRANSFORMERS

Designed for "Wireless World" Circuits

Model "35" Specified in Oct. 15th issue

"WIRELESS WORLD FOUR"

Price £2.5.0

MODEL "34" Specified in June 25th issue

"BAND PASS FOUR"

Price £2.5.0

MODEL "37" Specified in Aug. 13th issue

"REGIONAL ONE"

Price £1.10.0

Please state voltage and frequency of supply mains.

Manufactured by RICH & BUNDY, Ltd., 13, New Road, Ponders End, Middlesex. Phone: ENFIELD 0177. City Retail Stockist: R. H. WOOD, 2, Queen Street, L.C. Phone: City 1106.
Power grid detection has been proved to give far better quality than the anode bend method while being at the same time considerably more sensitive. Rectification is linear, providing the correct values of grid condenser and leak are used. Get full details from the "Wireless World" for May 7th, 1930 and try it out with the Mazda L.210—one of the best valves for the purpose.

The Amazing Mazda Radio Valves

** Characteristics **

- Fil. Volts: 220
- Fil. Amps: 0.1
- H.T. Volts: 150
- Amplification Factor: 15.4
- Impedance (ohms): 10,000
- Mutual Conductance (mA/V): 1.55

Mazda L.210 Price 8/6

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
How often have you wished for an R.K. which would work without extra power? Now you can have it—the new R.K. Permanent Magnet Model. Just connect it to your set and it will give you reproduction of the tone and quality which have made R.K. models famous ever since their introduction.

There are two other R.K. Reproducers, both obtainable complete in handsome cabinets of polished oak, mahogany or walnut; the Senior with built-in rectifier for use with A.C. mains from £20, and the Standard Senior from £16 16s., as well as the Junior Model, without cabinet, £4 15s., all of which are obtainable through your radio dealer.

Ask your dealer for particulars of hire purchase terms.

BELLING-LEE BATTERY CORD, complete with engraved wander plugs and spade terminals 9-way (for all Mullard Orgola circuits) £5 9

Also made in 5, 6, 7, 8 and 10 way.


BELLING-LEE FOR EVERY RADIO CONNECTION

Loewe Radio Resistances never vary. They eliminate cracking noises and "false fading." Current up to 10 watt carried without appreciable heating or change of resistance value. Elements independent of applied voltage. Perfectly homogeneous. Values available from 10,000 ohms to 10 megohms. Complete length approx. 1 1/2.

Retail price 1/6

Loewe Radio Condensers safeguard against losses. Dielectric values 20,000 megohms. Tested under potential of 400 volts A.C. Values available from '002 to '005 M.F. Complete length approx. 1 1/3.

1/3 Retail price '002 to '005 M.F. £1 1/3

RESISTANCES & CONDENSERS as specified in "WIRELESS WORLD," FOUR, 15th October.


**Telsen**

*Are Famous Amongst Constructors for Quality, Accuracy and Workmanship.*

---

**Telsen B.F. Chokes,** designed to overcome wide wave-band ranges from 15 to 4,000 meters, externally low and capacity, shielded in genuine Bakelite. Inductance 10,000 micro-henrys. Resistance 500 ohms. Price 2/6 each.

**Telsen Fixed Condenser,** standardized in genuine Bakelite, suitable for wave-band work, with or without terminals. No. 253. Price 5/6 each.

---

*Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.*
SPECIAL ANNOUNCEMENT TO LONDON LISTENERS

You would doubtless like to enjoy the advantages of High Tension Accumulators—and so be spared the expense and unreliability of Dry Batteries. The problems of initial cost and re-charging need no longer trouble you. Our unique service offers you the famous CAV High Tension Accumulators fully charged and ready for immediate use. They are delivered to your door (anywhere within 12 miles of Charing Cross) at convenient intervals: and at an inclusive charge which represents a vast saving over your present expenditure, and definitely guarantees better reception than partly discharged Dry Batteries.

Over 10,000 London Listeners testify to the excellence of this unique High and Low Tension Accumulator service. Write for interesting Price List NOW.

RADIO SERVICE (LONDON) LTD.
105/6, Torriano Ave., Kentish Town, N.W.5
Telephone: NORTH 0623.

EVERYONE interested in the Trend of Motor Car Design for 1931 should get a copy of

The Autocar

The Leading Motoring Journal

OLYMPIA SHOW REVIEW NUMBER

The feature of this enlarged issue will be a carefully considered survey of the tendencies of Car and Bodywork development, written by the technical staff of "The Autocar," There will also be special articles for owner-drivers to assist them in the choice of a car.

Dated OCT. 24
PRICE 6d.
Obtainable everywhere

When Winding Your Coils—
USE REDFERN'S Ebonite Coils

FOR GREATEST EFFICIENCY IN SINGLE LAYER WINDINGS

Sole Manufacturers:
THE BRITISH EBONITE CO., LTD.,
HANWELL, LONDON, W.7.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Push-Pull amplification with moderate H.T. Voltages enables you to handle considerable volume in the output stage without distortion.

In this system the output of the receiver is divided between two valves, or a multiple of two. The product is combined by means of a Push-Pull output transformer and fed to the speaker. A greatly enhanced grid swing is thus permissible and a correspondingly louder signal can be handled without harshness or "chatter" due to overloaded valves.

A descriptive leaflet, W 412, gives full particulars, Transformer details and circuit. Ask your dealer or write direct.

FERRANTI Ltd.
Head Office and Works: HOLLINWOOD, LANCASHIRE.

---

HIGH POWER STATIONS versus SELECTIVITY!

In the Gam-brell All-electric Three, selectivity has been achieved without loss of quality of reproduction.

Read these remarkable results vide "Wireless Trader" test report.

"TOULOUSE was obtained at excellent loud-speaker strength clear of LONDON REGIONAL, as well as LANGENBURG clear of the MIDLAND REGIONAL, KOENIGSWUSTERHAUSEN clear of 5XX and RADIO PARIS, a feat not generally performed by a set of this nature under these conditions of test."

"11 miles from Brookmans Park, using an inside roof aerial...it was possible to limit the spread of both the London Regional and National stations to 3 degrees on a 100 scale and still obtain them at good volume. This, of course, represents extremely good selectivity and sensitivity."

"The tone was found to be well balanced, with a good bass response and crisp high-frequencies."

THE GAM-BRELL A.C. THREE.

"An outstanding model" for those who enjoy Foreign as well as British programmes.

Several changes of programme are obtainable simply by using the mains as aerial.

PRICES:
For A.C.: £26. 15.
For D.C.: £24. 0.

Write for full descriptive leaflet.

---

There are now three types of the famous GAM-BRELL NOVOTONE.

The Novotone is the only device designed to compensate perfectly for the serious losses in the reproduction of records. Connected in any amplifying circuit it results in reproduction of "amazing realism."

Type S
for Standard pick-ups £5
Type H
for High resistance pick-ups £5
Type J
Possesses all the characteristics of the Type S but has less overall amplification - £3 3s.

Full descriptive Novotone Folder on request.

GAMBRELL RADIO LTD.
6, BUCKINGHAM STREET, STRAND, W.C.2.
The Paramount
A.C. Mains Valves

For all-electric radio of the highest efficiency, for unfailing reception and a background of perfect silence—the improved series of "Marconi" indirectly heated A.C. Mains Valves stands supreme. Every feature desirable in modern receivers is included in this range—high conductivity, rigid construction, mesh anode to prevent overheating and grid emission and exceptional vacuum—each will contribute towards better reception in your own set. There are types for every receiver.

**THE COMPLETE SERIES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Amplification Factor</th>
<th>Impedance</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. 4</td>
<td>Screen Grid</td>
<td>550</td>
<td>500,000</td>
</tr>
<tr>
<td>M.H. 4</td>
<td>General Purpose</td>
<td>35</td>
<td>16,000</td>
</tr>
<tr>
<td>M.H.L.4</td>
<td>Detector and L.F. Amplifier</td>
<td>20</td>
<td>8,000</td>
</tr>
<tr>
<td>M.L. 4</td>
<td>Power</td>
<td>9</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Remember!

Marconi Valves are used by The B.B.C., Imperial Airways, Croydon Control Tower, Metropolitan Police, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, large Passenger Liners, &c., &c., because of their longer life, clearer tone, greater range and volume.

USE THE VALVES THE Experts USE!

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

In May of this year The Wireless World drew attention to the inadequacy of the service side of radio salesmanship, and pointed out that, after allowing for outstanding exceptions, the service given by the average retailer was unfair to the manufacturer as well as to the buyer.

Since we raised the subject a great deal of progress has been made in various directions. Several manufacturers have undertaken the training of their service agents, notably the Gramophone Company and the Marconiphone Company, whilst at least one school, the old-established London Telegraph Training College, has started a special course of instruction intended to cover this field.

An important contribution towards solving the problem of service has been made by the Gramophone Company, who have introduced into their school a system of coloured wiring, so coded that the dealer who handles their sets is enabled to trace every wire without difficulty by colour. We do not believe that any monopoly of this idea is claimed, or that the adoption of the scheme universally by set manufacturers would be resented. We would heartily recommend that the fullest consideration should be given by such bodies as the Radio Manufacturers' Association to the scheme, with the idea of putting it forward for adoption by its membership.

Any proposals which may tend to simplify the problem of servicing should be given the full attention which the subject deserves. We believe that confidence in service after sales can contribute very largely towards increasing the popularity of listening. Manufacturers, we know, are doing all they can to eliminate unnecessary servicing by increasing the standard of reliability of their receivers so that after-sales trouble is reduced to a minimum.

But however perfect the final production of sets may become, the problem of servicing must, we think, always remain, for servicing does not mean merely repairing faults; it embraces the much larger question of advice on technical points, on the choice of apparatus associated with the receiver, and effecting improvements by the substitution of new types of valves or additional accessories.

Some organisation of service seems to be desirable, in order that the public may be able to distinguish between those in whom they can place their confidence and those who are not to be so trusted. The highest recommendation for a retailer is represented in the satisfaction of his customers over a period of years. There must be a host of service men who can claim this qualification, and there should be some means of distinguishing them from others who have not earned such confidence by their endeavours; those who join the ranks of the service man on the merits of technical knowledge and training alone should also have some recognised certificate of competence to give confidence to the public.

In This Issue

THEORY OF THE VALVE AMPLIFIER.

PARIS RADIO SHOW.

THE WIRELESS WORLD FOUR.

MANCHESTER SET CONSTRUCTION COMPETITIONS.

CURRENT TOPICS.

SET REVIEW—COLUMBIA MODEL 307.

BROADCAST BREVITIES.

QUALITY RECEPTION.

LABORATORY TESTS ON NEW APPARATUS.

LETTERS TO THE EDITOR.

READERS' PROBLEMS.
The amount of energy picked up by the tuned aerial circuit of a receiver is extremely small even when the transmitting station is only a few miles distant. If power is drawn from the tuned circuit to operate directly a sound reproducer of any kind, the load thrown on the tuned circuit not only seriously reduces the selectivity or sharpness of tuning, but the amount of power available may be barely sufficient to operate even the most sensitive telephone receivers. A large volume of sound from a loud speaker represents the expenditure of a great deal more energy than is ever picked up by the aerial, and therefore the energy supplied to the loud speaker must be drawn from some local source at the receiving end and the rate of expenditure of this local energy must be controlled or modulated in such a way that it varies as nearly as possible in exact accordance with the varying amplitude of the high-frequency voltage generated in the aerial circuit by the oncoming waves.

These are the functions of a valve amplifier, and the object of this and succeeding articles will be to give a simplified explanation of the principles involved in the various circuit arrangements available for coupling two or more valves in succession or cascade in the different types of amplifier. The conditions leading to highest efficiency will be discussed and numerical examples will be given throughout.

The general principles of alternating current circuits and tuned circuits as apart from their relationship to valve circuits were treated at some length by the writer in a series of articles which commenced in The Wireless World on September 29th, 1929, under the title of "Wireless Theory Simplified." These previous articles should prove useful to established readers, but, particularly for the benefit of new readers, no vital principle will be left unexplained in the present series even though it might have been dealt with at some length previously.

General Considerations.

The electrical variations representing speech or music have frequencies ranging between 25 and 8,000 or 10,000 cycles per second, and these are conveyed across the space intervening between the transmitting station and the receiver by means of a radio-frequency wave, that is, by a "carrier wave" whose frequency is greater than 30,000 cycles per second or so. For a wavelength of 300 metres the radio-frequency involved is one million cycles per second or 1,000 kilocycles per second, the frequency being inversely proportional to the wavelength. The amplitude or strength of the high-frequency wave is varied or modulated in accordance with the wave shapes representing the matter broadcast.

Every receiver possesses a detector or rectifier which performs the essential function of separating out the low-frequency electrical variations from the radio-frequency or carrier-frequency oscillations. Without this separation it would be impossible to operate any electro-mechanical...
The Theory of the Valve Amplifier.

replicating device. The detector thus really forms the nucleus of every receiver, and one of the first points in designing a receiver is the attainment of efficient and satisfactory rectification.

The efficiency and general performance of a valve detector depend to a very large extent on the value or amplitude of the high-frequency voltage applied to its grid circuit. In general the voltage developed across the tuned circuit associated directly with the aerial is too small to enable the rectifier valve to function properly if the latter is connected directly to the tuned aerial circuit. Only when the station being received is powerful and moderately close is satisfactory rectification under these conditions attainable.

For the reception of distant stations which produce extremely feeble oscillations in the aerial tuning circuits one or more valves are employed between the aerial tuning circuit and the detector valve in such a way as to produce high-frequency voltage oscillations of greatly increased amplitude at the grid of the detector; the high-frequency oscillations are virtually amplified before being applied to the grid circuit of the detector, but it will be realised presently that the energy represented by these oscillations of increased amplitude is drawn from a local source of supply such as a high-tension battery.

The so-called amplified oscillations are really a new set in a separate circuit quite distinct from those in the aerial circuit, but are controlled by the aerial oscillations through the medium of the amplifying valves in such a way as to have the same form and frequency.

Progress in Valve Design.

Whether high-frequency amplification before the detector stage is employed or not, the low-frequency power output available in the anode circuit of the detector valve is not usually sufficient to operate a loud speaker, and one or more stages of low-frequency amplification are nearly always employed after the detector valve to enable a sufficiently high power input to the loud speaker to be obtained.

Both for high-frequency and low-frequency amplification the main principles involved are essentially the same, but there are many practical considerations which render the two categories widely different both as regards the types of valves most suitable and the characteristics of the interstage couplings. Remarkable progress has been made during the last two or three years in the design of valves, the two outstanding steps forward being the introduction of the screen-grid valve for high-frequency amplification and the independently heated cathode valve for A.C. mains operation.

Another important advancement has been the practical application of the coupled circuit or band-pass filter system to receiving sets, enabling high selectivity to be obtained without attenuation or weakening of the higher note frequencies relatively to the lower ones. With the multiplicity of circuit arrangements available and the wide range of components on the market, there is an amazing diversity of designs of receiving sets available both to the set constructor and to the purchaser of commercial models.

But in spite of all these changes there has been very little change in the fundamental principles involved in amplifier design, although certain new principles have been added and the constants of tuned circuits have been revised to suit the newer types of valves.

In the first place we shall give a brief summary of the chief properties of an amplifying valve and then consider the ordinary three-electrode valve as a high-frequency amplifier, dealing in particular with the methods of coupling to a succeeding valve, subsequently extending the treatment to include refinements such as methods of maintaining stability, etc. The same general principles apply to both the indirectly heated cathode or A.C. valves and the filament type of valve.

If a three-electrode valve with the cathode heated to the normal operating temperature has the anode potential and grid voltage adjusted so that the corresponding point on the grid voltage/anode current curve lies on the straight, steep part of that curve, any small change in the value of the grid voltage will produce a corresponding change in the anode current, one being proportional to the other. Now the change of anode voltage that would have to be made to give the same change in anode current would be several or many times greater than that at the grid. The ratio of the change of anode voltage to the change of grid voltage having the same effect on the anode current is the amplification factor of the valve, being denoted by the greek letter \( \mu \). Thus if one volt change in the grid potential alters the anode current by 2 milliams, with the anode voltage maintained constant, and if 10 volts change in the anode voltage with the grid potential constant also makes a 2 milliam. difference in the plate current, then the amplification factor of the valve is \( \mu = 10 \). This is the maximum voltage amplification the valve itself is capable of giving under theoretically perfect conditions. In practice the actual amplification obtained from the valve always falls short of \( \mu \), but a further gain might be obtained through the step-up effect of a special tuned circuit or transformer. In any case, the amplification obtained is always proportional to \( \mu \).

Another very important "constant" of an amplifier...
The Theory of the Valve Amplifier.

The valve is the A.C. resistance between its anode and cathode. The A.C. resistance is simply defined as the ratio of a small change of anode voltage to the corresponding change of anode current in amperes. Thus in the example given above a change of 10 volts in the anode voltage was assumed to cause a change of 2 milliamps. In the plate current. Such a valve would have an A.C. resistance of \( R_a = \frac{10}{0.002} = 5,000 \text{ ohms.} \)

The A.C. resistance \( R_a \) and the amplification factor \( \mu \) are the two most important constants of the valve, and knowing these the actual voltage amplification obtained with any known impedance connected in the anode circuit can be calculated.

Voltage Amplification.

If a small alternating voltage whose R.M.S. or effective value is \( V_a \) is applied to the grid of the valve an alternating voltage \( \mu V_a \) is in effect injected into the anode circuit, and this causes an alternating component of current, over and above the mean or D.C. value, to flow round the anode circuit. Provided there is no external impedance connected in the anode circuit the alternating component of the plate current will be \( \frac{\mu V_a}{R_a} \) amperes, by Ohm's law, but under such conditions there would be no voltage variation at the anode, and therefore no voltage amplification whatever would occur—a varying current in a conductor without impedance or resistance is absolutely without effect of any kind.

In order to obtain a voltage variation over some part of the external anode circuit an impedance must be connected somewhere in the circuit, the usual place being between the anode of the valve and the positive high tension supply terminal. In Fig. 1 (a) is shown a simplified diagram in which an impedance \( Z \) is connected in the anode circuit of a valve. The grid is maintained at a definite mean negative potential through the agency of the grid bias battery \( E_g \), and a source of alternating voltage \( V_a \) is also included in the grid circuit.

The resulting equivalent alternating electromotive force set up in the anode circuit is \( \mu V_a \) volts where \( \mu \) is the amplification factor of the valve. As far as the alternating components only of the current and voltage in the anode circuit are concerned, the anode circuit itself is electrically equivalent to the circuit of Fig. 1 (b), where \( R_a \) represents the A.C. resistance of the valve. The alternating current set up round the closed circuit is given by dividing \( \mu V_a \) by the total impedance of the anode circuit, and this total impedance is the effective value of \( R_a \) and \( Z \) in series. Whether \( R_a \) and \( Z \) can be added together by simple arithmetic or not depends on the nature of the impedance \( Z \). In fact the very properties of the combined circuit depend on the kind of impedance for which \( Z \) stands.

For instance, it may stand merely for a simple resistance, or for a more or less complicated tuned circuit.

Whatever the nature of the connected impedance \( Z \) might be, when an alternating component of current flows round the anode circuit an alternating voltage is naturally set up between the ends of the impedance, the magnitude of this potential difference being equal to the product of the current and the impedance. And this is the useful output voltage which can be applied between the grid and cathode of a succeeding valve.

Consideration will next be given to the particular case where the external impedance \( Z \) takes the form of a tuned circuit, and attention will be drawn to the method whereby the alternating voltage built up across this resistance is transferred to the grid of the next valve. This represents the simplest case.

(To be continued.)

Radio Amateur Call Book.

The autumn issue of the "Call Book" has now been issued, and copies may be obtained from Mr. F. T. Carrier, Flat A, Glenmore Mansions, Streatham, S.W.16, for 4s. 6d. post free, or 14s. 6d. for the four quarterly issues.

The list of call-signs of all known amateurs of the world has been carefully revised and brought up to date; in fact, it has now grown so long that it has been found necessary to omit the supplementary list of short-wave commercial stations. We feel that this is a matter for regret as the section, though admittedly only a modest selection from the ever-increasing number of short-wave stations of general interest to amateurs, was undoubtedly of great service; however, we do not doubt that the omission was only decided upon by the publishers after much consideration and in order to keep the book within reasonable bounds.

Working on 1,750 Kilocycles.

Members of the Monmouthshire Transmitters' Society are returning to the 170 metre waveband, and have successfully worked with OK3SK in Neubersdorf, near Olmuetz, Czechoslovakia. During the nights of Sunday and Monday, October 5th and 6th, the following stations were in communication with him: G6PA, G6QI, G6ZR, G6RB, G2IP, G6PA, G6DR, G6UJ and G6FO. The Czechoslovakian station was working on 1,750 kc. with an input of 15 watts. Mr. Austin Forsyth (G6FO), the chairman of the Monmouthshire Transmitters' Society, says that the noteworthy feature of these contacts was the ease with which they were effected, signals being reported by OK3SK as generally about R5, QSA4. Conditions on the Sunday night were rather better than on Monday, and G6QI was able to get through on telephone. The stations belonging to the society—G2RA, G6QI and G6FO, all in Newport, Mon.—were working within 10 watts.

Mr. Forsyth hopes that the favourable results obtained will encourage other amateurs, both in Great Britain and on the Continent, to give the longer wavelengths a trial.

New Call Signs and Addresses.

G6QH C. Hewins, Garwick, Cross Gates Road, Grimsby, Lincs. (Change of address). Station temporarily closed owing to change from D.C. to A.C. mains.

G6S6 K. Franklin, 16, Cannon Street, Dover, Kent.

G6WQ A. Brown, 7, Stanley Road, Broughton Park, Manchester.


G6XB G. F. Jones, "Brynawel," Senthon, Corwall. (Change of address).

2ABS J. Hunter, 65, Harvey Road, London, S.E.8.

2ABB (ex 2PF), R. B. Jeffries, Lynn Drive, Mount Hill, Clapham, South London.

2AVF J. Norris, 16, Gorse Street, Stamford, Manchester.

2AWA A. W. Allan, 3, Lansdowne Terrace, Gosforth, Newcastle on-Tyne.

CORRECTION.

The call-sign of Mr. J. C. Cooke's station at Harrowdowne Road, Wembly, is G6CZ, and not D6CZ, as printed in our issue of September 3rd. We trust that no foreign transmitters have been misled by this misprint.
By a Member of the Staff.

Last year the Paris Radio Exhibition rubbed shoulders with the Motor Cycle Show in the Grand Palais, Champs Elysées; in consequence its visitors included a jaded and unprofitable overflow from the other section. This year's exhibition, held from September 26th to October 9th, stood splendidly exclusive in the Artists' Quarter, Boulevard Raspail, Montparnasse, with the noticeable result that most of the visitors were real enthusiasts, there being fewer of the army of catalogue hunters. Some two hundred firms were represented, and from the very large attendance it is safe to conclude that the Exhibition was successful.

Those who have followed The Wireless World reviews of the French Show from year to year will have heard the lament that nothing but superheterodynes could be found on the set-makers' stands, and the repetition of the same circuits for a number of years brought forth the comment that this type of set would appear to have assumed a life eternal. Owing to the difficulty of obtaining permission from landlords to erect outside aerials and to the fact that there are some six transmitting stations in Paris, it had been thought, apparently, that a superhet provided the only solution to the reception problem in these rather difficult circumstances.

A new influence bids fair to change this fashion. The French have seen lately how well the highly specialised American receiver functions—that type with a straight multi-stage H.F. amplifier—how selective it is, what excellent signal strength can be got with an indoor aerial, and, last, but not least, that the quality of reproduction is considerably better than that from the average superhet. Not that there is any inherent defect causing distortion in this receiver when modern methods of inter-valve coupling such as band-pass filters are pressed into service, but it must be conceded that it is essentially for use with distant transmissions and never has lent itself well to local station reception.

At last there is a strong rival to the hitherto ubiquitous superhet., and most of the set-makers are marketing for 1931 at least one receiver with a number of stages of straight H.F. amplification. The commendable practice of ganging the tuning condensers to give...
Paris Show.—

one-dial control and of providing separate screening compartments for both valves and coils is to be seen in a number of cases. From the foregoing it must not be taken that the superhet is rapidly dying, but that the public now have the choice of two receiver types, and their verdict after a period of trial may cause a large reduction in the interest shown in the superhet. at next year's show. The number of sets called by trade names ending in "dyne" is still formidable.

There were only two or three kit sets to be found, and from the paucity of really good components one must conclude that home construction still has not a very great following. Portable sets appear to have increased in popularity, there being a number of new models on view. Much attention was being paid to the British Rees Mace sets exhibited by Rees-Radio.

All-mains sets are much in evidence, the key to the position being the general release of a new series of indirectly- and directly-heated A.C. valves by some four or five valve manufacturers. It has been found possible to produce an A.C. bigrille (two-grid) valve. This in the battery-heated category has been extremely popular for superhets, in which it is used as combined first detector and oscillator. To maintain absolute freedom from hum in a seven-valve all-mains superhet is no mean feat, and this may be another reason why the straight H.F. set with fewer valves is receiving so much attention at a time when A.C. sets are in demand.

As in this country, the tuning range in all sets must cover both medium and long broadcast waves. It is an open secret that in the long-wave units which have been added to certain imported American sets, the problem of obtaining selectivity with quality with the large number of powerful long-wave stations has only been solved after much experiment in elaborate band-pass filters. Practically no examples of the three-valve set with S.G. H.F.-Det.-L.F. for battery operation, so popular in England, were to be found. The equivalent would be a modest superhet with one of the complex bigrille circuits, to be fed, if possible, from H.T. accumulators, of which there is an abundant supply judging by the number of stands devoted to their sale.

Moving-coil loud speakers, which hitherto have been rather restricted in use by patent royalty, are now to be seen in the most ambitious receivers and in many radio-gramophones. The adoption of the Westinghouse metal rectifier on a large scale for mains-rectifying equipment has given an impetus to the sale of speakers with A.C. field excitation. Permanent magnet moving-coil speakers do not seem to be on the market yet, but reed-driven cones, on the other hand, could be seen all over the exhibition. Owing to the voltage fluctuation of mains supplies it is becoming common practice to include a regulator to maintain a constant pressure in order to prevent damaged valves and varying sensitivity. This usually consists of a barretter containing an iron wire element in hydrogen.
Paris Show.—

Cabinet work in general was superb, more attention being paid to external finish than in this country. Frame aerials incorporating waveband switches are sold by most component makers, and in one or two examples the winding is held inclined to the vertical, to avoid, so it is claimed, parasitic disturbances.

Some receivers, which are illustrated herewith, and are likely to appeal to the British amateur, will now be briefly reviewed. The Radiola-4 is an all-mains, multi-stage, straight H.F. receiver built around the new Dariovalves. There are three ganged H.F. stages giving one-dial control, and coils, condensers and valves are contained in separate screening compartments. Such a receiver is abreast of the times, and nothing but favourable comment can be made concerning the advanced technique employed. The inter-valve inductances are wound on rl in. formers, and a line voltage regulator is included in the mains eliminator.

An interesting but less ambitious receiver is the Pécaud E3, containing a screen-grid H.F. stage with anode variometer. It is mains-operated, and contains smoothing and rectifying equipment in a separate metal compartment in the base. The price complete is 1,859 francs, or £15, which represents good value for money. On the Hervor stand (Herbolet et Vorns) was a highly specialised set with three screen-grid stages. The screening, albeit carried to perfection in the case of coils, valves, and condensers, is extended even to the wiring. The receiver is, of course, all-mains operated, and has, by virtue of the ganging of four condensers, one-dial control. A moving-coil speaker is provided with a speech coil to match the single low-frequency valve.

On the stand of Etablissements Radio L.L. could be seen a comprehensive range of all-mains superhets. The Synchro-Secteur-Six has one-dial control and an indirectly heated two-grid valve as frequency changer, followed by two A.C. triodes for the intermediate-frequency amplifier. The second detector and first L.F. valves are indirectly heated, while the output valve has a filament heated with raw A.C. A car set, the controls of which are fitted to the instrument board, is of interest, first, because of the elaborate precautions taken against mechanical vibration by suspending the receiver proper on springs, and, secondly, in view of the methods used to prevent electrical interference. Resistances of 80,000 ohms are interposed in each sparking plug lead and condensers of 2 mfd. by-pass any H.F. oscillations produced by make-and-break contacts. Wiring is bunched into groups and shielded in earthed flexible metallic tubing.

A very compact three-valve, all-mains set housed in
Wireless World

OCTOBER 22nd, 1930.

Paris Show.—
a handsome cabinet and typical of British practice is the Lemouzy S.331. A series of receivers with three screen-grid H.F. stages were being shown by Radiophone-Viel, and a frame aerial adjustable in two planes forms part of their equipment. These receivers, by reason of their selectivity and sensitivity, are a direct challenge to the superhet. Push-pull output now gaining in popularity in France is used in a number of this firm’s sets. On the stand of Etablissements Horace Hurm was a miniature portable set built into a suitcase. A test soon convinced one of the extremely selective properties of the superhet. circuit—stations embracing never more than two degrees on the tuning dials. Although only for ‘phone reception as it stands, it is easy to pass on the signals to an amplifier—for instance, to that of an electrical reproducing gramophone.

Judging by the difficulty in approaching the stand of Integra it was evident that the home constructor’s set being demonstrated was popular. It cannot be described as a kit set in the sense usually understood in this country, for, by rearranging the various components on a large baseboard, any one of the twelve circuits described in the catalogue can be followed. The small slab coils in circular celluloid containers, clearly seen in the illustration, point to the difference in technique in the two countries. The straight H.F. sets in pressed steel cases by Ondia mark a distinct advance in receiver design. They bear a striking similarity to certain receivers seen at Olympia.

With regard to valves, mention should be made of the products of Fotos, Dario, Visseaux, and Métal. In this season’s new models there are counterparts to every type of valve on the British market, except the indirectly heated pentode. There are low- and high-voltage pentodes and A.C. screened valves. The latter do not appear to have attained the same efficiency as those seen at Olympia, the inter-electrode capacity being about 0.01 micro-microfarad as against an average of 0.003 micro-microfarad for our valves. A remarkable new output valve (three-electrode) is the Fotos F.10 with a mutual conductance of more than 5 mA. per volt and an A.C. resistance of about 1,700 ohms. The dissipation is 8 watts at 250 volts H.T., and with but 18 volts negative bias the output is as large as that from a power pentode. The filament consumption is only 0.5 amp. at 4.0 volts.

Now that attention is being paid to the composition of valve bases with a view to avoiding unnecessary high-frequency losses, considerable interest attaches to the quartz valve-holders shown by Etablissements S.I.F.-R.A.Q. These consist of skeleton structures with the very minimum of solid material. The power loss factor of quartz is far less than that of ebonite, and, incidentally, the general physical properties are highly satisfactory. For screen-grid valves and detectors these holders should find wide application.

There are few innovations of interest to the constructor on this side. Comparisons may be odious, but with thoughts of Olympia fresh in his mind, perhaps the critical visitor to Paris may be forgiven for a sotto voce word of congratulation to the amateurs of Britain.
In the process of developing the layout of the components and general make-up of the receiver two sets were built side by side. By this means alternatives could readily be tested and comparisons made. At the same time tests could be made as to just how far one might go in simplifying the layout, modifying the wiring, and cutting down the size and number of components used.

While, in the majority of cases, the working drawings are sufficient guide to construction, a description of the procedure adopted will probably simplify matters.

**Above Baseboard Assembly.**

Seven-ply wood is used for the baseboard, $\frac{3}{16}$ in. in thickness. It measures $16\text{in.} \times 18\text{in.}$, and is therefore just $1\text{in.}$ deeper than a standard which has been adopted in radio-gramophone cabinets, an unavoidable modification, but one to which a cabinet maker can readily conform. A sheet of tin plate held down by $\frac{3}{4}$ in. round-headed screws covers the entire surface. Bends once made in this sheet of tin cannot be readily removed, and if it should become accidentally bent or marked a new piece might be fitted.

Using pencil or scratch lines for setting out the positions, locate the base covers of the four coils. With a round-headed screw holding each cover, secure the coils accurately in position, having first linked them together. Frequently test the switch action for freedom as the screws are tightened, and if a reasonably correct alignment is maintained the switch spindle will operate quite freely. Next proceed with the valve positions, and for this purpose it is as well to completely dismantle one valve holder and use it as a template. Good appearance calls for accuracy in setting out, and the positions of all holes once determined should be...
The Wireless World Four.—
lightly marked with hammer and centre punch and
a pilot hole may then be made, using a short \( \text{\textfrac{1}{8}} \)in.
drill. All valve-holder terminals are reversed so that
the stems carry through to the underside and the
knurled heads are discarded, with the exception of the
grid connections of the detector and H.F. valves, these
remaining the top side. Holes \( \text{\textfrac{3}{8}} \)in. in diameter are
carefully taken right through the base to give ample
clearance to the connecting screws.

There is little difficulty in setting up the four tuning
condensers, which are carried on a pair of end brackets,
after which the three screens are carefully centred and
the positions for the fixing holes marked. A pair of small
brackets made from sheet aluminium support the two
variable resistances used to control volume and regenera-
tion, and holes for the fixing screws may be provided. Always see that
the holes through the tin plate for holding down screws give easy clearance, or, in the event of
using brass screws, it is quite easy for them to break off when being driven home.

Other holes required for down-going leads are four
within the coil bases. Reference to the wiring diagram shows that these are made adjoining terminal No. 5
on the second coil from the front, terminals 5 and 6
on the third coil, and terminal No. 6 on the fourth
coil. Holes are also drilled to accommodate short round-
headed screws and tags near terminal No. 6 in order to
provide a point of earthing within each coil. Three
other holes are made immediately to the rear of the
two valve screens in order to carry through points of
earthing from the top to the underside by means of
four B.A. bolts. Another hole is made through in a
corresponding position behind the detector valve which,
by the use of a \( \text{\textfrac{1}{8}} \)in. screw and four nuts, provides
support in addition to a point of earthing to the
anode by-pass condensers adjoining the H.F. choke.

Having drilled all holes and remedied any slight
errors, perhaps, with the aid of a small round file, all
apparatus is removed, the sheet of tin plate unscrewed
from the plywood so that metal clips lodged under the
tin may be taken away. The baseboard having been
cleaned down with fine glasspaper and the edges of all
holes cleaned off with a sharp drill or rose bit, a coat
of shellac varnish might be applied to both sides. In
the course of construction it was found convenient to
put through two additional holes in each of the side edges about \( \text{\textfrac{1}{8}} \)in. in and \( \text{\textfrac{1}{2}} \)in. from front and back.
These were used to secure two pieces of rough wood, \( \text{\textfrac{1}{2}} \)in.
wide and \( \text{\textfrac{1}{8}} \)in. thick, running down the two edges
so as to give support to the set with all the underside
apparatus clear of the table. The four holes provide a
fixing to the cabinet.

Components in the Underside.

With the board clear, attention may be turned to
securing the condensers, resistances, etc., on the unders-
side. Avoid the ruling of guide lines in exposed posi-
tions on the wood. The components once on need not
be removed. It will be noticed that the components fall
in line, and that those associated with the detector and
H.F. stages are suitably located to provide short earthing
wires. Stand all components in their correct posi-
tions, using the rule to check accuracy of spacing and
alignment. Make the positioning look symmetrical and
pleasing, taking care to avoid the obstructing of the \( \text{\textfrac{1}{8}} \)in.
holes through which the valve-holder screws are to pass.

It is now an easy matter with bradawl and screws to
fix all components, using round-headed \( \text{\textfrac{1}{8}} \)in. No. 6's for
the condensers and resistances, heavier screws if
necessary for the mains transformer and L.F. chokes, and smaller but longer ones for the porcelain leak holders and H.F. chokes. One might be cautioned not to accidentally catch the resistances with the screwdriver during fixing, for while this class of resistance is perfectly durable and has a heavy watts rating, its fine wire, which is left almost exposed to facilitate cooling, is readily damaged.

As more than fifty parts are used, the possibility of a faulty component being encountered might be worth guarding against. Mains condensers are roughly tested by connecting them to some 200 volts from a battery or mains eliminator, allowing to stand for a few minutes and then short-circuiting them through a coil of wire and noting that they each give a snappy spark. Chokes, both H.F. and L.F., are tested for continuity, likewise the feed resistances, using a milliammeter and battery, bearing in mind that for every volt of the battery 1 milliamp will pass through 1,000 ohms. Thus the battery voltage approximately equals the number of thousand ohms resistance when 1 mA. is recorded.

Omitting, for the time being, the heavy mains transformer, attention can be resumed to the top side, noting, first of all, that no screw points protrude. All the tuning components can now be set up permanently in position. Before fixing down valve holders see that the terminal screws and nuts are really tight, while the nickelling might be filed away and the ends of the screws well tinned in readiness for wiring. Nothing else is worthy of comment in the assembly, which is really quite straightforward. No. 22 tinned wire, straightened by stretching, is used for all wiring except the heater circuits of the three indirectly heated valves, these being run straight through with No. 18.

The bulk of the wiring is kept down near the baseboard, but there is little point in dropping a lead which runs between two elevated points. It should be noted that no common earthing wires occur in the H.F. circuits, the cathodes of the three indirectly heated valves are taken straight to their respective tags, while seven condensers facing toward the line of indirectly heated valve holders are earthed on their own cases and then taken across to cathode or earthing tag. Short earthing wires are run under the coil covers from the top of, every earthing condenser, which, with its bend-up tag, is carried on terminal No. 5. It should be noted that it is the first two earthing condensers which have a capacity of 0.005 mfd., the other two being 0.01 mfd. Direct earthing wires about 3in. in length are run between holding tags under screen-fixing screws and the fixed tag to which the braided pigtail of the condenser is soldered. Whether wiring from the practical or theoretical diagram it is worth while carefully inking over each line in red as a lead is run. An omitted lead is not always easy to trace and may not entirely prevent the set working. Resin-cored solder is a great aid to making good connections, using just a trace of Fluxite on iron and tag. An acid flux must not be used. Good appearance is obtained by using a small size of sleeving only just large enough for the wire and selecting coloured silk rather than the painted variety. Gramophone pick-up connections are, obviously, omitted until after a preliminary test.
The Wireless World Four.—
As no fault is likely to be met with other than that due to a component or wiring, reception can be expected on switching on. The action of the volume controls is that the left-hand one prevents local station overloading, and the right-hand one controls the sensitiveness of the set. For distant station reception it is better to cut down volume if necessary by the screen feeble distant station tuned in by operating the earthed moving plates individually. It should be found that the settings coincide. Straight-line capacity condensers would, of course, compensate for differences in stray capacity, in that a capacity correction would remain constant over the tuning scale. In addition the condenser assembly could be set up so that the weight of the moving plates could be balanced, and that when one

A fixed capacity condenser of 0.0001 mfd. is inserted in the aerial lead. Note the 1 mfd. condenser connected in the earth lead of the H.F. volume control. (This was omitted from the circuit given in the previous issue.)

volts control. The condenser assembly provides access to the grub screws holding the moving plates to the spindle. These may be slightly slackened off and a set was lifting, another set could be falling, thus permitting of any dial being used even though the friction drive be weak.
While it is advisable to adopt the branching points shown, the leads are, of course, run by the most direct routes.

The type of cabinet chosen is not unduly tall, and permits of set and gramophone motor being assembled side by side. A stout upright supports a cross-batten on to which the receiver slides so that the operating spindles pass through clearance holes in the front panel. In order to clear the under apparatus of the baseboard, the loud speaker is mounted towards the side of the grille. The direction of connecting the leads to the gramophone motor may, perhaps, be a consideration should a slight hum be experienced, though this difficulty has not been met with in sets built to this specification. It is necessary to earth the frame of the gramophone motor. A double-pole "on and off" switch breaks both main leads and is assembled on the front panel to balance the wave change switch.

Good reception of European stations is easily obtained on 6ft. of indoor wire, and that this performance is duplicated in various sets was demonstrated in that two receivers placed side by side and connected to independent 6ft. aerials gave identical results going round the dials and on the weakest of foreign stations.

MANCHESTER SET CONSTRUCTION COMPETITIONS.

Prize Winning Receivers Embody the Latest Ideas.

Year by year a steady advance has been made in the standard of the entries to the "Evening Chronicle" constructional competition which is held in connection with the Manchester Radio Show. This year, however, a marked change has come about and the sets entered have reached a remarkably high standard as regards design, circuit principle and workmanship. Without exception the winning sets included all those modern features which are at present attracting amateur interest such as band-pass tuning, power grid detection, all mains operation, screening of tuning coils and valves under metal covers, ganged wave-change switching and one-dial control.

(1) The first-prize winning set in Class I for three or four stage mains or battery-operated sets (entered by E. V. Jones, Liverpool). Pre-H.F. band-pass tuning is included.

(2) All mains-operated three-valve set awarded second prize in Class I. Space is provided for the loud speaker between the receiver and eliminator sections. (L. Williams, Manchester.)

(3) First-prize winner in Class II (C. R. Deglone, Manchester) for all mains-operated sets arranged to cover two wavebands by a simple change-over switch and without the need for retuning.

(4) A particularly clear front panel is the merit of the second-prize winning set in Class II. (V. Banks, Helmsley, Lancs.)

(5) A well-constructed set, The Wireless World Band Pass Four, awarded a special prize in Class I (V. Banks.)
Greater effective amplification is definitely ensured by the New Cossor Screened Grid Valve. This is due to its minute inter-electrode capacity which has been reduced to the order of 0.001 micro microfarads—lower than that of any other Screened Grid Valve on the market. Because of this and because grid current has been eliminated, the use of this New Cossor Valve will considerably increase the efficiency of your Receiver.

Write for free fully descriptive Folder on "How to increase the range of your Receiver," mention No. L35W.W.

Cossor 215 S.G. 2 volts, 15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1.1 m.a./v. Normal working anode Volts 120. Positive Voltage on Screen 60-80. Price 20/-

Everyone wants the best in radio. So everyone wants the Six-Sixty Mains Valve. But you must

Convert your battery set to all-mains operation. It is so simple with the Six-Sixty A.C. All-Mains Conversion Equipment. No internal wiring alterations. Dimensions of complete equipment do not exceed the batteries replaced. Price, complete Conversion Equipment, from £8 : 5 : 0. Mains Unit only (H.T., L.T., & G.B.), £6 : 6 : 0. Think of the added power, range, selectivity, convenience and delight of All-Electric operation and write for our FREE literature of the whole Six-Sixty range.

SAY

SIX - SIXTY

(B.V.A. RADIO VALVES AND EQUIPMENT)

SIX - SIXTY RADIO CO., LTD.,
SIX - SIXTY HOUSE, 17/18, RATHBONE PLACE,
OXFORD STREET, LONDON, W.1.

Telephone: Museum 611617.

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

Stamboul, after a period of silence, is again functioning on 1,500 metres.

WIRELESS ROOM IN A LIBRARY.

A special wireless room has been set apart in the Barlowe (Lance) Public Library for group listening to the B.B.C.'s adult education talks. The Carnegie Trustees have installed the broadcast receiver.

TWO SETS: ONE AERIAL.

An unusual case was heard in the Nottingham Summons Court a few days ago when John Cooper was fined 5s. for operating a set without a licence. The accused pleaded that he thought one wireless licence was sufficient although there were two sets in the house working off the same aerial. One set belonged to his wife's sister.

BROADCASTING FROM A ROOF GARDEN.

"Radio House," in Berlin, illustrated in our issue of October 8th, is expected to be ready for occupation before Christmas. This home of broadcasting is one of the largest buildings to be constructed in the capital in recent years. The façade has a frontage of 168 yards. Above the five storeys a terraced garden will be available for meetings and public concerts.

"RADIO WIZARD" CAUGHT.

A man said to be known internationally as a "radio wizard" and "wanted" by France and England for infractions of radio laws, was among the persons apprehended by the Brooklyn police when they raided a "set-runners" wireless station at Coney Island on September 27th. The transmitting apparatus, valued at £5,000, was used for regular communication with rum-running vessels outside the 12-mile radius.

ANOTHER "FIVE YEAR PLAN."

Five years is a period which has special attractions for the Soviet Government. We understand that in addition to the famous economic "Five Years' Plan," Russia is preparing a special five-year programme for the development of communications, including wireless. The scheme includes a network of sixty-two radiotelegraph stations situated at strategic points, besides a system of "wired wireless" for the distribution of broadcast programmes.

The complete communications scheme will involve a capital outlay in excess of £135,000,000.

HEAR STRASSEBURG SOON.

Radio Strassburg, whose debut has been expected every week for the past month or two, will, it is officially announced, give its inaugural transmission on Armistice Day. We understand that the wavelength will be 345 metres.

FIRE!

One thousand radio receivers, adjudged obsolete, went up in flames at Philadelphia recently during "the biggest burning of obsolete radions in the history of the industry." writes a correspondent. The ceremony was staged.

A TANK AERIAL.

This Vickers-Armstrong tank is equipped with a Marconi 5-metre transmitter, and the aerial consists of a flexible copper-plated steel rod, 12 feet high, which is almost invisible.

near the City Hall by the Philco Co., which is organising an up-to-date radio campaign, and was presided over by a representative of the Mayor's office.

STATE-BROADCASTING IN N.Z.

Better times for New Zealand listeners are promised by Mr. Donald, the Postmaster-General, who informed the House of Representatives last week that the Government would take over the control of all stations from the Radio Broadcasting Company in January, 1932. The existing stations are at Auckland, Christchurch, and Dunedin.

Bordeaux's second annual wireless salon opens on Sunday next, October 26th, and will run for a week.

There are 39,152 shops in the United States selling radio apparatus, according to the latest survey of the U.S. Department of Commerce.

I.E.E. WIRELESS SECTION.

The opening meeting of the Wireless Section of the Institution of Electrical Engineers will be held on Wednesday, November 5th, when the inaugural address will be given by the chairman, Mr. C. E. Rickard, O.B.E.

WIRELESS AND UNEMPLOYMENT.

Statistics from U.S. Government departments indicate that radio is comparatively unaffected by the world trade depression. The Department of Labour reports that forty-four radio manufacturers employed 35,103 workers in August, an increase of 25.8 per cent. over the figures for July.

Although figures are not available it would be safe to assume similar conditions in the British radio industry, which is contributing no small share to the reduction of unemployment.

"WIRELESS WORLD" DIARY.

"The Wireless Amateur's and Experimentalist's Diary and Note-Book" is issued this year in a slightly larger form to accord with the other diaries published by Iliffe & Sons Ltd. The information contained follows generally the lines of previous issues, as this has been found to meet the wishes of the majority of our readers as far as the necessarily limited space will permit.

Every section has been carefully revised and brought up to date. The useful formulae and Abacs have been considerably amplified. The typical wireless receivers and circuit diagrams have been largely rewritten in the light of the latest modern practice, and a new feature has been introduced in the form of practical hints and tips for set builders and set users, based upon the various questions propounded and difficulties experienced by our numerous correspondents during the past year. A complete list of the broadcasting stations of Europe and of the principal short-wave broadcasting stations of the world will be found invaluable by broadcast listeners and short-wave experimenters, and the final pages are devoted to a very comprehensive list.
of the valves of British manufacturers, giving, in tabular form, all the necessary technical data, with few words of advice upon the choice of valves for any given purpose.

“The Wireless World: Diary” is strongly bound in leather, with printed insert, and the price is 1s. 6d., or post free 1s. 7d.

THE SCIENCE MUSEUM RECEIVER. In the simplified circuit diagram of the Science Museum receiver, described in our last issue of July 30th last, the LSS anode resistance was erroneously shown with a value of 5,000 ohms. The correct resistance is 25,000 ohms.

Radio chaos in America. Fourteen American broadcasting stations now use or have been authorised to use the maximum power of 50 kilowatts and twenty-seven others are applying for the privilege.

During the coming months, writes our Washington correspondent, the Federal Radio Commission will have to consider more than 300 applications for changes of station ownership, wavelength and power. It is predicted that most of the applications will be summarily refused owing to the tremendous amount of congestion already prevailing.

The present laxity of private ownership in America is probably responsible for the fact that the Federal Radio Commission is a much more harassed body than the Union Internationale de Radiocommunication, although the latter controls all the broadcasting stations of Europe.

Aurora borealis and short waves. That the aurora borealis induces a kind of temporary paralysis on the short-wave lengths was affirmed by M. Paul Halbroun at the last meeting of the French Academy of Science, writes our Paris correspondent. Reports from the Company Radio-France showing that on a particular night in September the "northern lights" gravely affected 25-metre communications on the Paris-New York service necessitating a change-over to 17,000 metres. The Moscow company had also reported that reception of short-wave stations on the night in question was next to impossible.

Signals were also affected on the Franco-Japanese and Franco-South American routes.

Columbus stamps. We are indebted to Senor Eduardo Navarro, of Madrid, for sending us a complete set of the new Columbus postage stamps, now in circulation in Spain, to commemorate the discovery of America.

Round Table Discussion. The Bournville Radio Society held the opening meeting of the season on Thursday, October 9th, when a round-table discussion took place between the committee and members.

The membership of the Society is limited to employees of Messrs. Cadbury Bros., Ltd., but visitors are welcome at the Lecture Room, Dinmore Block, Bournville Lane, on Thursday evenings.

Hon. Secretary, Mr. J. F. Cleaver.

FORTHCOMING EVENTS.


Martyn Hill and District Radio Society.—At 8 p.m. At Tillingham School, Peterley Lane, N.10. Third lecture on “Some of the Elementary Principles of Radio,” by Mr. Leonard Hardie, B.Sc., A.I.E.C.

THURSDAY, OCTOBER 13th. Slade Radio Society.—At 8 p.m. At the Parachute Hall, Bournbrook Road, Birmingham. "Radio Broadcasting," a film display by Messrs. Ensign, Ltd.

FRIDAY, OCTOBER 22nd. Wembley University Society.—At 7.30 p.m. At Park Lane School. Ordinary meeting.


News from the Clubs.

Radio reminiscences. At a meeting of the Bristol and District Radio and Television Society held at the University on October 15th, a lecture was given by Mr. Gosnall, of the General Electric Co., on the development of radio reception from the early days of Dufay and Writtle up to the present Regional scheme. This interesting lecture was followed by a demonstration of the latest models of H.E.C. productions, the 3- and 4-valve A.C. models, the 5-valve kit set, and the U.E.C. photomixing valve.

Hon. Secretary, Mr. B. T. Jordan, 1, Mitre Road, Cootham, Bristol.

A Good Start. The autumn session of the Muswell Hill and District Radio Society opened auspiciously with a dinner at the Florence Restaurant, Rupert Street, London, W., on October 1st. Messrs. E. H. McCormack was in the chair, and among those present were Capt. H. J. Round, M.C., M.I.E.E., President of the Society, and Mr. P. K. Turner, the loyal toast.

After dinner and the loyal toast, the Chairman proposed the toast of "The Society," which was responded to by Mr. Turner, who congratulated the Society on the excellence of their syllabus, which includes lectures and demonstrations by such notable names as the Gramophone Co. (I.M.V.), the Marconi Co., and Murphy Radio, to name but three.

There was then an intermission for a short time, after which the orchestra, which had been30,30,30 playing some music during the dinner, showed its versatility by supplying dance music until an early hour of the morning. Thus ended the first of the many social functions which are the rule during the session of the Muswell Hill Radio Society.

Anyone wishing to join the society should write to Mr. C. D. With, at 68, Compton Road, Muswell Hill, London, N.10.
A New Three-valve Receiver for A.C. or D.C. Mains.

In the Columbia range of broadcast receivers the Model 307 occupies an intermediate position between the simple two-valve twin-station Model 309 and the long-range 3-H.F. Model 304, which was reviewed in the November 27th, 1929, issue of this journal.

The three-valve circuit comprising a screen-grid H.F. amplifier, detector and pentode output valve is an arrangement which has proved itself capable of meeting present-day demands of selectivity, range and volume at a reasonable price, but careful attention to detail on the part of the designer is essential if the requisite degree of selectivity is to be attained with only a single H.F. stage.

In the Columbia Model 307 there are only two tuned circuits—an input tuned circuit across grid and filament of the screen-grid valve, and a simple tuned anode circuit in the output. Both circuits are tuned by side-by-side drum dial condensers which can be operated independently or simultaneously at will, and the anode condenser on the right is calibrated in wavelengths. The requisite degree of selectivity is obtained by loose-coupling the input tuned circuit to the aerial. This is done in two ways, (1) by tapping in the aerial feed at a point near the low potential end of the coil; (2) by controlling the aerial coupling through a three-electrode differential condenser. This condenser, which is of the solid dielectric type, is housed in a moulded case on the aerial terminal panel at the back of the set, and, once adjusted in relation to reception conditions in the neighbourhood and to the electrical constants of the particular aerial in use, requires no further attention.

The advantage of the differential aerial condenser is that a satisfactory compromise between range and selectivity can be obtained without appreciably-affecting the capacity across the aerial tuning circuit. The condenser can, therefore, be used also as a volume control for local station reception without disturbing the setting of the left-hand tuning dial.

As an indication of the effectiveness of this arrangement the short-wave performance of the receiver on a 50ft. outside aerial at a distance of five miles from Brookmans Park may be cited. The best setting for the aerial condenser, having regard to the attainment of adequate range, was found to be the first division from the zero or minimum (1/4 full scale), and with this setting the Regional transmitter (356 metres) occupied a band from 325 to 375 metres and the National transmitter was confined to the lower part of the tuning range from 275 metres downwards. That this satisfactory state of affairs was not obtained at the expense of range is indicated by the fact that thirteen foreign stations were tuned in clear of the local transmitters with the same setting of the differential aerial condenser. For the above results, of course, the best possible use was made of the reaction control.

Two Pre-detector Volume Controls.

The selectivity on long waves is not of such a high order as on short waves, but is, nevertheless, sufficient to separate Radio Paris and Daventry 5XX. In all, seven stations were received at good strength on the long waves.

It has already been pointed out that the differential condenser can be used as a volume control, but an independent volume control described as an "Intensifier" is also incorporated in the aerial circuit. This takes the form of a high-resistance potentiometer across the tuned aerial circuit and regulates the proportion of the voltage induced across the aerial coil which is passed to the grid of the screen-grid valve. It follows that this volume control does not affect the input from a gramophone pick-up, and an additional external volume control is necessary when reproducing from records.

A compound switch similar in design to that used in the Model 304 serves to connect the pick-up in the grid circuit of the detector and also to change from long to short waves. Normally, the detector functions as a leaky-grid rectifier, and gramophone leads are short-
Columbia Model 307.

circuit to prevent interference from low-frequency induction in the pick-up leads. The operation of switching in the pick-up also changes the detector valve bias and so converts it to a L.F. amplifier. Incidentally, the grid bias for all three valves is derived from a common potentiometer, each tapping being thoroughly decoupled.

A resistance-capacity filter in the detector anode circuit deflects D.C. from the high-permeability type L.F. transformer coupling the detector and pentode power valve. The loud speaker terminals are connected directly in the anode circuit of the P.M.24 output valve.

It is well known that accentuation of the high frequencies is a characteristic of the performance of pentode valves, and for this reason a filter, consisting of a condenser and resistance in series, is connected between the anode of the valve and earth. The values of resistance and capacity have been chosen to give the high note correction required by the Columbia 325 and 326 loud speakers, and it is emphasised in the instruction booklet that unsatisfactory results may ensue from the use of other types of loud speaker. This point was borne out by experiments with a loud speaker having a good response up to 6,000 cycles which gave undue prominence to the sibilants in speech and needle scratch in gramophone records. It would appear that the filter circuit has been adjusted to give only a moderate restriction of the upper frequencies.

In the A.C. model tested the mains transformer is suitable for supply voltages from 195 to 245 volts with a total of six alternative primary tappings. A filament circuit potentiometer or "hum adjuster" is mounted on the same panel as the primary tappings and may be adjusted with a screwdriver from the back of the set. This component does its work adequately, and a well-defined minimum is easily obtained, at which point there is no trace of 50-cycle hum in the loud speaker.

The H.T. current is supplied through a Cossor BU/624 full-wave rectifier, and is very completely smoothed by chokes and a T.C.C. condenser bank. Both the screen grid and detector anode circuits are decoupled, and the screen grid potential is derived from a potentiometer consisting of two cartridge type resistances in series.

The arrangement of compartments in the aluminium chassis is well thought out, and it is interesting to note that a subsidiary screen is provided to prevent interference between the H.F. choke in the detector anode circuit and the tuned circuits associated with the H.F. valve. Another constructional feature worthy of mention is the method of screening the lead to the anode of the H.F. valve. The edge of the screening trough surrounding this valve has been turned over to form a tube and the anode wire is supported inside concentrically by small ebonite end bushes. The exposed end of the anode lead is, therefore, little more than an inch in length.

The cabinet work is unusually sturdy, and both the top and back panels are easily removable, giving ready access to the receiving and rectifier valves respectively. Adequate ventilation of the interior of the cabinet (an important point where use is made of indirectly heated A.C. valves) is provided by large diameter holes drilled in the base and a long slot in the back panel.

A model designed for D.C. mains is also available, and the price of both A.C. and D.C. models is 30 guineas in oak and 31 guineas in mahogany. The same chassis is obtainable in a pedestal type cabinet, together with a built-in four-pole balanced armature cone loud speaker, the price being 35 guineas in oak and 36 guineas in mahogany. The makers are the Columbia Graphophone Co., Ltd., 102-108, Clerkenwell Road, London, E.C.1.
Mystery of "London National."

No one who has attempted to seize the inner meaning of recent happenings in con-
nection with the Brookmans Park station can fail to note that the National trans-
mitters have fallen from grace. At first the premier station of the two, it now plays second fiddle.

Sad Reflections.

The B.B.C. engineers came out into the open last week with the statement that it had been decided to use the Regional rather than the National when any one programme is being radiated for the reason that, beyond a radius of 15 or 20 miles, the London Regional is heard better than the London National. This casual statement has probably a very sad significance.

Too Low a Wavelength.

If they had wished to be bluntly truthful, the B.B.C. might have added that this country is possessed of a wave-length unsuited to the uses required of it. Experience is showing that the 261-metre wave is too low for a station with regional, not to mention national, aspirations.

A Wrong Choice.

No other European station with so large a service area appears anywhere near London National on the wavelength chart; the nearest stations of any consequence are Horby (Sweden), on 287 metres, and Helsinki (Finland), on 221 metres. Both these stations employ a mere 15 kW., and are obviously not intended to cut such a figure as Brookmans Park with its 68 kilowatts.

An Exchange of Wavelengths?

Perhaps if London National were to exchange with the relay stations the British common wave of 285.5 metres the results would be less disappointing.

Heterodyning.

It is a pity to break in upon the romantic thoughts associated with the lengthening winter evenings by talk of Continental heterodyning. But there can be no doubt that the better receiving con-
ditions are also revealing culprits who were undetected during the summer.

Several of the British stations have been affected.

B.B.C. Sufferers.

For example, disturbance on Daventry National transmissions has been traced to far-away Angora; the National common wave has been jolted several times of late by Radio Lyons. Even London Regional has been jammed by a whistle ascribed to the third harmonic of Hilversum.

These and other cases of interference with B.B.C. transmitters have been traced by the Tatsfield receiving station. Full details have been sent to the Brussels office of the International Broadcasting Bureau, whose duty it is to straighten other tangled wires with firmness and tact.

A Challenge Accepted.

I hear that Mr. Cleghorn Thomson, the Scottish Regional Director, is to take up the recent challenge anent the organisation of broadcasting in Scotland. In his annual talk from Scottish stations on his plans and policy for the coming year, Mr. Thomson will, on November 1st, have several important things to say, quite apart from the question of programmes.

Worth Listening To.

The Scottish H.Q. have been accused of (a) being too dependent on Savoy Hill, and (b) too independent of Savoy Hill. Mr. Thomson's task of satisfying both sets of critics should give his talk a piquant flavour. If you can tune in a Scottish station on November 1st, the opportunity should not be missed.

From Durham Cathedral.

The National Service on October 26th comes from Durham Cathedral, which has not been used as much as most Northern cathedrals for broadcast purposes. The address on "Christian Citizenship" will be given by the Dean (Bishop J. E. C. Welldon).

Making Our Flesh Creep.

The idea has been fostered in certain sections of the daily Press that the "B.B.C. Green Van" spends its time chasing unlicensed listeners. Such an exhilarating function is, of course, quite outside the scope of the broadcasting organisation. The van in question is used exclusively for outside broadcasts, and is often to be seen at strategic points on high days and holidays. It might spoil the pleasure of these occasions if the spectators associated it with other duties.

Black Magic.

The Post Office Direction Finding Van is the vehicle that strikes terror into the hearts of unlicensed listeners. Naturally, the P.M.G. refuses to disclose the magical process of detection.

I see that this "Black Maria" is setting out on a tour round Cardiff.

Revue Over Transatlantic 'Phone.

The high-speed revue, "Give me New York," is to be re-broadcast nationally on November 15. This is in a sense a new broadcast, as the author, Holt Marvell, has revised the first edition, which was given two years ago, and new music has been written.

The idea of the revue is that an English impresario, being anxious to place a London play with a New York theatre manager, submits specimens of it over the transatlantic telephone. The call costs £3 a minute, hence the speed of the show.

A Musical Fighter.

Another of those periodical wrangles between the B.B.C. and the music in-
terests seems to have been settled by the new arrangement whereby eight of the Hallé concerts may be broadcast during the 1930-31 season.

Sir Hamilton Harty, like Sir Thomas Beecham, has shown himself to be a re-
doubtable fighter, but all musically-minded listeners will be glad that the recent contention has not led Sir Hamil-
ton to turn his back on the microphone in the manner of his illustrious con-
temporary.

By Our Special Correspondent.

World's Largest Broadcast Studio. This photograph gives some idea of the vastness of the converted warehouse on the south side of the Thames, now used by the B.B.C. as a studio to accommodate the National orchestra and chorus, comprising more than 250 performers.
UCH has been written on the comparative advantages of "anode-bend" and "leaky grid" detection, and a fair statement of the position to-day would seem to be that while the former has a decided superiority from the point of view of good quality, yet the latter is still employed by the great majority of set users. The reason is simply that the reaction which can be, and almost invariably is, associated with this method increases amplification to an extent which makes it possible to dispense with a H.F. amplifying stage, or to conceal inefficiency in such a stage when it is used. This amplification by reaction, however, is dearly bought. Since grid current is always flowing in the detector a resistive load is thrown upon the preceding H.F. tuned circuit, leading to loss of both amplification and selectivity, and it is the aim of reaction to counteract both these defects.

Now, although amplification may thus be restored to its original value, the selectivity curve suffers a distortion, which is illustrated in Fig. 26.

Here the full curve represents the transmission of sidebands by a H.F. tuned circuit. When this is loaded by a leaky grid detector and the amplification is brought back by reaction to the original value the broken curve is obtained showing an increased loss of sidebands up to 10 k.c. on either side, and a decreased selectivity in the region beyond (which is just the region where increased selectivity is required to cut out adjacent stations).

In addition to reaction distortion there are losses of low and high tones in both the grid and plate circuits of a leaky grid detector, and we must conclude that this method is unsuitable for reproduction of high quality.

It should be noted, however, that a new era seems to be opening with "power grid detection" (see The Wireless World, May 7th, 1930, p. 474 and p. 479), where distortionless reproduction is obtained by a grid detector using 300 volts H.T. This method of rectification has been employed successfully in a number of receivers lately described in this journal.

Anode Bend Detection.

The function of a detector is to rectify the incoming high-frequency carrier wave which is modulated at audio frequencies, and so allow the latter to be separated from the high-frequency wave and applied to the sound-reproducing device.

The modulated carrier is in envelope form as shown in Fig. 27 (a), the amplitude of the high frequency varying at audio frequency. In order to make use of this by the L.F. amplifier it must be cut in halves and one half discarded, the result being as in Fig. 27 (b), which is the equivalent of a pulsating direct current which would have a mean steady value, as shown by the dotted line, if the carrier wave were unmodulated, but which varies below and above this value if modulation is present.

We now come to the case of the anode bend rectifier. Fig. 28 shows a typical grid plate current curve with (a) modulated, (b) unmodulated carrier waves applied to it, and indicates the manner in which the plate current varies when there is no plate load present.

In order to make use of these changes of plate current...
Quality Reception.—
for the purpose of operating the L.F. amplifier we must insert some sort of coupling device. In resistance capacity coupling a high resistance is inserted in the plate circuit and a grid leak and condenser are used to couple to the following L.F. valve.

The presence of the resistance introduces some new conditions which must be considered (Fig. 29). The first is that the grid volts-plate current curve is now less steep, but, on the other hand, it is straighter, and the effect of the curved lower part is less marked. It is evident that the variations of plate current are now much smaller than in Fig. 27. Since we are dealing with rectified current, of which only one-half is used, the root mean square value will be 0.35 of the maximum at any point, as shown by the dotted curves in Fig. 29, and this value (in amperes) multiplied by the resistance in ohms will give the volts output.

If now we shunt the plate resistance with a condenser of suitable value, the high-frequency variations are smoothed out to a considerable extent, making the mean value much higher, and since the plate resistance is still of the same value the low-frequency output is increased.

Care must be taken to see that the condenser which shunts the plate resistance does not interfere with the low-frequency characteristics, i.e., cause the output to be deficient in the higher audio frequencies. For this reason the impedance of the condenser should not be less than about four times the valve A.C. resistance as measured under working conditions; this condition gives 4 x 15,000 = 60,000 ohms, which will be satisfied at 5,000 cycles by a 0.0005 mfd. condenser.

This by-pass condenser passes most of the H.F. current, but in order to make sure that as little as possible gets through to the plate resistance, and so to the following L.F. valve, it is necessary to insert a radio-frequency choke as in Fig. 17. Even when transformer coupling is used the choke is still necessary, for although the inductive reactance of the primary offers an obstacle to H.F. currents there is enough capacity between primary and secondary to transmit quite a lot of H.F.

Large Detector Input for Good Quality.
In the days when H.F. amplification was a difficult and ineffective business, the peak swing on the grid of the detector rarely exceeded a volt, and in consequence the valve acted only on the strongly curved part of the bottom bend; distortion was unavoidable in such circumstances, and anode bend had nothing to recommend it in preference to the leaky grid method. Nowadays, with screen-grid H.F. amplification giving a single stage gain of 50 or more, the detector grid can be swung up to ten peak volts at a distance of 100 miles from Daventry. With such large swings the straight line part of the characteristic is utilised, the bottom bend being only a small part of the whole path and, as Fig. 28 shows, the plate current faithfully follows the grid swing.

The possibility of such large detector grid swings is a direct, though perhaps unforeseen, consequence of modern methods of H.F. amplification, and marks the most notable advance towards high-quality reproduction that has been seen in recent years.

High-frequency Amplification.
When high-frequency tuned circuits are used both preceding and following a screen-grid valve, the coils of these two circuits being well designed for low losses, we must expect the high audio frequencies to be attenuated owing to cutting of sidebands. Fig. 30, curve 1, shows the selectivity curve due to two such circuits in combination, and it appears that the voltage transmission drops to 0.5 at 5 kilocycles off tune. This is a serious attenuation of the high tones, but fortunately the curve can be improved by judicious detuning of the circuits in opposite directions. Curve 2 shows the effect of detuning one circuit by 5 k.c. to the right, and the other by an equal amount to the left. The process is continued in curves 3 and 4, and evidently an excellent curve is obtained at some stage, such as curve 3, where the variation over the audio range does not exceed 6 per cent. The process of detuning is too delicate to be carried out by ear alone, but is a simple matter if a milliammeter is used in the plate circuit of the anode bend detector valve. Each circuit can be accurately tuned by observing when the needle indicates the maximum detector current, and then the condenser dials...
Quality Reception.—

should be rotated equal amounts in opposite directions till the best effect is obtained.

Often the H.F. grid circuit is so heavily loaded by the aerial that its selectivity curve is much flatter than that of the plate circuit; in this case the result of detuning is not so good, but it is usually possible, while still retaining sufficient signal strength, to couple the aerial so loosely to the grid circuit that the curves are nearly identical.

Input Capacity Due to Feed-back.

It now remains to describe the experiments previously referred to in this article on the effect of feed-back from the plate load of the pentode through the residual plate-grid capacity which exists between the plate and grid leaks in the glass pinch and the valve-holder. This feed-back results in the appearance of a large effective capacity between the grid and filament.

An audio-frequency generator (Fig. 31) of the heterodyne type, which produced frequencies between 50 and 5,000 cycles at constant voltage, was connected to the primary of an equal ratio transformer across the secondary of 40 ohms maximum value. Thus the equivalent resistive plate load could be varied from 0 to \(25^\circ \times 40 = 25,000\) ohms. In the experiments the resistance load was first shorted by closing the key K, and the voltmeter reading was noted. On opening the key the grid leak of 0.75 megohm was shunted by the capacity which appeared across it due to feed-back and the voltmeter reading changed. By means of the variable condenser C capacity could be added to give the same change of voltmeter reading as was caused by introducing the plate load. With any fixed resistive load the required value of C was found to be independent of signal frequency, thus showing that the feed-back is actually capacitative. The effective capacity increased as the resistive load was made larger, as shown in Fig. 32, curve 1. This is to be expected, since for a high-resistive load the working line lies more in the region where the valve amplification is large, as has frequently been pointed out in *The Wireless World*. It attains a value of 90 mmf. for a load of 17,000 ohms, which value is attained by the impedance of most reed-driven loud speakers (of 2,000 ohms nominal impedance) at 5,000 cycles.

As a check on the method, a similar experiment was carried out with a power triode, a DFA9. The results are shown in Fig. 32, curve 2, and the values agree well with those derived from the formula for triodes.

It is evident from Fig. 32 that the equivalent input capacity of a loaded pentode is much larger than that of a low magnification power triode, and must be taken into account when the coupling between detector and pentode is being designed, otherwise the high tones may be seriously attenuated.
L.T. CHOKE FOR “ALL D.C. THREE.”

A special heavy-duty choke constructed according to specification, and for use in the above receiver, has been submitted for test by W. Bryan Savage, 146, Bishopsgate, London, E.C.2. The measured D.C. resistance of the winding is 59 ohms, which is the same as that of the choke used in the original set: measured D.C. resistance of the winding is 146 ohms, according to specification, and for use in another receiver, the inductance was found to be 5.1 henrys; an entirely satisfactory value. As a guide for those who may require a heavy-duty choke of this type but for another purpose, the inductance with different values of D.C. flowing is given below.

<table>
<thead>
<tr>
<th>D.C. in mA</th>
<th>Superimposed A.C. in mA</th>
<th>Inductance in henrys</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.8</td>
<td>11.9</td>
</tr>
<tr>
<td>50</td>
<td>4.8</td>
<td>9.2</td>
</tr>
<tr>
<td>100</td>
<td>4.4</td>
<td>9.1</td>
</tr>
<tr>
<td>200</td>
<td>6.2</td>
<td>7.2</td>
</tr>
<tr>
<td>250</td>
<td>6.0</td>
<td>6.4</td>
</tr>
<tr>
<td>300</td>
<td>6.6</td>
<td>7.2</td>
</tr>
</tbody>
</table>

The physical dimensions of the choke are according to specification, the height being 2' 7" in. x 2' 6" in. x 1' 12" in deep. A further application of these quartz crystals is to be found in calibrating a wavemeter where a high order of accuracy is required. As supplied by the Loewe Radio Co., Ltd., the crystal is mounted in a dustproof case fitted with two contact-pins, and they are available ground to resonate at any wavelength between 40 and 1,000 metres. The prices vary according to the degree of accuracy required. Those guaranteed to within 10 per cent. of the marked wavelength cost 55s. each, and to within 1 per cent. the price is 70s. An accuracy of one part in 1,000 can be guaranteed at the price of 110s. per crystal.

Heavy-duty choke for the “All D.C. Three,” made by W. Bryan Savage, over terminals not exceeding 3½ in., this enables the choke to be accommodated comfortably in the space available under the plinth. The price is 21s.

WATMEL SCREENING BOX.

There are some occasions where a screening box of slightly smaller dimensions than those generally employed is required, and to meet this need the Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex, have produced a box measuring 4½ in. x 6½ in. x 6½ in. high made from aluminium. In one corner of the box is a small hatch 2½ in. x 2½ in. x 1½ in., deep with a 1½ in. diameter hole cut in the base to accommodate a screen grid valve. A loose wooden base is fitted to the box, which has also a number of holes drilled in the sides to pass lead-in and lead-out wires. The valve hatch is built up from separate pieces of metal and can be easily removed if it is not required. The price of the box is 5s.

Watmel aluminum screening box with built-in hatch for the valve.

LOEWE QUARTZ OSCILLATORS.

One of the conditions imposed by the Postmaster-General in the issue of a licence for experimental transmission is that the wavelength of the transmitter should be checked, from time to time, by reference to a wavemeter. Where the power in use does not exceed 10 watts a suitable quartz crystal may be connected in the grid circuit of the oscillating valve, but in the case of higher power than this the use of a separate control valve becomes essential.

The Milnes H.T. unit consists of a battery of nickel-iron-type cells mounted in a crate and incorporating an ingenious series-parallel switch which connects groups of cells either in parallel or in series. Four cells constitute a group, which, when connected in parallel, can be charged from a 6-volt accumulator. The switch consists of an ebonite rod extending the full length of the crate and operated by a lever located outside the container. Fixed to this rod is a number of bent-wire contacts and steel studs, which bear against spring leaves connected to each group of four cells.

Where the wavelength of the transmitter has to be checked, a wavemeter is required. Those guaranteed to within 10 per cent. of the marked wavelength cost 55s. each, and to within 1 per cent. the price is 70s. An accuracy of one part in 1,000 can be guaranteed at the price of 110s. per crystal.
Laboratory Tests on New Apparatus.

The advantage of the nickel-iron type of battery is that it cannot be damaged by a heavy discharge or an overcharge; even a short circuit has no harmful effect on the plates. These are very robust, as they consist of steel, will not buckle, and there is no possibility of loose paste falling out.

For a battery of given voltage it is necessary to employ more cells than would be the case in a lead-type storage battery, since the E.M.F. of each cell, when fully charged, is of the order of 1.1 volts only. The bulk is not greatly increased, as can be seen by the size of the 120-volt unit, which, together with switch, measures 15 gin. X 9#in. X 44in. high.

The resistance between fixing poles is usually the case when testing dry-cell batteries, since the E.M.F. of each cell, when fully charged, is the same as the S.P.D.T. and Change in capacity is obtained, as is usual with this type of component, by compressing a sandwich consisting of sheets of spring metal interleaved with sheets of mica.

A condenser of this type requires to have a rigid back plate to withstand the pressure applied to the sandwich, and in this respect the Lissen version could be slightly improved, as the back plate is rather flimsy, consisting of a piece of thin fibre sheet. A moulded cover plate would confer a real advantage and assure that the condenser would not change its capacity owing to bending of the back plate under the continual strain of the pressure on the sandwich.

The makers are Messrs. Lissen, Ltd., Worple Road, Isleworth, Middlesex, and the price of the 0.001 mfd. size is 2s. A 0.002 mfd. size costs 5s.

MELBOURNE SWITCHES.

These switches are made by the Melbourne Radiophone Supply, Norwood Buildings, Hatherley Road, Walthamstow, London, E.17, and function on the push-pull principle. The body consists of a circular disc of asbestos 1 in. in diameter and 1/16 in. thick, in the centre of which is mounted a single-hole fixing bush. This acts also as a guide for the moving plunger.
CARRIER WAVE INTERFERENCE.

Sir,—Many important and far-reaching results have been born of the consideration of what have apparently been simple happenings (to wit, Stevenson and the kettle—Newton and the apple—Galileo and the metal balls dropped from Pisa’s leaning tower—etc., etc.). I hope, therefore, I may be excused for thinking forward then use of thought which a simple every-day happening has suggested to me.

I have, since its inception, taken a keen interest in the reception of broadcast programmes, and have spent altogether very many thousands of hours searching for some improvement which shall lead to better reproduction, and I think I can safely lay claim to an “outfit” which, although perhaps untidy in appearance, does nevertheless give very fine reproduction.

Low-frequency amplification can, with fair ease, be made audibly (and very nearly scientifically) perfect, and the “diode” rectifier does not distort. Were there only one transmitter on the air, all would agree that practical perfection would be possible—but, alas, frequency separation, to use an Americanism, has us best.

The band-pass filter has its advantages, but it has two inherent disadvantages:

(1) Frequencies over, say, 5,000 cycles are eliminated at the expense of brilliance.
(2) It varies from too sharp a cut-off at one end of the frequency scale to a deplorable double-hump with an intervening, and equally deplorable, dip at the other end.

There are other minor disadvantages, but these need not be touched on here.

To come to the point of this letter—supposing we are “tuned in” to the London Regional wavelength and have so flattened our response for the sake of realism that we receive a slight interference from a foreign station or stations; for some moments we receive the unmodulated carrier, and with it the background just referred to. It has been our wont to picture such interference as shown in the diagram, Fig. 1, the base line depicting the audibility level, the dotted line the interfering station, and the dark line, London Regional. The shaded portion has seemed to represent the interference.

Now, were this so, we clearly should receive the unwanted station [weakly, of course] when the carrier wave from London Regional ceases.

But this is not the case, for as soon as the carrier ceases all is silent.

Carrying this to a logical conclusion, it becomes apparent that—

(a) The London Regional carrier has been responsible for the interference.

(b) Corollary—if we eliminate the fundamental frequency of a carrier we also eliminate the modulations thereof.

Now let us consider the position in practice. We have, say, three stations, A, B and C, working on frequencies of 991, 1,000 and 1,009 k.c. If the centre one were required, we should, using the best “band-pass” method of selection, accept all frequencies between 995½ and 1,004½ k.c.—but then, alas, the brilliance.

But, supposing we “go one letter” and sharply reject at 991 k.c. and 1,009 k.c., at the same time tuning flimsily to 1,000 k.c., as in the circuit, Fig. 2, the 1,000 k.c. acceptance, as indicated in Fig. 3 (a), is thereby cut on both sides and becomes as Fig. 3 (b).

By making our 991 k.c. and 1,009 k.c. tuning circuits really sharp we approach very nearly to a curve 18 k.c. in width (and, therefore, retaining frequencies up to 9,000 cycles properly—a very much more desirable feature than retaining up to 4,500 cycles only), and of ideally perfect shape.

Interference from stations at 982 k.c. and 1,018 k.c. will be above audibility, and can, therefore, be ignored.

Fig. 1.

Fig. 2.

Fig. 3.

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, 9, and must be accompanied by the writer’s name and address.

RADIO SERVICING.

Sir,—I should be glad if you would allow me a little space to add my quota to the discussion on “Radio Servicing” which has recently received considerable attention in your journal.

I beg leave to state that at least the members of the W.R.A. must be absolved from any accusation of incompetence as far as their own districts are concerned. Every dealer has his own district and his own particular type of trade, which calls for specialised knowledge of the sets most generally in use therein.

I commenced business in the better-class type of district, but soon found that the competition from the dabbler and the managing-director type of person who is delighted to get staff for all his friends at trade price was too big to fight.

The course I adopted was to go to a working-class district, where the only people I had to contend with were “experts” who did not know a milliamp from a megohm, and inside a year I had built up a cast-iron connection and a reputation for almost Papal infallibility. Here is my point. After two years of 0-v-1 and 0-v-2 receivers, the only thing which keeps me ahead of my work is your excellent paper, and a lot of that is beyond me now, simply because I have not the opportunity of exercising a tenth of the knowledge I have. I can deal quickly, efficiently, and economically with any trouble brought to me by one of my customers, and I claim to be a super-efficient dealer in my own district. I should hesitate to set my wits against your recent correspondent, Mr. R. V. Jones, who could probably suggest improvements in the Science Museum Receiver, upon which I look forward with feelings akin to reverence. If he, however, were to come to Aston and make the round of my clients he would find that they...
would take my word against anybody's on the subject of the simple sets which, for financial reasons, they have to use.

The problem is, at present, engaging the attention of this Branch, and I hope to draw up the papers for the first examination during the next week. Mr. Jones will realise, however, that a tremendous latitude must be allowed. If one standard paper is set for all candidates and every entrant is expected to get a high percentage of marks, the papers must be easy to be fair. If they are too advanced the majority of dealers will fail, and the temptation on defect its own study.

What we propose to do, therefore, is to make a reasonably simple set of questions upon accumulator charging, Ohm's Law, fault finding on straight sets, knowledge of correct values for associated components, effects of varying anode resistance on performance of valves, etc., etc., and then to add to these certain "honours" sections on advanced theory dealing with multistage F. W. sets, all-make sets, P. A. work and the like. Then a dealer will be able to pass the examination if he is capable of running a service depot at all, and to obtain honours standing in the subjects which he has made his particular study.

I trust that this will suffice to show that the Wireless Retailers' Association, at least, is conscientiously working to ensure that the man in the street shall have evidence, before entering a shop, that the owner has sufficient knowledge to give him the assistance or technical advice he needs.

One last point. Mr. Jones refers to "enormous profits." I have been an hour on this, and for three-quarters of that time a customer has been in the shop. My head assistant has been with him all that time selling him a 14s. dry H. T. battery. He, the customer, came in for a four-and-sixpenny one, which would, of course, be right for working a valve set, but not the slightest use for what the customer required. It is the first time he has been in the shop, and my notes are that he has a three-valve 0-0 set, which needs at least two 60-volt H. T. blocks. When his results go off he replaces the older of the two. It took forty-five minutes to convince him that he only needed a 60 and very wise to spend 9s. 6d. more on a good 100. We have done the customer a service, and our overhead charges are 1s. in excess of the "enormous profit." This is not an isolated instance. We can say with truth that components are more often a loss on paper than a profit. Of course, it does not actually work out so in what the customer requires. It is the first time he has been in the shop, and my notes are that he has a three-valve 0-0 set, which needs at least two 60-volt H. T. blocks. When his results go off he replaces the older of the two. It took forty-five minutes to convince him that he only needed a 60 and very wise to spend 9s. 6d. more on a good 100. We have done the customer a service, and our overhead charges are 1s. in excess of the "enormous profit." This is not an isolated instance. We can say with truth that components are more often a loss on paper than a profit.

But (and it is a very big "but") the dealer's real profit bears no more relation to his re-sale discount than the average home constructor's set does to the designer's version of the same circuit.

J. WELLSING. (Chairman, Birmingham Branch, Wireless Retailers' Association.)

Sir,-The letters on "Radio Servicing" have been of interest, apart from a purely business and technical point of view.

Personally I have occasionally been bitten by a dealer, but that fact does not affect my testimony that the majority are honest. It seems to me to be a case of "the man in the street shall have evidence, before entering a shop, that the owner has sufficient knowledge to give him the assistance or technical advice he needs.

I trust that this will suffice to show that the Wireless Retailers' Association, at least, is conscientiously working to ensure that the man in the street shall have evidence, before entering a shop, that the owner has sufficient knowledge to give him the assistance or technical advice he needs.

One last point. Mr. Jones refers to "enormous profits." I have been an hour on this, and for three-quarters of that time a customer has been in the shop. My head assistant has been with him all that time selling him a 14s. dry H. T. battery. He, the customer, came in for a four-and-sixpenny one, which would, of course, be right for working a valve set, but not the slightest use for what the customer required. It is the first time he has been in the shop, and my notes are that he has a three-valve 0-0 set, which needs at least two 60-volt H. T. blocks. When his results go off he replaces the older of the two. It took forty-five minutes to convince him that he only needed a 60 and very wise to spend 9s. 6d. more on a good 100. We have done the customer a service, and our overhead charges are 1s. in excess of the "enormous profit." This is not an isolated instance. We can say with truth that components are more often a loss on paper than a profit.

But (and it is a very big "but") the dealer's real profit bears no more relation to his re-sale discount than the average home constructor's set does to the designer's version of the same circuit.

J. WELLSING. (Chairman, Birmingham Branch, Wireless Retailers' Association.)

Sir,—I propose the article under the pseudonym of "Free Grid." From his remarks it appears to me that the writer is included in the section of radio enthusiasts tolling under the alleged false impression that true reproduction must go hand-in-hand with volume, and that only the successful organ recital at the volume of a mouth organ, or a violin resembling the vocal efforts of a bronchial mouse, is what we require. I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I writer above of what I know, but there may be no harm in suggesting that the present defects of radio servicing arise mainly out of the present universal "hard-upness," and that the larger solution is for everyone, trade and public alike, to anticipate and recreate that revival of trade and prosperity which politicians continue cleverly to diagnose but fail to cure.


ALEXANDER BALDIE, M.B.

BEDLAM IN THE HOME.

Sir,—I propose the article under the pseudonym of "Free Grid." From his remarks it appears to me that the writer is included in the section of radio enthusiasts tolling under the alleged false impression that true reproduction must go hand-in-hand with volume, and that only the successful organ recital at the volume of a mouth organ, or a violin resembling the vocal efforts of a bronchial mouse, is what we require.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I writer above of what I know, but there may be no harm in suggesting that the present defects of radio servicing arise mainly out of the present universal "hard-upness," and that the larger solution is for everyone, trade and public alike, to anticipate and recreate that revival of trade and prosperity which politicians continue cleverly to diagnose but fail to cure.


ALEXANDER BALDIE, M.B.

BEDLAM IN THE HOME.

Sir,—I propose the article under the pseudonym of "Free Grid." From his remarks it appears to me that the writer is included in the section of radio enthusiasts tolling under the alleged false impression that true reproduction must go hand-in-hand with volume, and that only the successful organ recital at the volume of a mouth organ, or a violin resembling the vocal efforts of a bronchial mouse, is what we require.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I quite admit it would be ridiculous to invite the Queen's Hall orchestra to occupy a corner of a drawing-room, but Free Grid apparently lacks that quality, and is not capable of being satisfied with an acoustical system resembling the vocal efforts of a bronchial mouse, or a violin resembling the vocal efforts of a bronchial mouse.

I writer above of what I know, but there may be no harm in suggesting that the present defects of radio servicing arise mainly out of the present universal "hard-upness," and that the larger solution is for everyone, trade and public alike, to anticipate and recreate that revival of trade and prosperity which politicians continue cleverly to diagnose but fail to cure.


ALEXANDER BALDIE, M.B.
An Interesting Point.
I understand that by varying the value of the grid resistance in an R.C. stage it is possible to vary the frequency response. I fail to understand, however, why varying the value of the anode resistance does not have the same effect, since it is obvious that it is only in parallel with the grid resistance.

T. D. R.

You difficulty arises from the fact that you have supposed that the anode resistance is in parallel with the grid resistance, whereas actually this is not quite the case, as will be seen on reference to Fig. 1. In this diagram R₁ represents the anode resistance, C the coupling condenser, and R₂ the grid resistance. It will be obvious at a glance that C is in series with R₁ and R₂, and is in parallel with both of them. It will be obvious, therefore, that all that happens when R₂ is varied is that the amplification at all frequencies is altered. Here again we are ignoring such factors as the plate-filament capacity of V₁.

A selection of queries of general interest is dealt with below, in some cases of greater length than would be possible in a letter. 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.

Both C and R₂ were simultaneously altered in value by the same amount. It will be obvious, therefore, that all that happens when R₂ is varied is that the amplification at all frequencies is altered. Here again we are ignoring such factors as the plate-filament capacity of V₁.

An Acute Interference Problem.
As you will see from my address, I live less than twenty miles from Davenport, although the nearest station is in the studio. The station terminates its nightly transmission at 20.00 main evening programme; but with only partial success. The interference is only in parallel with grid condenser and leak in an R.C.C. amplifier.

An Eliminator as Battery Charger.
I have an H.T. eliminator with a valve rectifier capable of giving 60 milliamp. at well over 200 volts. Would it be possible to use this instrument to charge a 120-volt H.T. accumulator battery, and if so, how should it be connected? The output of the rectifying valve in your eliminator could certainly be used for recharging an H.T. accumulator, but the problem will be how to connect it.

There will be no need to make any internal disconnections in the eliminator. The procedure is to join a lead from the centre tapping of the H.T. winding of its power transformer to the negative terminal of the battery; another wire from the rectifier filament (or the centre tapping of its transformer secondary winding) must be taken to the positive accumulator terminal, via a milliammeter and a regulating resistance in series.

FOREIGN BROADCAST GUIDE.

BUCAREST
(Rumania).

Geographical Position : 44° 25' N. 26° 6' E.
Approximate air line from London : 1,302 miles.

Wavelength : 294 m. Frequency : 761 kc.
Power : 12 kW.
Time : Eastern European Time (2 hours in advance of G.M.T.).

Standard Daily Transmissions.
16.00 B.S.T. (Sun.), 17.00 (week-day) concert and news ; 18.30 gramophone records ; 20.00 main evening programme ; opera (Thurs.) ; 21.15 dance music (Sun.) ; 21.45 news and close-down (week-days).


Announcements are usually made in French, Italian and German as well as in Rumanian.

The studio transmits its nightly transmission with gramophone record of Royal Anthem sung by mixed choir and the good-night greeting : Buna Seara tatamai.
Grid Circuit Modifications.

My three-valve H.F.-det.-L.F. receiver, with indirectly heated valves, is fed entirely from A.C. mains, except that dry batteries are used for grid bias. I now propose to arrange for automatic bias, and, if possible, should like to use a 1,000-ohm potentiometer already in my possession. I believe that this will provide the necessary voltage drop for biasing my M.I.A. output valve, and that negative voltage for the H.F. valve can be taken through the slider. The detector works with a zero grid, so need not be considered. With maximum H.T. voltage applied, the M.I.A. is rated to consume 19 mA, when biased to 22 volts.

Will you please give me a circuit diagram showing the appropriate grid circuit connection? W. M. M.

Making a normal allowance for the H.F. and detector valves, and taking the figure you give for the L.F. valve, the total anode current of your receiver may be assumed to amount to 25 mA. at least, which will develop a bias voltage across your 1,000-ohm resistors of 25 volts for the last valve. This is rather on the high side, but it should be easy to adjust matters by removing a few turns of wire from the resistance winding.

Apart from this minor difficulty, your proposal is quite sound; the potentiometer should be connected in the manner shown in Fig. 2. It may be pointed out that, under operating conditions, the slider should make contact with the resistance element at a point quite near to the end joined to the cathode bus bar.

Matched Filter Circuits.

Would any advantage be gained by providing critical coupling adjustment (by means of a series variable condenser) between the aerial and the input circuit of a filter? R. H. H.

In order that satisfactory single-control tuning of the two component circuits of a filter may be achieved, it is desirable that the proportion of the total aerial capacity which is transferred to the first circuit should more or less balance the valve capacity which is in parallel with the second circuit. This can be done by choosing a suitable setting for the aerial series condenser.

Further, the height of the two tuning peaks of a filter circuit should be sensibly the same; any differences can readily be detected by noticing the relative deflections of a detector milliammeter while the circuit is being tuned through resonance. For this reason it is an advantage that damping due to the aerial should be adjusted (by alteration of coupling) to match that imposed by the valve.

It is seldom difficult to find an adjustment of coupling that allows a reasonably good compromise between the requirements of matched capacities and matched damping; we may add that the use of an aerial input coil with a number of tappings is a satisfactory alternative to the variable series condenser.

Increasing Transformer Output.

I have made the power transformer described in "The Wireless World" of January 22nd, and have modified it in the manner suggested in the constructional article by relocating the 6-volt winding by one capable of supplying 3 amps. at 4 volts. I now wish to driven 4 m.a.p. from this L.T. secondary. Will you please tell me what modifications should be made?

A quantity of wire of each of the gauges specified for the original construction is available; and, as special instrument wires are not easily obtainable locally, I should prefer to make the alterations without using another size of wire, if it is possible to do so.

R. C. L.

As you already have a supply of wire of the gauges as recommended, it is suggested that you wind two extra turns of No. 16 D.C.C. wire on each L.T. secondary bobbin. But we would point out that the voltage regulation of this output, when modified in this way, will not be as good as before; if possible, we advise you to obtain some No. 16 wire, and to wind the same number of turns as originally specified for each coil.

OCTOBER 22nd, 1930.

Failing Eliminator Output.

Although my H.T. battery eliminator (A.C. mains) is nearly two years old, its output, as far as the "pover" terminal is concerned, seems to be undiminished, but I can detect a very considerable falling-off in voltage at the remaining two terminals. Even though the controlling variable resistances are set at minimum, output voltage seems to be insufficient, except for the last valve.

Do you think it likely that the rectifier valve has lost its emission, or can you suggest any other probable fault? R. P. T.

If the output of your rectifier had fallen off considerably, this would be reflected in a lowered voltage of the main H.T. supply, and so we do not think that this is responsible for your trouble.

It seems much more likely that the controlling resistances have developed a defect, and that their ohmic value, when set in the "minimum" position, is very much greater than it should be. The ohmic values of this sort are particularly likely to arise when variable resistances of the compression type are used.

Differences in Coil Design.

Is there any basic difference between coils designed for use in conjunction with battery-heated and indirectly heated S.G. valves? I ask this because, although I have no mains supply, I am often tempted to try circuit arrangements described in connection with A.C.-operated receivers. F. S. F.

There is no essential difference, but it so happens that most indirectly heated valves have a higher impedance than their battery-heated counterparts, and so, to attain maximum magnification, the primary windings of intervalve H.F. transformers should have more turns. However, as A.C. valves are the more efficient, it is unusual for designers to strive after the utmost possible stage gain, which, even if attainable, may be embarrassing high, and we find in practice that coils may often be interchanged.

Filter Circuit Adjustments.

It has been suggested in your pages that it is convenient, when making critical adjustments to a capacity-coupled filter, to loosen coupling between individual circuits by temporarily fitting an extra large mutual condenser. Is there any corresponding way of dealing with a filter coupled by mutual inductance? V. J. T.

In this case the equivalent course of procedure is to replace the coupling inductance by a normally used coil, using only two or three turns. Alternatively, one can connect this coil in parallel with the coupling inductance included in the receiver. This latter method of loosening coupling is probably the most convenient, as the extra coil may easily be clipped in position without disturbing existing leads.
With a still lower impedance than type P.M.256, the Mullard P.M.256A definitely meets the demand for an output valve capable of handling large signal voltages without danger of overloading, and of delivering sufficient power for operating all forms of speaker including the moving coil type.

Its excellent performance is obtained at the very moderate anode voltage of 200, while the filament consumes only 0.25 amp. at 6 volts which may, if desired, be obtained by a step-down transformer from the A.C. electric light mains.

The amplification factor (3.6) indicates that the P.M.256A is particularly suitable for use in sets where large signal voltages are built up by the previous stages of low frequency amplification.

**Mullard**

**THE • MASTER • VALVE**

MISCELLANEOUS ADVERTISEMENTS.

NOTICES.

THE CHARGE FOR ADVERTISEMENTS in these columns is:

12 words or less, 2/- and 3d. for every additional word.

Each paragraph is charged separately and name and address must be included.

SERIES DISCOUNTS are allowed to Trade Advertising agencies, or in cases of consecutive insertion, provided a contract is placed in advance, and in the absence of such a contract a 10% premium is added to the previous issue: 10 consecutive insertions 2/-; 20 consecutive, 10% ; 30 consecutive, 15%.

ADVERTISEMENTS for these columns are accepted up to FIRST POST on THURSDAY MORNING (previous to date of issue where the Head Offices of The Wireless World, Dore St., House, Tudor Street, London, R.C., or on WEDNESDAY MORNING at the Branch Offices, 15, Herford Street, Coventry; Guildhall Buildings, Navigation Street, Birmingham; 200, Dornasgate, Manchester; 101, St. Vincent Street, Glasgow, G.S.)

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 any advertisement and may alter the copy at their discretion.

Postal Orders and Cheques sent in payment for advertisements should be made payable to Iliffe & Sons Ltd., and crossed " Iliffe & Sons Ltd., as not being unchargeable if lost in transit should not be sent as registered mail.

All lettry relating to advertisements should quote the number which is printed at the end of each advertisement, which must be quoted in any communication which is up.

The proprietors are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

All deposit matters are dealt with at Dorset House, Tudor Street, London, E.C.4.

The proprietors are not responsible for the responsibility.

Readers who wish to advertise in the columns of the wireless world should have a volume control is necessary you will find incorporate them and the technical

BENZAMIN

THE VIBROBLER

1. Anti-microphonic—ulse aims on

2. Self-aligning sockets—suitable for solid

3. Socket and tuned oldfics lies in

4. Screw terminals in fingers to

5. Safety devices—no distortion or contact between parts and base.

6. Wire for Co. No. 147.

7. TRIO No. 17.

8. TUNED COILS.

9. LETTERS.

10. Wire for Sale.

SPECIFIED BY EXPERTS

ROTH-OMH

SMOOTH—SILENT—ACCURATE.

Your local dealer can supply the

EXACT TUNERS

6/- each.

N. K. ELECTRIC LTD.


THE EXACT MANUFACTURING CO.

Croyd Works, Priory Place, COVENTRY.

Adequate protection for 12 months; must be sold, no returns.

`ell transactions up to £Yoga deposit fee of 1/- is charged; on WEDNESDAY MORNING at the Head Offices of The Wireless World, Dore St., House, Tudor Street, London, R.C., or on WEDNESDAY MORNING at the Branch Offices, 15, Herford Street, Coventry; Guildhall Buildings, Navigation Street, Birmingham; 200, Dornasgate, Manchester; 101, St. Vincent Street, Glasgow, G.S.)

If the money be deposited with "The Deposit System," the use of the Deposit System is recommended, should be addressed No. 000, c/o "The Wireless World," number will appear in the advertisement.

The proprietors are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

Each paragraph is charged separately and name and address must be included.

receivers for sale.

specify by experts.

Roth-Omh Potentiometers.

free exchange. Receiver-Ohm Potentiometers

6/- each.

N. K. ELECTRIC LTD.


THE EXACT MANUFACTURING CO.

Croyd Works, Priory Place, COVENTRY.

Adequate protection for 12 months; must be sold, no returns.

receivers for sale.

specify by experts.

Roth-Omh Potentiometers.

free exchange. Receiver-Ohm Potentiometers

6/- each.

N. K. ELECTRIC LTD.

NATIONAL Portable Fire, complete, just delivered from America.

Marquis, 28-6, gen. and T.F. purchased and H.T. accumulators, 24 volt, complete, with 2 volt valves, and never used.

MARCONI Superhet Model 83, complete, good condition numerous accessories including mains transformer and 2 month's guarantee.

Marchmont St., W.C.1.

PHILIPS Accumulator Hire. 11 volts 30 milliamps; £2.

60 ma. output, price £3/15; Ecko trickle charger, 3 amp., 4 volts, list price £4.

Microphones for pickup, complete with valves.

DO NOT Buy Dry Batteries, join our service; we keep you continuously supplied with fully charged C.A.V. high tension accumulators, by regular exchange, anywhere within 12 miles of Charing Cross. For less than the cost of unrefilled dry batteries, nothing to buy—no deposit, payment on each delivery or by quarterly subscription, if your dry battery has been in use for one month or more we definitely guarantee that accumulators will give better and more selective reception; we also give the same service with low tension accumulators or maintain your own at equal advantage.

214, Guildhall St., Preston.

PLINN'S Safety H.T. Supply Units are Famous for Reliability and Silent Working.

Political Reception; we also give the same service with low tension accumulators or maintain your own at equally satisfactory results.

October 22nd, 1930.

THE WIRELESS WORLD.
TRUTH ABOUT WIRELESS

Simple facts are often harder to believe than Fairy Tales, and some people can never believe that anything is good unless they pay two or three times as much for it.

THE GRAVES' 'VULCAN' SET is the ideal first set for the man who wants perfectly satisfactory results for the most modest outlay. It is made under an Official License and embodies all the improvements possible in a perfectly-revised set. It gives you the best results possible, and is the necessary companion of any of the really great Wireless World receivers. Everything about the set is in startling contrast to first-class sets; there are no complications. Even if you are only a beginner you can start right away to enjoy the wonders of wireless with as much certainty as if you had studied it for years.

CABINETTS.

One Owner writes about 'the Vulcan Set': "Having owned a wonderful set of Wireless World receivers I found it necessary to write and say how much I am pleased with your product. It is the finest 'set I have had, but low battery has prevented much use."

British Government 30/- Henrys, 50-100 milliamperes, substantially.

Motors, better quality and substantial saving in cost.

All information. Costs you nothing to get all partial).

ADVERTISMENTS.

A HANDSOME PRODUCTION.

One Owner writes about 'the Vulcan Set': "Having owned a wonderful set of Wireless World receivers I found it necessary to write and say how much I am pleased with your product. It is the finest 'set I have had, but low battery has prevented much use."

British Government 30/- Henrys, 50-100 milliamperes, substantially.

Motors, better quality and substantial saving in cost.

Price complete and carriage paid.

Terms: 12/ with Order, 10/- Monthly.

Test it in your own home. Fullset Approval.

Write for Illustrated Catalogue. Full particulars of this and other high-class receiving tube-valve holders, No coils to buy with set. Full instructions with each set. No repairs.

ANOTHER WIRELESS BARGAIN.

The Graves Screened Grid 3-valve Set (not Illustrated) in Oak to fix to table. Everything of highest quality and all components accessible, 15/- with Order, 12/ Monthly.

This is a list of remarkable complete, very selective and far-reaching and wonderful; a substantial saving on most popular sets; including Portable and All Parts. Post Free.

We have 90 years experience for honest dealing.

J. G. GRAVES LTD.

POWER CHOKES

guaranteed.

substantially built, for smoothing circuits in Eliminators during current surge to 500 to 1,100 amperes, inductance 30 henries, 8/6 post free.

Note change of address.

REPAIRS

Chargers and Eliminators.—Contd.

T. O'REILLY Crangers, A.G., mains, for 2- and 4-watt transformers, etc., price £4/10.;

To suit all Westinghouse rectifiers, 4v. 3a. C.T., 6v. la. C.T., price 25/- (not post. free, guaranteed, Wireless World."

CABINETTS.

Cabinets to Your Own Requirements; custom-made on return—Turner's, 5, Stratford St., Nuneaton.

D. G. B's Cabinets.—Table models in solid oak and mahogany, from 11/- to 7/-.

D. G. B's Cabinets, fitted with Radiant or Resistron valve if required.

D. G. B's Cabinets.—Pedestal model, with separate battery compartments from 5/6/- to 12/-.

D. G. B's Cabinets Made to Customers' own Designs.

D. G. B's Cabinets.—Write for new 16-page cata.

COULTERTON.

COILS. TRANSFORMERS, ETC.


BAND-PASS Three Coils, 15/- set; selected transformers for winding, 6/- set; greatest primary supports, 5/- set, all post free—Grovcs Brothers, St. Mary's Place, Shrewsbury.

BAND-PASS Four Coils, complete set; 25/-; c.o.d.

BAND-PASS Three Coils; 4½/; Band-Pass Four, 70/-; Regional One and Band-Pass Nine coils, 17/- pair; A, B, C, D, E, F, G, H, I, 1/2 each. F. C. HEADBEAD & Co., 10, Fish St., St. Albans.

The new combined transformer and eliminator, with adjustable tuning control and a wide range of input. It is the best and most complete model on the market.

WE PAY FOR YOUR VULCAN SET.

Full instructions with each set. No repairs.
You must hear this speaker

"GRASSMANN" MOVING COIL

is spoken of by the Technical Press as being definitely superior to nearly every other make. Confirm this yourself by asking your dealer to demonstrate. You will immediately appreciate its sensitivity, even response, ability to handle volume, richness of tone and absolute fidelity. Its price and performance sets a world standard of sound reproduction.

PRICES

6 v, 200 v, 240 v, D.C. £4 17 6. Universal A.C. 75 v, 125 v, 200 v, £8 5 0.

ROTOR ELECTRIC LTD.,
Telephone: Museum 9942.

Northampton Polytechnic Institute,
ST. JOHN STREET, E.C.1.

A Course of Five Lectures on
MODERN ACOUSTICS

will be given by

A. H. DAVIS, ESQ., D.Sc.
(National Physical Laboratory),
On Wednesdays, at 8 p.m., commencing October 22nd, 1930.

The course includes consideration of methods of measurement, analysis and reproduction of sound, and the acoustics of buildings.

 Fees for the Course, 9/-.

"SWITCHES for RADIO and
POWER"

Lyons "B.A.T." 750 watt Q.M.B. Switches are designed and manufactured to give efficiency, power and long life. They are available in High Frequency circuits, also H.T. and L.T. Battery Eliminators, Trickle Chargers, Gramophone Motor Switches, Moving Coil Loud Speaker Field Switches, Starting small Electric Motors, etc.

ONE HOLE FIXING

Two very popular types are:
No. 728 with Soldering Tags 2/6 each.
No. 730 with Screw Terminals 2/9 each.
Send for Free Booklet "Switches for Radio and Power" with 20 New Circuits, plus these and many other thoroughly reliable Switches.

CLAUDE LYONS LTD.,
76, Oldhall Street, Liverpool,
40, Buckingham Gate, S.W.1.

LOUD SPEAKERS.

EPOCH Moving Coil Speakers.

EPOCH. Everybody who heard the Model 99 agreed with the "Evening News" that it was the finest Speaker in the world.

EPOCH. Everybody who heard the Model 101 (Domino) agreed with the London "Evening News" that the Super Obscura Model was truly named.

EPOCH. But those who managed to hear the new Model 102 (Domino) under fair working conditions will never forget it.

EPOCH. They will never rest until one of these Speakers is on their sets.

EPOCH. Top new 101 (Domino).

EPOCH. The new 101 (Domino).

EPOCH. The new 101 (Domino).

EPOCH. The greatest advance in the history of associated Moving Coil Speakers.

EPOCH. The new 101 cannot be adequately described.

EPOCH. All standards of quality reproduction must be revised.

EPOCH. Never before has such clarity been achieved.

EPOCH. Never before has such sensitivity and power been obtained in a Home model.

EPOCH Model 101.-The speaker of no comparison.

EPOCH. Epoch Permanent Magnet Moving Coil Speakers; all models greatly improved.

EPOCH. First and foremost the Cabinet Models O, 1, 2, 5, 12, and 14; prices complete from £1 10/-.

EPOCH. Those contain very powerful permanent magnet Moving Coil Speakers.

EPOCH. They are not joint units fitted into cabinets, but are specially balanced as Cabinet Speakers.

EPOCH. No drumminess; no box resonance, but clear, sharp, marvellous reproduction.

EPOCH. Magnificent woodwork, very compact.

EPOCH. They cost less than some makes of interior units without Cabinets.

EPOCH. Permanent Magnet Moving Coil Speaker Units for portable, £3 15/-; ready for use.

EPOCH. Standard Cross Magnet Permanent Magnet Speakers; price £4 1/-; the finest of its kind.

EPOCH. Permanent Magnet Super Speakers; they are £6 12/-.

EPOCH. Remember, the famous 66 and 99 Speakers are heavily reduced in price.

EPOCH. The 99 is also further improved in sensitivity.

EPOCH. Range of Moving Coil Speakers is the largest in the world; a Speaker for every requirement.

EPOCH. Send for booklet 6t, the most interesting and useful publication on the subject.

EPOCH. Call for a demonstration.

EPOCH RADIO MANUFACTURING Co., Ltd.,
42 CHERRY ORCHARD ROAD, E. CROYDON.

THE WIRELESS WORLD

Advertisements.

The Music Lover's Choice!

BAKER'S SUPER-POWER A.C. MODEL.

BAKER'S NEW 1931 A.C. & D.C. MAINS models are without a doubt the most highly efficient Moving Coil Speakers manufactured to-day!

They are the cumulative result of six years of specialisation—

This new A.C. Model is equipped with the well-known Westinghouse H.T.1 metal rectifier (output 200 volts, 100 m.a.) and is quite free from objectionable hum. The D.C. Model can be used on A.C. Mains by the addition of the necessary A.C. equipment. This interchangeability will be of genuine interest to many D.C. users who may at some time in the future be encountered with a change in their Mains supply.

WRITE NOW

For new and enlarged 32 page booklet on "How to get Realistic Reproduction."

IT IS FREE and yours for the asking—

BAKER'S "Selhurst" RADIO

The Pioneer Manufacturers of Moving Coil Loud Speakers.

OFFICE

89 SELHURST ROAD, S. NURWOOD, S.E.25.
WORKS & DEMONSTRATION ROOM

42 CHERRY ORCHARD ROAD, E. CROYDON.

PHONE: CROYDON 161B.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
TUNING COILS and METHODS OF TUNING


MENTION "THE WIRELESS WORLD", when writing to advertisers, will ensure prompt attention.
OXFORD 22ND, 1930.

OARITHMIC
LECTRO LINE LTD., 254, Vauxhall Bridge Rd.,
engraved or plain.
plated for
Fits all screw terminals.

Aids to Perfect

CLIX

"SPRINGSCREW" WANDER PLUG.

"FIT-ALL" SPADE TERMINAL.

Focusing the CLIX Resilient Socket and Solid Pin, the terminal completely insulated, the spike contact, no points or other adjustment required. Black sprayed with full name of markings.

Fits all screw terminals.

CLIX

Aids to Perfect Contact.

Write for illustrated Catalogue to
GARROTT, WHITFELD & CO., LTD., LIVERPOOL.

Component, Etc. for Sale.---Contd.

FERRANTI A.F.5, 18/-; Lavois LYT9, 1.5; Mania A.C/I.

Ferranti A.F.5C, 24/-; P.M.14, X; R.M.I.D., power
transformer, type A and B, 21/-; Mania rectifying
valves, 30/-; Ferranti latest pickup, 37/6; 50/-.

ADVERTISEMENTS.---For all Radio Dealers.

Write for illustrated Catalogue to

TeKaDe A.R.S., 17/6; Mania A.C/I.

Ferranti A.F.5, 18/-; Lavois LYT9, 1.5; Mania A.C/I.

ADVERTISEMENTS.---For all Radio Dealers.

Write for illustrated Catalogue to

S.W.1. SCOTT SESSIONS and.

Ritchie, Sloane St., Rugby.

Wireless Notes.---For all those who want the best
equipment for radio, gramophone or television.---Potters for
parts to be got at Black, Banham, Langford, Farnborough,

If any difficulty write to
SIFAM ELECTRICAL INSTRUMENT Co., LTD.,

For a A.L.L. RADIO DEALERS

SIFAM POCKET VOLT METER

PRICE 7/6

Circuit Testing ADAPTER

THE WIRELESS WORLD

Advertised for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
 Engineers.—Important notice.—Results now to hand show that 97% of our candidates pass their exams at the first attempt, a remarkable record unapproached by any other organisation, and showing why we alone guarantee No Pass—No Fee. If 95 out of every 100 ordinary men can succeed, why should you remain in the ranks? Now is the time to get busy and improve. Our "Method of Viva" Engineering Examiners explains the most simple and easiest, and success will be assured. Write to Mr. A. M. Low, in every branch of civil, mechanical, electrical, motor and wireless engineering, showing the obvious advantages of our Appointments Department, and including a brilliant foreword by Prof. A. M. Low, in which he shows clearly the chances you are missing. Send for free handbook now (state branch, post or exam.).—British Institute of Engineering Technology, 87, Shakespeare House, 25-31, Oxford St., London, W.1. (1909)

PATENTS AGENTS.

PATENTS and Trade Marks, British and foreign, and latest lists free on request. A. LAMPLUGH, LTD., AND COMPANY, LIMITED, 1, Tyseley - Birmingham, and definitely supersedes the Moving Coil.

REPAIRS.

SOUND'S THE "LAST POST" TO ALL BALANCED ARMATURE SPEAKERS and definitely substitutes the Marine Cell.

THE VERDICT OF THE EXPERTS.

A revolution in loudspeaker construction. It definitely surpasses all present known types of speakers. All the advantages of a moving coil, none of the drawbacks. No hum, No heat. No rectifiers, transformers, or smoothing condensers required to perfect the reproduction. Double basses and celli are perfectly audible. Light and beautifully balanced. Gives reproducing mages; amazing fidelity. Reproductions. It must be heard to be believed.

ASK YOUR DEALER FOR A DEMONSTRATION.

S. A. LAMPLUGH, LTD., KING'S ROAD - TYSELEY - BIRMINGHAM.

BAND PASS FOUR

Supplied ready wired and tested or as a constructional kit. Full particulars and latest lists free on request. MAGNUM SCREENING BOXES as specified for Band Pass Four.

25/- Per Set of 5 including baffleboards.


MAGNUM SCREENING BOXES

WANTED.

THE WIRELESS WORLD ! Nos. 456 to 557, inclusive. £1.0.6d, Gillatts Rd., Birmingham. (1909)

BUSINESSES & PROPERTY FOR SALE.

SMALL Accumulator Charging Service, select N. London district, worked from basement at 5/- week, including 2 younger partners; owner inexperienced. -Box 9041, The Wireless World. (1910)

SITUATIONS VACANT.

"Big Money in the Wireless Trade!" Become a trained salesman and radiograph. A short training enables you to qualify for a really big job with good salary, ending in an introduction to prospective employers. Write in full for syllabus of special 6-week course of training in the evenings, commencing shortly—Dept. T.O.S. The London Telegraph Training College, 4, Regent's Park, London N.W.1. (1934)

WANTED.—Skilled wireless electrician, with some knowledge of car equipment and magnetos, state experience and wages.—Knighton, Birmingham. (1918)

YOUTHFUL experience, practical and assembly, necessary. Owner experience preferred but not essential.—Box 7047, The Wireless World. (1917)

MENTION OF " THE WIRELESS WORLD " WHEN WRITING TO ADVERTISERS WILL ENSURE PROMPT ATTENTION.

FIGURED OAK RADIO GRAMOPHONE CABINET

Done Ltd., Hadfield Road, published full page. Will take gramophone and set up to 21" x 16" panel, and 16" hoarding, speaker and battery combination, covers the whole trade, from 1 1/2" wide and 16" deep, front with silk backing, round, and separate buffer behind for sale to any size chassis. Phone Regent and Ward, or Eagles 916.

F. DIBBY, 9, The Oval, Hackney, London E.2. (1909)

THE QUALITY HOUSE

PERSUS MFG. CO., LTD. (Dept. W.W.), BRANSTON ROAD, BURTON-ON-TRENT.

POLAR CONDENSERS

A Universal Range.

NEW 24-PAGE CATALOGUE ON
cw NEARLY THE BEST AVAILABLE.


POLAR WIRE


BONA FIDE TRADERS' GUIDES.

Send for our comprehensive Illustrated List. QUICK SERVICE.

POLAR CABLES

for D.C. H.I. in Polished Oak and to specification, complete with Aluminium Screwing Boxes and Base Plate. PRICE £3 17 6.

RIGBY & WOOLFENDEN, ROCHDALE

CABINETS

Phone: 2599.

SAXON 20 STRAND WIRE AERIAL INSULATED AERIAL WIRE LAMPOON RESISTORS RIGBY'S AERIAL WIRE 13/6 Blackpool, Lancs.

Bel-Canto FOR REALISATION IN RADIO LOUD SPEAKERS, UNITS & RADIOGRAMS.Write for list.

**SITUATIONS WANTED.**

**ADVERTISER,** having car and telephone, would undertake for firm, installation and service of wireless, London and suburbs. — Box 766, c/o The Wireless World.

**SOUND Engineer,** 24, desires responsible post giving scope for ability, last 15 months engaged in task to improve industry, installation and service, thorough technical knowledge modern A.C. radio design, and, above all, a practical man, used to hard work and long hours. — Box 766, c/o The Wireless World.

**BOOKS, INSTRUCTION, ETC.**

"WIRELESS MANUAL," (10th edition). By Capt. J. Forth. - A popular, treatise, technical, containing full set, installation, and maintenance, learn how to secure perfect reception—illustrated, 4s. net, from Wills, or Pemberton, Park St., Kingsway, W.C.2.

**AUCTION SALES.**

**THIRD PORTION WITHOUT RESERVE.**

By order of A. P. Sugden, Esq., F.S.A., the Executors for the late Messrs. Colson & William F. H. G. Colvan (Wilm's Gramophone and Wireless), Ltd. will sell by Auction, upon the Premises, No. 3, TOTTENHAM ROAD, on TUESDAY, 29th OCTOBER, 1930, at 12 o'clock.

**EXTENSIVE STOCK OF PHONOGRAPHS, WIRELESS AND GRAMOPHONE MANUFACTURERS including 100 Polar Condensers, 1 gross Lasto 350 Lastolite Insulating Condensers, 1 gross Forma Leg Condensers, 1 gross Lasto Reaction Condensers, 1 gross Lasto 3-5 Volts Resistors, 1 gross 20-watt Zeclux High Power Resistors, 4 gross R.F. Várley Resistors, 5 dozen Manganese 8-Ampere Valves, 8 dozen Pye 20 Hectres Low Frequency Chokes, 1 dozen Mercato All Yards A.C. Transformers, 1 gross 7-volt Battery Condensers, 1 gross Igmacite pre set 6 ohms, Resistances 1 dozen 25-75. M.A. Resistors, 5 B.T.H. D.C. to B.C. 75-20 volt Primary and Secondary 75 volt. Motors. Universal Test Plant, voltage from 120 D.C. and A.C. to 240 volt D.C. and A.C., complete with Circula Rectify. Convertor: 10 sets H.T. Battery Eliminator, 100 T.C. High Power 1,500-volt grade in charge of set, installation, and condensers, 6 gross Wireless Portable Panels, Drilled and Engraved, 6 gross Val Val Panels for Purchasers, 1 gross 3x6 Wireless Panels. Drilled and Engraved. 1,000 GRAMOPHONE CABINETS, 1,500 PORTABLE WIRELESS CASES, 3,500 WELL SEASONED WIRELESS PANELS. Large Stock of Piano Wireless and Gramophone Parts. Piano-board Furniture, 5- Octave Piano, Gramophone Cases and Parts, Hot Plate, Heavy Veneer Panels by Buxer, Plywood Weighing Machine, Office Furniture. including 600 Pianos, and Roll Top Desks, Trypax Tables, Bentwood Arm and other Chairs.


---

**WIRELESS AS A CAREER.**

**FULL TRAINING FOR POST-MASTER GENERAL’S CERTIFICATE, AND STATION ENGINEERS’ WORK.** Complete course of equipment including Auto-alarm, Modern laboratories. Low fees. Instruction free. Apply.

**TECHNICAL COLLEGE, PARK ST., HULL.**

---

**BUY ON DEFERRED TERMS.**

**HUNDREDS**

Buy on Deferred Terms — 

**WIRELESS.**


**THOUSANDS**

24 Plate, 6 Volt. A.C., £2. 24 Plate, £6. D.C., £12. Western Electric 24 Plate, £60. Company for 1,000 ft. A.C., £120. 2,000 ft. A.C., £240. 3,000 ft. A.C., £480.

**HUNDREDS.**

**BATTERIES.**


**THOUSANDS**

24 Plate, 6 Volt. A.C., £2. 24 Plate, £6. D.C., £12. Western Electric 24 Plate, £60. Company for 1,000 ft. A.C., £120. 2,000 ft. A.C., £240. 3,000 ft. A.C., £480.

**DEFERRED TERMS.**

1 Down & 3/5 per 3 month.

BUY ON DEFERRED TERMS —

**HUNDREDS**

1 Down & 3/5 per 3 month.

**WIRELESS.**


**THOUSANDS**

24 Plate, 6 Volt. A.C., £2. 24 Plate, £6. D.C., £12. Western Electric 24 Plate, £60. Company for 1,000 ft. A.C., £120. 2,000 ft. A.C., £240. 3,000 ft. A.C., £480.

---

**ADVERTISEMENTS.**

INDEX TO ADVERTISEMENTS.

A recent user writes:

"Please accept my thanks for the services rendered in the purchase of the eliminator which I have decided to keep. You can therefore forward the money to the seller with my thanks. I shall always praise your Deposit System which is the safest way of dealing with strangers that I know of."

W. H. THEWLS.

49, Webster Street, OLDHAM, Lancashire.

Make Use of The Wireless and Radio Review DEPOSIT DEPARTMENT

From a recent advertiser's letter:

"I must say my paper is a good advertising agency."

C. R. PEARCE.

St. Germans, Cornwall.

Make Use of The Wireless and Radio Review DEPOSIT DEPARTMENT

A recent user writes:

"Please accept my thanks for the services rendered in the purchase of the eliminator which I have decided to keep. You can therefore forward the money to the seller with my thanks. I shall always praise your Deposit System which is the safest way of dealing with strangers that I know of."

W. H. THEWLS.

49, Webster Street, OLDHAM, Lancashire.

INDEX TO ADVERTISEMENTS.

B.E., Bertram Thomas, Manchester

PARFAIT THE PERFECT EBONITE

SUPPLIED IN SIX FINISHES

Semi-Polished Black

Semi-Polished Mahogany

Highly Polished Black

Highly Polished Mahogany

Matt

Cube Surface

From most wireless dealers.

THE WIRELESS WORLD OCTOBER 22ND, 1930.

F. W. SMURTHWAITE, A.M.I.R.E.

BELMONT RD., WALTHAM, SUFFOLK.

MANUFACTURER OF RADIO APPARATUS TO INDIVIDUAL REQUIREMENTS.

RADIO GRAMOPHONES AND WIRELESS RECEIVERS.

COMPLETE INSTALLATIONS FOR COUNTRY HOUSES, YACHTS,

PUBLIC INSTITUTIONS, HOSPITALS, &c., &c.

HIGH POWER AMPLIFIERS FOR DANCE HALLS, RESTAURANTS, &c., &c.

SHORT WAVE RECEIVERS FOR BOAT AND AIRCRAFT.

"WIRELESS WORLD" FOUR. This receiver and all other published designs made to

WILL YOU FAVOUR ME WITH A CALL AT MY WORKS, AND DISCUSS YOUR REQUIREMENTS WITH ME PERSONALLY?

BERTRAM THOMAS, MANCHESTER

RADIO DATA CHARTS A SERIES OF ABACSES

Providing most of the essential Data required in receiver design.

By R. T. BEATTY, M.A., B.E., D.Sc.

All keen amateurs will appreciate this book.

PRICE 4/6 net

BY POST 4/10

From all leading bookdealers, or direct from the Publishers.

31,8 Bush Hill Road, London, E.C.1

THE WIRELESS WORLD OCTOBER 22ND, 1930.

Advertisements, B. Potter & Co., Ltd., Station Buildings, ROCHDALE.

Mention of "The Wireless World" & It is written to advertisers, will ensure prompt attention.

PARFAIT THE PERFECT EBONITE

SUPPLIED IN SIX FINISHES

Semi-Polished Black

Semi-Polished Mahogany

Highly Polished Black

Highly Polished Mahogany

Matt

Cube Surface

From most wireless dealers.

THE WIRELESS WORLD OCTOBER 22ND, 1930.

F. W. SMURTHWAITE, A.M.I.R.E.

BELMONT RD., WALTHAM, SUFFOLK.

MANUFACTURER OF RADIO APPARATUS TO INDIVIDUAL REQUIREMENTS.

RADIO GRAMOPHONES AND WIRELESS RECEIVERS.

COMPLETE INSTALLATIONS FOR COUNTRY HOUSES, YACHTS,

PUBLIC INSTITUTIONS, HOSPITALS, &c., &c.

HIGH POWER AMPLIFIERS FOR DANCE HALLS, RESTAURANTS, &c., &c.

SHORT WAVE RECEIVERS FOR BOAT AND AIRCRAFT.

"WIRELESS WORLD" FOUR. This receiver and all other published designs made to

WILL YOU FAVOUR ME WITH A CALL AT MY WORKS, AND DISCUSS YOUR REQUIREMENTS WITH ME PERSONALLY?

BERTRAM THOMAS, MANCHESTER

RADIO DATA CHARTS A SERIES OF ABACSES

Providing most of the essential Data required in receiver design.

By R. T. BEATTY, M.A., B.E., D.Sc.

All keen amateurs will appreciate this book.

PRICE 4/6 net

BY POST 4/10

From all leading bookdealers, or direct from the Publishers.

31,8 Bush Hill Road, London, E.C.1

THE WIRELESS WORLD OCTOBER 22ND, 1930.

Advertisements, B. Potter & Co., Ltd., Station Buildings, ROCHDALE.

Mention of "The Wireless World" & It is written to advertisers, will ensure prompt attention.
1,500,000 VALVES transported without loss or damage . . .

Messrs. Impex Electrical Ltd., the well-known importers of French Dario Valves use Imperial Airways machines for transporting these delicate goods from Paris to London. Up to date more than 1,500,000 valves have been carried without loss or damage.

Are you sending your goods by

IMPERIAL AIRWAYS
THE BRITISH AIR LINE

It means safer handling, fewer breakages, lower insurance rates and quicker Customs clearance.

In London, goods are collected on telephonic request, or may be handed in to any Freight Agent, or to Airways House, Charles Street, Haymarket, S.W.1

Full particulars from any Freight Agent or direct from

IMPERIAL AIRWAYS LTD.
Airways House, Charles St.,
London, S.W.1

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

THE Full O'Power Radio Battery is
definitely creating a new interest in
Radio Circles.

No other battery can offer such a
perfect reproduction, such large output or such
long life. Yet, because of the use of modern
manufacturing methods and quantity pro-
duction—it costs no more.

You must try a Full O'Power in your set
before you can appreciate the great difference.
Get one to-day:

POPULAR TYPE
Size V.1 6v volts - 8/-
Size V.2 100 m. - 15/-

POWER TYPE
Size V.3 50 volts - 11/6
Size V.4 60 - 13/6

SUPER RADIO TYPE
Size V.5 30 volts - 25/-

GRID BIAS BATTERIES
Size G.1 6v volts - 1/-
Size G.2 9v volts - 1½
Size G.3 14v - 2½
Size G.4 18v - 3½
*For National and Symphony
Portable Sets.

Write for the new
Full O'Power Booklet
giving sizes and prices
of the complete range.

FULL O'POWER BATTERIES
Siemens Brothers & Co. Ltd., Woolwich, S.E.18.
NEW YORK SHOW

The Wireless World

AND
RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, October 29th, 1930.

Burton

SELF-LOCATING

VALVE

HOLDER

1/- each

Pentode

Valve

Holders

1/6 each

MANUFACTURED BY

C. F. & H. Burton

PROGRESS WORKS

WALSALL, ENG.

ULTRA

“THE SWITCHBOARD

TO EUROPE”

TENS OF THOUSANDS

PRAISE ITS POWER,

RANGE AND TONE

The only 3-valve All-Electric Receiver

using screened-grid valves. £23 complete.


McMICHAEL

PORTABLE

 RECEIVER

22 GNS.

Point No. 5.

CONTROL.

The seven technical conditions

fulfilled by this Receiver have

been harnessed to Controls

which make tuning and control

delightfully easy and certain.

Hear it at any high-class radio

store or our London showrooms.

L. McMICHAEL LTD.

Wexham Road, Slough, Buck.

Try-

POWER GRID DETECTION...

with the

L210

Power grid detection has been proved to give far better quality than the anode bend method while being at the same time considerably more sensitive. Rectification is linear, providing the correct values of grid condenser and leak are used. Get full details from the Wireless World for May 7th, 1930 and try it out with the Mazda L210—one of the best valves for the purpose.

THE AMAZING

MAZDA

RADIO VALVES

CHARACTERISTICS

Fil. Volts - 2.0
Fil. Amps - 0.1
H.T. Volts - 150
Amplification Factor - 15.5
Impedance (ohms) - 10,000
Mutual Conductance (mAv) - 1.55

MAZDA L210 PRICE 8/6

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

THESE FIVE TRUMPS
IN YOUR HAND

BY USING

PERTRIX
NON-SAL-AMMONIAC
DRY BATTERIES

PERTRIX LIMITED,
BRITANNIA HOUSE, 233, SHAFTESBURY AVENUE,
LONDON, W.C.2.
Works: Redditch.

Get an
Improved Pertrix Accumulator
as well.

"The batteries you can trust"

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Read what Leading National Newspapers say:

"Quality the outstanding feature"

"Exceptional Selectivity"

"Extraordinarily Simple Tuning"

"Completely Stable"

"No Hum"

These extracts are taken from published test reports on the Varley Senior All-Electric Transportable Receiver from a leading National Daily Newspaper which has arranged to "review fearlessly" several well-known Receivers, and from another great National Daily.

A REMARKABLE RECEIVER—HEAR IT YOURSELF.

Write for Section 'A' of Varley Catalogue, which gives details and Hire Purchase Terms.


Mention of "The Wireless World" when writing to advertisers, will ensure prompt attention.
PHILIPS BATTERY ELIMINATORS
FOR A.C. & D.C. MAINS

A constant H.T. Supply is essential for your receiver to give you perfect reception. Even the best H.T. batteries are exceedingly unreliable and require frequent replacement, but a Philips Battery Eliminator enables you to take your H.T. supply direct from the electric mains thus ensuring absolutely faultless reception. Once installed, it requires no attention and the amount of electricity consumed is almost negligible.

Type 3005 for A.C. Mains - Price £3.17.0
Type 3002 for A.C. Mains - Price £5.10.0
Type 3009 for A.C. Mains - Price £5.15.0

For 10/- down you can have any of these on Philips Easy Payment System.

Philips Battery Eliminators

Made by the manufacturers of the famous Philips all-electric radio receivers, Argena electric lamps, commercial and industrial fittings and neon signs.

PHILIPS LAMPS LTD., PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Here's your chance to Test NIKALLOY!

The Metallurgical Marvel of the Nickel Age in Radio.

**HYPERMITE**

**L.F. INTERVALVE TRANSFORMER**

The Nikalloy core of the Hypermite gives maximum inductance (50 henries) and ensures perfect high and low note response.

NIKALLOY renders Hypermite the smallest efficient transformer for modern compact set assembly and use with modern valves.

NIKALLOY makes Hypermite the most reliable low-priced transformer obtainable.

NIKALLOY is the latest phase in the triumphant progress of R.I. Transformer manufacture: specialised experience must count.

The leading set makers have chosen "Hypermite" for inclusion in modern receivers—it is specified in the most popular circuits—it is indisputably the best.

- Resistance primary D.C. 1,000 ohms.
- Resistance secondary D.C. 6,000 ohms.
- Inductance primary 50 henries.
- Ratio 3:1.
- Dimensions overall 21" x 11" x 24" high.
- Weight 7 ozs.

Mounted in a neat Bakelite case.

12'6" Write for leaflets giving full description and technical details of the R.I. Big Nikalloy Three—the "Hyperma," "Hypermite," and "Hypercore."

**STOCKED BY ALL GOOD DEALERS**

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

---

**R.G.D. ABSOLUTE REALITY**

**THE R.G.D. DE LUXE ALL ELECTRIC RADIO GRAMPHONE.**

- 2 Screened grid stages!
- Band Pass Filter!
- Super Selective!
- Single Knob Tuning!
- Fader from Radio to Record!

All Mains operated with exclusive cabinet design.

For those desiring the very best that both Radio and Gramophone can give, the "R.G.D." De Luxe Radio Gramophone is the ideal instrument. The Radio side of this instrument is so powerful that given favourable atmospheric conditions over 30 stations can be received with ample volume. The quality of reproduction from distant stations is equal to that of local stations.

- In Oak £80
- In Mahogany £85

Literature and Illustrated Specification on Application.

The RADIO GRAMOPHONE DEVELOPMENT Co.,

72, Moor Street, Birmingham.
To users of Portable Wireless Sets

ECONOMY IN RUNNING COSTS

Every owner of a Portable Set knows what is meant by the words 'H.T. Battery.' Too often this expensive accessory has to be renewed — distortion, crackling, whistling noises, and into the dustbin goes another H.T. Battery.

The designers of OSRAM VALVES knew this when they produced the range of OSRAM 2-volt Valves for Portable Sets. The closest possible check is kept on each individual OSRAM 2-volt Valve to ensure that the H.T. current taken is as low as consistent with good quality broadcast reception.

In addition to the reduction in H.T. current taken, the design ensures the best performance obtainable with 2-volt Valves.

The OSRAM VALVES for Portable Sets

- S 215 for Screen Grid Portable Sets
- H 2
- BL 210 Detector, H.F. & L.F.
- L 210 Amplifiers
- P 215 - Power Valve
- P 210 - Super-Power Valve

OSRAM Valves

Made in England

Sold by all Wireless Dealers

FOR ECONOMICAL WIRELESS

Write for the "OSRAM WIRELESS GUIDE" (1930 Edition), sent POST FREE on request.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Creators of High Grade Precision Condensers

CYLDON ALONE GIVES ACCURATE MATCHING

Gang control, adopted for the Wireless World Four, depends entirely for its efficiency upon accurate sectional matching such as CYLDON construction alone can give. Superior raw material skillfully fashioned, many outstanding mechanical features, gauge tested machined parts, precision built, and capacitance bridge tested after complete assembly, recommends you to build with CYLDON... it costs more but its construction amply justifies it.

STG 25 Twin '005 30/-
STG 25 Triple '005 45/-
STG 23 Twin '003 30/-
STG 23 Triple '003 45/-
STG 35 Triple '003 45/-
STG 33 Triple '003 45/-
STG 45 Four '005 65/-
STG 43 Four '003 60/-

*Specified for the WIRELESS WORLD FOUR.
Supplied complete assembled with special screens.

SYDNEY S. BIRD & SONS LTD. CYLDON WORKS,
SARNESFIELD ROAD, ENFIELD, MIDDLESEX.
Tele: Enfield 5071/2

D.C. to D.C.

FOR RECEIVERS, AMPLIFIERS,
RADIOGRAMS requiring 300 v.
120 m.a., 400 v. 150 m.a., 500 v.
100 m.a., etc.

M-L D.C. to D.C. Rotary Transformers operate from 12 v. to 200 v. and are suitable for Public Address work, large country house installations, ships, installations in D.C. Districts.

FREE!

The Book of the M-L Rotary Transformer, which describes all machines of our manufacture. Write to-day.

M-L MAGNETO SYND. LTD.
Radio Dept., COVENTRY.
Telephone: 5001

Contractors to the Air Ministry,
The British Broadcasting Corporation,
The General Post Office,
Marconiophone, The Gramophone Co.
Ltd., etc., etc.

FREE!

The Book of the M-L Rotary Transformer, which describes all machines of our manufacture. Write to-day.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
“RADIOGRAND” TRANSFORMER, new model, shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. The outcome of careful research, this transformer is scientifically designed right down to the smallest detail. Made in ratios 3:1 and 5:1 it will meet the needs of modern broadcasting conditions for several years to come. Price 12/6 each. Ratio 7:1 Price 17/6 each. The “Ace” Transformer has been specially designed for inclusion in all Portable Sets and where space is limited. Similar finish to the “Radiogrand.” Made in ratios 3:1 and 5:1. Price 8/6 each.

TELSN FIVE PIN VALVE HOLDERS. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, designed to provide the most efficient contact with the valve legs. Price 1/- each.

TELSN H.F. CHOKES, designed to cover the whole v.h.f. band from 18 to 4,000 metres. Extremely low self-capacity, shrouded in genuine Bakelite. Inductance 150,000 microrhms; resistance 400-420 ohms. Price 2/6 each.

Telsen "RadioGrand" Transformer, new model, shrouded in genuine Bakelite, with new windings and core, fitted with earth terminal. The outcome of careful research, this transformer is scientifically designed right down to the smallest detail. Made in ratios 3:1 and 5:1 it will meet the needs of modern broadcasting conditions for several years to come. Price 12/6 each. Ratio 7:1 Price 17/6 each. The “Ace” Transformer has been specially designed for inclusion in all Portable Sets and where space is limited. Similar finish to the “Radiogrand.” Made in ratios 3:1 and 5:1. Price 8/6 each.

TELSN FIXED (NECA) CONDENSERS, shrouded in genuine Bakelite, made in capacities up to 0.003 microfarad. Price 6d. each. Supplied complete with patent grid Lead. Clips to facia in either vertical or horizontal connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.

Already famous, the popularity of TELSEN TRANSFORMERS and new range of Components is becoming daily more noticeable. For perfection of workmanship and beauty of finish Telsen stand pre-eminent.

The ever increasing demand for Telsen Components more than justifies our claim that they are “Radio’s Choice” for “Better Radio Reception.”
Rhath

Almost Re-Creation

prices

Pedestal Model
Oak £18.5.0
Mahogany £20.0.0
Walnut £20.0.0

Table Model
Oak £15.5.0
Mahogany £16.14.0
Walnut £16.14.0
Also in Rexine, in choice colours, mostly figured—Brown, Blue or Grey, £12.10.0.
Chassis only £9.10.0

Beethoven's majestic overtures, Wagner's mighty operas, the delightful melodies of Schubert, or the swinging waltzes of Strauss—one and all are interpreted by the Ferranti speaker with a realism that re-creates the work of the master mind. The rendering of speech is crisp and startlingly life-like in clarity.

Ferranti
Moving Coil Magno-Dynamic Speaker
Ferranti Ltd.
Head Office and Works - Hollinwood, Lancs.

Tests of Time
Nine Centuries Ago...

the first tower of the Tower of London was built. It still stands, mellowed but not harmed by the passing of time. Like the White Tower (built in the Conqueror's time), the famous T.C.C. Condenser has stood the test of time. From the first years of this century the Telegraph Condenser Co. has made nothing but condensers. And so, to-day, when you buy "The Condenser in the Green Case," you know that you are buying the unrivalled experience of those many years of condenser-specialising. You are safe in buying T.C.C. Condensers. They will stand the test of time.

The condenser illustrated is the 0003 mfd. T.C.C. flat mica type . . . . . . . 1/3d.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
No Chemical Action

whatever.

That is the essential difference between the Westinghouse METAL Rectifier, and so-called "metal" rectifiers depending upon electrolytic action which limits their life.

WESTINGHOUSE METAL RECTIFIERS

are now obtainable from 15/-, and there is a unit for every form of A.C. mains operation.

These are three of them:

- HIGH TENSION
- LOW TENSION
- GRID BIAS

Full details of all units, circuits, and components required are given in our new book "The All-Metal Way, 1930," 40 pages of valuable information regarding A.C. mains operation.

Send 3d. stamp for a copy.

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

Telephone: North 2415.

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

UNRIVALLED ANYWHERE for OUTPUT, SIZE and PRICE

MAKE ANY SET ALL-MAINS, standard or portable.

This remarkable new Model A.C. 100 ensures constant High and Low Tension power entirely free from hum. It is as simple to use and as compact as an H.T. Battery and just as safe. The output is the highest of any Unit of anything like the size and price. This fine instrument ensures ALL-MAINS economy and quality with any type of receiver.

Tappings: 2 Variable—0/100 and 0/200 Volts; 1 Fixed—0/150 Volts. Output 25 mA. Combined trickle charger for 2, 4 and 6 Volt L.T. Accumulators. Incorporating the Westinghouse Metal Rectifier. £5 10s. or 10/- deposit and the balance in easy monthly instalments.

MODELS A.C. 72. This efficient H.T. Battery. Model A.C. 16 is a 6 Volt A.C. Mains Field Excitation. Fitted with 10" corrugated cone, with moving coil having an impedance of 30-40 ohms at 50/4000 cycles. Price £10 10s. Also supplied complete with Oak cabinet £20. Mahogany cabinet £24 10s. Walnut cabinet £25 10s. Also supplied without rectifier.

MODEL A.C. 100. Fitted with 6" corrugated cone, with moving coil having an impedance of 10-15 ohms at 50/4000 cycles. Price £4 15s. This model is not supplied complete with cabinet.


The wonderful R.K. reproducers have stood the test of four years and still remain in unchallenged supremacy. They are without doubt the finest reproducers ever built. We agree that R.K.'s cost a little more than some other loud speakers, but the results are so far superior as to make the additional cost seem absurdly inadequate. Our unique hire purchase facilities are at your disposal, so that you can possess and use one of these remarkably fine speakers on payment of only a small deposit.

ATLAS MAINS UNITS

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

EDISWAN

THE EDISON SWAN ELECTRIC CO. LTD., Incorporating the Wiring Supplies, Lighting Engineering, Refrigeration and Radio Business of the British Thomson-Houston Co., Ltd., Radio Division, 1a Newman Street, Oxford Street, W.1 Showrooms in all the Principal Towns

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
FOUR ALL-ELECTRIC RECEIVERS by Columbia

No less than four all-electric models are offered by Columbia, varying in price from twelve to thirty-one guineas. The three new receivers are destined to enjoy the same immediate success as the famous 304; they come from the hands of the same master designers; the same quality and reliability is inbuilt. Their specifications will repay the closest study.

Model 304. "The choice of the Experts" 5 valves, including 3 Screen-grid. Tuning dial calibrated in wave-lengths. Immense power and range. All-Electric A.C. or D.C. 26 gns. 27 gns. 28 gns. Oak Mahogany Walnut


Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
I2
ADVERTISEMENTS.
THE WIRELESS WORLD
OCTOBER 29TH, 1930.
No Wonder he Loses Customers, WITH A STORES LIKE THIS.
The illustration is perhaps a little far-fetched, but the moral is true enough. Every day firms are losing customers through antiquated methods of storage. No customer enjoys waiting while aimless search is being made in some apology of a store for some component he requires. Time is money to him, if not to you, and he is not inclined to wait for it to be handed him, and handled with care and regularity? Far better than old-fashioned dark and dismal wooden shelves. They save many pounds per year.

THE "BENCHRACK" (Tiltrack Principle)
A real help for storing small parts such as Terminals, Nuts, Washers, Insulators, etc. Made to stand on the work bench, it enables all small parts needed for the job in progress to be stored where they are immediately to hand. All the trays are tilted so that the parts stored can be seen at a glance, and the front faces of the trays are rounded so that the smallest parts can be swept up the slope with the fingers of one hand. Each tray is provided with patent hinging partitions which can be moved quickly to make larger or smaller compartments. Rely to somebody, these racks greatly facilitate stocktaking. All the steel has been galvanised so that fire cannot damage it. Save many pounds per year investing this Benchrack.

TILTRACK JUNIOR
This all-steel rack is designed to hang against a wall or other convenient position, and is a most excellent rack for storing small parts. It is supplied complete with white canvas protective cover to keep out the dust. All the trays are tilted and have movable partitions.

MANY TESTIMONIALS
THE Unit consists of indestructible nickel iron cells which are kept charged automatically from the L.T. accumulator—thus supplying a steady and ample stream of H.T. Current. The L.T. Accumulator will require very little more charging than formerly. It seems too good to be true—but nevertheless, it is. Absolutely abolishes H.T. worries. The "Alkium" nickel and iron plates are explained from any troublesome customer with lead plates. Solution is impossible, and cells cannot be damaged by any rate of charge or discharge. Will supply 40 milliamps per hour.

©THE YACHTING WORLD AND MOTOR BOATING JOURNAL
Covers Every Aspect of Yachting and Motor Boating
There are many more styles of "Tiltracks." Please send for lists.
Particulars from Manufacturer & Patentee—BERTRAM THOMAS, MANCHESTER.
London Office & Showroom—28, Victoria Street, S.W.1.

PROVED AND TESTED.
Reduce your H.T. Running Cost 80% by taking it from the L.T. Accumulator.
MILNES H.T. SUPPLY UNIT
Many Testimonials.
120 Volts Unit £4.5.0
500 Volts Unit £8.10.0
All who are interested in power-craft, whether cruisers, speed-boats or outboards, will enjoy reading "THE YACHTING WORLD AND MOTOR BOATING JOURNAL."
It is a well-produced and attractive paper dealing with yachts and boats of all types and tonnages on sea and inland waters.

Subscriptions: Home and Canada, £1.10.0, other countries abroad £1.18.6, per annum, post free.
Every Friday 6d.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
13 Electrical Instruments in ONE

DIRECT READINGS

in AMPERES
-1 milliamp to 12 amperes:
  0 - 0.1
  0.1 - 1
  1 - 10
  10 - 12

VOLTS
1 millivolt to 1200 volts:
  0 - 1200
  0 - 12
  0 - 1

OHMS
1 ohm to 1 megohm:
  0 - 1000
  0 - 100
  0 - 10

NO CALCULATIONS OF ANY KIND
NO EXTERNAL SHUNTS OR MULTIPLIERS

The ‘AVOMETER’

THE AVOMETER is a British first grade instrument giving—at the turn of a single switch—thirteen ranges of readings in Amps, Volts and Ohms. It gives you direct readings, using only one pair of terminals, without external shunts or multipliers, without the need for calculations of any kind.

There is one AVOMETER only. It is portable, precise, complete and self-contained. It measures 7½ x 6½ x 4 inches and weighs 5 lbs. It is the best and handiest complete measuring instrument. The AVOMETER is low-priced yet priceless. It will be invaluable—and indispensable to you.

Price £8. 8. 0. Deferred Terms if desired.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINNER HOUSE, DOUGLAS STREET, LONDON, S.W.1.

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

MARCONI H.2

Marconi H.2, the new two-volt detector, combines to an unusual degree, high efficiency rectification and high quality reproduction. H.2 has an amplification factor of 35 and an impedance of only 35,000 Ohms—mutual conductance 1.0 M.A. per volt—the highest ever attained in this class.

It is the obvious detector for portables, or indeed for any set where maximum efficiency is essential; because of its advanced design, it will give wider range, better tone and freedom from all microphonic troubles.

Here is convincing evidence of the reliability and efficiency of Marconi Valves.

Marconi Valves are used by The B.B.C., Imperial Airways, Croydon Control Tower, Metropolitan Police, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, Large Passenger Liners, &c., &c., because of their longer life—clearer tone—greater range and volume.

One of the many entirely unsolicited letters we receive from the public about Marconi Valves.

"I thought it might be of interest to you to learn of the performance of a Marconi Valve which I purchased in December, 1923. . . . From the date on which it was purchased to the 10th July, 1930, it has been in constant use in my wireless receiver, which is a three-valve instrument. The Marconi valve has been working in the detector holder and in the other holders at different periods. Despite the fact that it has certainly been abused, it is still going strong and may be good for some time yet."—J. B., Hamilton.

MARCONI VALVES

USE THE VALVE THE Expert USES!

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

The Wireless World Olympia Show Competition has now been completed and the winning apparatus ascertained as well as the names of those entrants whose voting has gained for them the prizes which were offered.

It will be remembered that the apparatus at Olympia was, for the purpose of the Competition, divided into various classes and, in addition, entrants were asked to vote for what they considered to be the single outstanding exhibit of the Show. The vote has resulted in the Pye "Twin-triple" A.C. receiver being placed first as the outstanding single exhibit, and this receiver has also, as one would expect, gained first place in Class 1 as the best receiver. The award in Class 2, Radio Gramophones, goes to the R.G.D. Radio Gramophone de Luxe. In Class 3, which includes batteries of all kinds, the winner is the Exide "Gel-Cel." In Class 4, Mains supply units, Clarke's "Atlas" combined eliminator and trickle charger, model A.C.188, comes first. Class 5, Loud speakers of all types, Ferranti Magno-Dynamic Speaker. Class 6, Valves, Mazda A.C./Pen. In Class 7, which included apparatus not specified in other sections, the Jackson Bros. "Chassimount" condenser has been voted first place.

In awarding the cash and other prizes which were offered to the readers whose voting agreed most closely with the opinions of the majority, we have had to divide the prizes on account of ties. Two entrants—Mr. A.

In This Issue

THE FREQUENCY CHANGE OF THE SUPERHET.

NEW YORK RADIO SHOW.

UNBIASED OPINIONS.

CURRENT TOPICS.

MAKING A 20-HENRY CHOKE.

APPARATUS REVIEWED.

VELOCITY OF SOUND IN LOUD SPEAKER DIAPHRAGMS.

NEW AMERICAN VALVES.

A D.C. BAND-PASS THREE.

CORRESPONDENCE.

BROADCAST BREVITIES.

READERS' PROBLEMS.

No. 583.

Wednesday, October 29th, 1930. Vol. XXVII. No 18.
The Use of Band Pass Filters and a Screen-grid Detector.

By A. L. M. Sowerby, M.Sc.

Since the operation of frequency changing is that which marks out the superheterodyne from all other types of receiver, a good deal of attention was devoted to this process in the preceding article of this series, in which the general principles of the receiver were discussed. We will therefore accept the conclusions already reached, and base the present discussion, which will largely be concerned with more practical points, on the knowledge that we have to add a local oscillation of suitable frequency to the incoming signal, rectify the resulting mixture, and collect the beat-frequency so formed from the output of the detector valve so that it can be passed on to the intermediate-frequency amplifier for further magnification. We will also presume it to be established that the oscillator-frequency must differ from that of the incoming signal by the frequency to which the intermediate-frequency amplifier is adjusted.

These remarks suggest that in considering the design of the frequency changer of a superheterodyne we shall have to work exclusively in terms of frequencies rather than in terms of wavelengths. A numerical example will, perhaps, serve to emphasise the point. If we wish to convert a 200-metre signal (1,500 kc.) to suit an intermediate amplifier working at 3,000 metres (100 kc.), we shall have to combine with it local oscillations of either 1,600 kc. (1,875 m.) or 1,400 kc. (2,144 m.). The frequency difference between signal and oscillator is in either case 100 kc.; the wavelength differences are 12.5 and 14.3 metres respectively. For an incoming signal on 2,000 metres (150 kc.) the oscillator has to be set at 50 kc.

(6,000 m.) or 250 kc. (1,200 m.). Here we still have the same 100 kc. frequency difference between signal and oscillator that we had for the 200-metre example; the two wavelength differences, however, are now 4,000 metres and 800 metres. These last differences not only show no apparent connection with the wavelength differences for the 200-metre signal, but are even vastly different from one another. A survey of these figures makes it quite evident that any attempt to discuss the frequency-changer on the basis of wavelengths is going to land us in arithmetical complications of the most alarming description, whereas we need nothing much more than simple subtraction if we elect to work in terms of frequency.

The circuit of a typical frequency changer is given in Fig. 1, and an examination of this diagram will help to show the points which require more detailed attention. The oscillator, V1, has to produce oscillations, as free from harmonics as possible, without consuming too heavy an anode current. These oscillations have to be fed, by a suitably designed coupling arrangement, to the grid of the detector valve V2. It is usual to employ a coupling coil (L in the diagram) connected between the earth end of the frame and the filament of the valve. Both signal and oscillator frequencies are thus impressed simultaneously on the grid of V2, which is adjusted for rectification. In the anode circuit of this valve there is a transformer, the primary of which is tuned by a condenser to the intermediate frequency. It is necessary to tune the primary in order that there may be a condenser of reasonably large capacity to by-pass to earth the high-frequency

Fig. 1.—Circuit diagram of the frequency changer of an American superheterodyne (date about 1924), designed for use with UV.2014 valves. L is coupled variably to the grid coil of the oscillator V1. The valve V2 is adjusted as grid leak rectifier.
The Frequency Changer of the Superhet.—

components of the anode circuit of the valve. Although it is quite possible to combine the two functions of oscillation and detection in a single valve, fewer complications arise if we allot a separate valve to each job, for we are then able to choose and adjust each valve for the best possible results. Since the oscillations must be produced before they can be rectified, we will begin our more detailed survey with the oscillator.

Choosing the Oscillator Circuit.

The only essentials of an oscillator are that some provision should be made for feeding energy back from the plate circuit to the grid circuit, and that one or other of these circuits should be tuned. There are, therefore, many circuit arrangements that may be used; a few of them are given, each in its simplest form, in Fig. 2. Of these a is based on the old-fashioned single-valve set, with swinging reaction coil, and it is intended to typify also all the more modern capacity-controlled variants as well. If the anode circuit is tuned instead of the grid circuit, at b, more power is available, while for the greatest output a tapped anode circuit, as at c, may be used.

If it is intended to control the amplitude of the oscillations by varying the coupling between grid and plate circuits the design of the oscillator will probably be based on one of these three arrangements, but if other means of control (e.g., variations of filament or anode voltage) can be used the circuit at d is attractive on account of the fact that it only uses one centre-tapped coil. Range changing by replacing the coil is thus made very simple. The fact that neither side of the tuning condenser is earthed is, however, a point against this circuit, for unless some care is taken in screening hand-capacity effects may be troublesome. The Numans circuit,1 using either an ordinary four-electrode valve or a screen-grid valve, may also be pressed into service.

On the whole, the writer would be inclined to choose circuit b if the mechanical arrangement of the set were such as to provide no safeguards against hand-capacity, but if a metal panel were to be used d would in most cases be more convenient.

The grid potential of an oscillator can be controlled in either of two ways: the simplest is to use a grid leak and condenser, the leak being taken to the negative end of the filament. If this is done, the anode current of the valve drops to a very low value as soon as it is made to oscillate, but "squegging" (intermittent stop-

---

1 See Experimental Wireless, December, 1924, and August, 1925.

Fig. 2.—Four of the many possible oscillator circuits. Either (b) or (d) is likely to be the most convenient in practice. In (d) a variation of coupling can be obtained by adjusting the capacity of C, though at the cost of disturbing the tuning.
The Frequency Changer of the Superhet.

important, is by so controlling the oscillator valve that
the harmonics are minimised as far as possible. This,
primarily, is a matter of operating voltages, and is most
easily achieved if the oscillations are kept down to a
low amplitude.

Next, we should like to arrange the feed from oscilla-
tor to detector in such a way that even such harmonics
as are produced do not reach the grid of the detector.
In cases where this precaution is thought necessary,
an extra tuned circuit, as in the skeleton diagram of
frame aerial, however, will be tuned to only one of
these, so that if the frame-tuning is sharp enough only
the desired station will be heard. Usually, it is desir-
able to employ two tuned circuits (one in addition to
the frame) in order to block the second channel more
completely. The extra tuned circuit may either be
coupled to the frame to make a band-pass filter, or may
be incorporated in a stage of high-frequency amplific-
tion of normal design. It is an annoying fact that in
neither case is it likely to be satisfactory to gang the
two signal-frequency tuning condensers, because move-
ment of the frame aerial in relation to various objects
in its neighbourhood will upset its tuning.

The Detector Circuit.

Whatever input the detector may be given, its main
duty is to produce as large a voltage as possible across
its output circuit, which is tuned to the intermediate
frequency. In an ordinary receiver the detector valve
really operates both as detector and as the first audio-
frequency amplifying valve, having a transformer or
other audio-frequency coupling component in its plate
circuit. For this reason it is necessary to choose a
valve which is suitable for low-frequency amplification.
In the superheterodyne the first detector may be re-
garded, in analogous manner, as the first intermediate-
frequency amplifier. One would, therefore, select a
screen-grid valve as the most reasonable one to precede
the tuned intermediate-frequency coupling circuit, and
the writer was not in the least surprised to find by experi-
ment that the substitution of a screen-grid valve for a
triode as first detector gave a very considerable increase
in I.F. output. Apart from the fact that it requires a
much smaller input from the oscillator, and that it offers
the possibility of introducing the oscillations into the
screen-grid circuit instead of the grid circuit, the valve
is handled exactly like a triode.

In the past it has been usual to adjust the detector
to work on the leaky-grid principle. In an ordinary
receiver the function of the grid-condenser is to pass
high-frequency currents to the grid of the valve while
blocking the audio-frequency voltages that appear on

Apart from the possibility of oscillator harmonics,
there is always "second channel interference." Owing
to the fact that the oscillator frequency is near that of
the signal, at any one setting of the oscillator there
will be two signal-frequencies with which the oscillator
can beat to provide the beat-note to which the inter-
mediate amplifier is tuned. With a 100 kc. intermediate
frequency, for example, an oscillator set to 700 kc.
will "tune in" stations at either 600 or 800 kc. The

The Frequency Changer of the Superhet.—

frequency (5,000 cycles) of the highest audio-frequency
note that one usually tries to retain in an ordinary re-
ceiver, we shall need a grid condenser of about one-
twentieth the usual capacity, i.e., from 5 to 15 micro-
microfarads. Superheterodyne receivers, with a sub-
lime disregard of the elementary mathematics of the
situation, have generally employed 0.0002 microfarad
condensers for this purpose.

It is probable that with a large in-
put from the oscillator the grid was
swung over so wide a voltage range
that anode-bend rectification took place
during part at least of the grid swing. This
suggestion is borne out by the
fact that if the grid-condenser and leak
are omitted, and the valve is adjusted
for anode-bend rectification, the inter-
mediate-frequency output is, at worst,
unchanged, and is more usually in-
creased. At all events it is clear that
the grid condenser and leak do not earn
their keep, and so are better left out.
If true leaky-grid rectification is de-
sired, the only practicable circuit is
that suggested in Fig. 4, where a re-
jector circuit, tuned to the intermediate
frequency, replaces the grid con-
denser.

It might, in fact, be worth while to
try out this method of rectification in
practice, so dimensioning the circuit
that "power-grid" detection took
place, for the process of rectification
introduces us once again to the trouble-
some question of harmonics. Owing
to the fact that rectification does not
consist of a complete suppression of one
half-wave of the applied voltage, combined with a per-
fectedly undistorted amplification of the other half-wave,
the output from a practical detector will contain not
only all the components that a theoretically perfect recti-
fier would give, but, in addition, harmonics of all of
them. An example will make clear the way in which
this "distortion" can introduce signals from unwanted
stations.

Suppose that we have set the oscillator to 1,000 kc.
Our pre-detector tuning is supposed to select either a
900 kc. or a 1,100 kc. station, with either of which
the oscillator would give the 100 kc. beat-note to which
the intermediate amplifier is tuned. A station transmit-
ing on 950 or 1,050 kc. would then give a beat-note of
50 kc., which should not be amplified by the inter-
mediate amplifier. But the first detector will "distort" this
50 kc. beat-note, giving rise to harmonics of it—100 kc.,
150 kc., and so on. The first of these (second
harmonic) has the frequency to which the intermediate
amplifier is tuned, and so this station is liable to be
heard. If the pre-detector tuning is designed to pro-
vide against normal "second-channel" interference, it
will be sharp enough to cut out 900 kc. completely when
set to 1,100 kc., but it by no means follows that 1,050 kc.
signals will not be able to reach the grid of the detector.
So far as the writer can see, there is no satisfactory
means of combating this particular source of inter-
ference so long as one adheres to normal superheterodyne
design.

Bringing together all the suggestions that have been
made in the course of this rather discursive article, the
writer would suggest that the circuit of Fig. 5 represents

![Diagram of frequency changer]

Fig. 5.—An elaborate frequency changer including precautions against most of the possible difficulties discussed in the text. There is a band-pass filter for the signal frequency, an intermediate tuned circuit between oscillator and detector, while the I.F.A. coupling takes the form of a band-pass filter. A screen-grid valve is used as anode bend detector, and the whole is fully decoupled.

SCREENING HINTS.

A SIMPLE partition screen dividing the grid and
plate inductance of the H.F. valve is usually all that
is necessary in the case of sets employing only one H.F.
stage. If two H.F. stages are employed, however, the
problem becomes vastly more complicated, and it is
desirable to screen each stage in a completely enclosed
metal box. The H.F. valves, however, should not be
placed inside the boxes with the inductances, as trouble
is likely to be caused by the fact that the valve elec-
trodes are within the field produced by the coils. It
must be remembered also that if a band pass arrange-
ment is used it is necessary to separate the two halves of
the filter by means of a screen, because if inter-
action takes place the device will no longer fulfil the
function for which it is intended.

THE Seventh Annual Radio World's Fair in New York has just closed its doors. One hundred and seventy-six radio manufacturers have displayed their wares. Just how many people went to see them is a deep secret. At no time did I find Madison Square Garden overcrowded, and I can remember past years when you could not move in the crush. In fact, rumours and mutterings hint that the R.M.A. feel so upset about it that they express doubt as to whether New York will see a similar show next year. But, then, we have heard rumours of that sort before.

However, it can certainly be said that this year's show, more than any other, demonstrated beyond question that the modern radio set has become as much of a household necessity as the very furnishings. And it is difficult to enthuse over mere furniture, so perhaps the New York public should be forgiven. That the radio industry itself is mature and stable was evidenced by the general perfection of design and finish, both external and internal. New features were, with one possible exception, sound and conservative. There were no sensational stunt departures from generally accepted practice such as have, in years gone by, been offered to the public regardless of their real efficiency so long as they appeared to present a sufficiently plausible reason for attracting the not-so-technically-minded buying public.

Automatic Volume Control.

The possible exception is the new feature, widely adopted this year, called the automatic volume control. Arguments in favour of this device are that the volume level remains the same at all times, unless manually adjusted, thus preventing overloading of the loud speaker on local stations, and fading when distant stations are being received. This feature, although new in broadcast receivers, has been in use for some years in commercial point-to-point short-wave telegraph receivers, where it functions admirably. But in broadcast reception we do not want a receiver which will automatically level out all signals to the same degree of intensity. Perfect reproduction involves not only perfection of tone. It involves also the perfect reproduction of light and shade in music. In other words, the original balance between the pianissimo and fortissimo passages of a musical rendering must be preserved, else the "colour" of the performance is entirely lost. Controversy raged round this point some time ago, when it was the practice of the control room engineers at the broadcasting stations to reduce the volume of fortissimo passages and increase that of pianissimo passages. Having now got the transmitting end right there is no sense in ironing out the volume level at the receiver.

Other features of this year's sets included straight-line tuning scales with automatic lighting when the desired station is reached, one-knob tuning, local-distance switch, pre-selector tuning, "whisper tuning," two-electrode detector valves, increased use of shielding, which in some cases amounted almost to armoured, hum-less operation, noise filters, tone control, and gramophone connections.

With automatic dial lighting, as the tuning control is moved over the scale a light flashes up and remains on as soon as the adjustment for the desired station is reached, and in some cases the name of the station appears also. This, of course, is achieved by the prior adjustment of contacts behind the panel, according to condenser settings. Pre-selector tuning involves the inclusion of highly selective circuits.
OCTOBER 29th, 1930.

The New York Show.—

ahead of the detector, with, in some cases, complicated circuit arrangements ahead of the first H.F. stage, thus enabling razor-sharp tuning to be achieved, while at the same time admitting the full 10 kc. frequency band width. By means of the local-distance switch, the resonance curve of the receiver is widened to about 14 kc. when receiving from the local station, and narrowed to 10 kc. or less for distant reception, so that side-band fringe interference from the local is eliminated.

"Whisper tuning" is not so awesome as it sounds. It is simply a refinement whereby, by pressing in the volume control knob, the volume is reduced to a whisper while tuning from one station to another is being carried out, so that unwanted stations do not blare out at fifty horse-power strength at every degree on the dial; you simply swing across the dial in silence till the desired station adjustment is reached, pull out the volume control knob again, and the station you want comes in at full strength. A very desirable refinement—around New York.

Two-electrode detector valves are used in some sets, three-electrode valves of the small power variety in others, for the so-called "power detection," and occasionally even screen-grid valves are used in the detector stage. If you live in New York, within a few miles of two or three 50 kW. stations, and use a modern receiver with three or four screen-grid H.F. stages ahead of the detector, you want "power detection." Another object of power detection is to eliminate the first L.F. stage, sufficient power being delivered by the power detector to operate the output power valve.

The objectionable hum of A.C. sets has at last been eliminated, and this year's sets can be operated at low volume levels without that irritating hum impinging on the programme. Incidental noises of the click and grate order are greatly minimised, if not eliminated, by the noise filters, without in any way impairing quality.

Are Superhets Returning?

Most sets this year are fitted with tone controls, whereby the listener may accentuate either the treble or the bass, according either to his individual tastes or the acoustics of his home. This is quite a good idea, and should go far towards eliminating these acrimonious discussions as to the relative tonal qualities of Smith's and Brown's receivers. But what of the family disputes as to the setting of it?

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The Crosley Pal set, selling at a popular price.

The Crosley Pal set, selling at a popular price.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.

The development and introduction of quick-heater valves has eliminated that annoying wait for the receiver to become operative after it is switched on.
connect aerial and earth, and plug the power lead into the nearest electric light socket. There isn't a single battery in the whole set.

New D.C. Sets.

Home recording is a new feature of an R.C.A.-Victor eight-valve combination superhet, and electric gramophone. A small microphone is provided into which members of the family or friends can speak or sing. The records, of the unbreakable variety, are six inches in diameter and play for one minute and twenty seconds. Several of the new radio-gramophones incorporate automatic record-changing devices. The console of one instrument can accommodate assorted ten- and twelve-inch discs. Either side of ten- to twelve-inch records can be played without any rearrangement of the records, and with no interruption of the concert.

Midget sets are very popular this season. These little sets are entirely self-contained, and were displayed by over fifty manufacturers. They measure approximately fifteen inches square and eight inches deep, and are designed for use on the mantleshelf or other similar position. Small console sets, measuring only twenty-four inches high, were also much in evidence. The flat tops of these sets come in very handy as small occasional tables.

The development of 2-volt valves, a recent event here, has made possible a range of D.C. receivers whose performance compares favourably with that of the A.C. receivers. In the past the undistorted output of D.C. receivers has been far below that of A.C. receivers, due to the necessarily low voltage operating the power valves. In the new 12-valve Fada sets, to quote an example, adequate power is assured by the use of six small power valves in two banks of three each, operating in push-pull. The other valves are three screen-grid H.F. amplifiers, and three heater type valves in a two-electrode detector circuit and first L.F. stage. These receivers operate on 90 to 130 volts D.C., and should be welcomed by those whose supply is of this character. A few battery-operated sets were in evidence, for the benefit of those who live in rural areas where there is no power supply.

One of the outstanding novelties of the Fair was a new 24-hour self-tuning device incorporated in the sets displayed by Lyric Radio. In the centre of this device, which is mounted under the top lid of the set, is a watch, and around it are arranged 96 little levers which pull vertically out in ten graduated movements. Each lever corresponds to one fifteen-minute period of the day. As explained in a previous article, all programmes here are now arranged in 15-, 30- or 60-minute periods. Also mounted in the centre of the device is a tablet graduated in nine divisions, each one of which can be lettered by the user to correspond to one of his nine favourite stations. Contacts under the tuning dial are then pre-set accordingly for the dial readings of these nine stations.

No Portable Sets.

In operation all the user has to do is to study the radio programme, pick out the items he wishes to hear from any of the nine stations. If, for example, London Regional is No. 5 on the tablet, and it is desired to hear that station's programme between 6.15 and 7 p.m., the levers marked 6.15, 6.30 and 6.45 are pulled out to the graduation marked 5, but the set is not switched on. There is no need to worry further, or to keep an eye on the clock. Promptly at 6.15 the wireless set will

The Lyric 24-hour self-tuning device. The selection of a large number of programmes can be pre-arranged.
be automatically switched on, and will remain on, tuned to London Regional, till 7 o'clock. During the course of that programme, further levers may be set for future programmes, and as soon as London Regional terminates at 7 p.m. the set will be automatically retuned to the next station it is desired to listen to, and so on, according to the settings.

Before going to bed, levers may be set to return to London Regional for the dance music, and if you want the set switched off at midnight without the bother of getting up to do it, you just pull the midnight lever out as far as it will go, to graduation 10, and off the set will go at midnight. Or, if you are in New York, you may read in bed till two or three o'clock listening to stations farther west which, owing to difference of time, have not yet closed down. And if you want to be called at midnight, you set the levers accordingly to, say, 7 a.m., and to one of the local stations which starts up at that time with chimes or a bugle, and follows with physical jerks, daily dozen, setting-up exercises, or whatever you like to call that particular form of torture. This is quite the best device of its kind that I have ever seen.

Portable sets were conspicuous by their entire absence, but several sets were on display for use in automobiles and aboard motor boats. The latter are simply battery-operated sets, designed to occupy a minimum amount of space, and encased for marine use. The former fit under the dashboard, and are controlled by a single knob on the dash. The modern automobile receiver will function perfectly without signs of interference even when the car is running.

A most interesting exhibit was the Perryman valve-tester. This apparatus, which reminded one of a small telephone switchboard, tests 20,000 valves per day (when fed automatically) for correctness of filament, and plate current, gas pressure, etc., registering red or green lights when readings were incorrect or correct and stopping the cycle at a faulty valve.

The gallery was given over to a number of exhibits and demonstrations sponsored by the Science Forum and the New York Electrical Society. Here were numerous examples of "electronics," or more familiarly "telearchics." The photoelectric cell activated a small motor car whilst an invisible beam actuated an automatic counter as each visitor crossed its path. A suit of armour saluted visitors with a "Thank you" on leaving the stand, and judging by the lapse of time between each vocal effort, selenium was probably the cause. Practically no accessories were shown, and very few loud speakers apart from complete outfits. Only two or three firms showed short-wave receivers, among which the De Forest appeared as an extremely compact and well-made 4-valve battery receiver, and the Pilot Super Wasp, a 4-valve A.C. set of larger dimensions.

Speaking generally, prices were not low, but in view of the magnificence and aesthetic appearance of the cabinet sets, one was compelled to the opinion that they were excellent value for money.

An innovation this year was the inclusion in the Radio World's Fair of a number of non-radio exhibits of...
The New York Show.—The New York Show had on application to the Hon. Treasurer, Mr. H. Pottle, had on application to the Hon. Treasurer, Mr. H. Pottle, their disinterest among members of the Kentish Town Branch. The Wembley Wireless Society recommenced its weekly meetings on Friday, the 17th October. At the opposite end of the basement and District Radio Society, and every effort was being made to assist experimenters. A series of lectures and demonstrations of particular interest to short-wave enthusiasts is now being given every Tuesday evening at 8 p.m., at the headquarters Carlton Road School, Kentish Town, N.W.5. Amongst other things, the problem of the peaked amplifier for facilitating the separation of amateur C.W. stations operating in the narrow frequency bands at their disposal, will be dealt with in a practical manner. All keen members are cordially welcomed.

For any further particulars, application should be made to the Hon. Secretary, Mr. A. T. Jordan, 16, Clements Road, S.W.1.

For Balham Readers—Neon lamps and their application to radio and television were effectively described by Mr. Charles Rodgers in a recent lecture before the Balham and District Radio Society.

An important feature of this year’s programme is a series of non-technical talks for beginners on one meeting nights. These talks are given at 7.45 p.m. Members’ problems are dealt with at 8.30 a.m., after an interval for refreshments, a lecture or demonstration is given at 9.45 p.m. until 9.45 p.m. Some are of a common interest, and interested members are cordially welcomed. For Balham Readers—Neon lamps and their application to radio and television were effectively described by Mr. Charles Rodgers in a recent lecture before the Balham and District Radio Society.

New Session at Wembley.—The Wembley Wireless Society recommenced their weekly meetings on Friday, the 17th October, at 8 p.m. The large Hall, Park Lane School. A large number of old friends attended, and quite an interesting evening was spent discussing the new receivers shown at Olympia.

On Friday last an up-to-date lecture was given by Mr. Wallace on the conversion of existing battery sets to A.C. mains. Members and friends are again reminded that the meetings this year will commence at 7.30 p.m. and application to the Hon. Treasurer, Mr. H. Porte, 96, High Road, Wembley.

The Set of the Future.—A lecture on screened-grid valve amplification, illuminated with practical work, was given by Mr. Yeend, of The Marconiphone Co., Ltd, at the meeting of the Bristol and District Radio and Television Society, held at the University on October 17th. The lecture dealt with the performance peculiar to this valve, and demonstrated how advantage could be taken of the phenomena in circuit designing. A most interesting discussion followed, in which the members envisaged the receiver of the future. The meeting concluded with a demonstration of Marconiphone receivers embodying screened-grid amplification.

The lecture was given at a recent meeting of the South Kentish Town Radio Society.

Valve Vintage.—An amusing discussion on “Valve Vintage” took place at a recent meeting of the South Croydon and District Radio Society.

FORTHCOMING EVENTS.

WEDNESDAY, OCTOBER 12th.

Newcastle upon Tyne and District Radio Society.—At 8 p.m. At Tellington School, Telford, N.D. Concluding lecture of series, “Elementary Principles of Radio,” by Mr. Louis Harling, B.Sc., A.I.C.

THURSDAY, OCTOBER 13th.

Birmingham.—At 8 p.m. At the Victoria Hall, Bournville Road, Edgbaston. Lecture and demonstration by Mr. A. F. Poynton.

FRIDAY, OCTOBER 14th.

Bristol and District Radio Society.—At 7:15 p.m. In the Geographical Lecture Theatre, University of Bristol. Demonstration by News Graham Ambler, Ltd.

TUESDAY, NOVEMBER 4th.

Beechcroft Road, S.W.17. Concluding lecture of series, “Elementary Principles of Radio,” by Mr. Louis Harling, B.Sc., A.I.C.

THURSDAY, NOVEMBER 17th.

Birmingham.—At 8 p.m. At the Victoria Hall, Bournville Road, Edgbaston. Lecture and demonstration by Mr. A. F. Poynton.

WEDNESDAY, NOVEMBER 29th.

Beechcroft Road, S.W.17. Concluding lecture of series, “Elementary Principles of Radio,” by Mr. Louis Harling, B.Sc., A.I.C.

TUESDAY, NOVEMBER 5th.

Bristol and District Radio Society.—At 8 p.m. At the Victoria Hall, Bournville Road, Edgbaston. Lecture and demonstration by Mr. A. F. Poynton.

FUNDAMENTAL PRINCIPLES EXPLAINED.

The Newcastle upon Tyne and District Radio Society have this session introduced an innovation into their syllabus in the form of a series of four lectures by Mr. L. Hartley, B.Sc., A.I.C., on the elementary principles of wireless. The first of these lectures was given on October 4th, and brought home to members the many uses to which A.C. and D.C. current can be put quite apart from radio purposes. The action of many of these components that we regard as so commonplace—the choke, transformer and condenser—were explained, as were the functions of batteries. This talk concluded with a brief explanation of the all-important subject of atoms and molecules.

The second lecture, which is about half a mile away, was given on October 11th, and dealt with the theory and uses of the thermal valve, which, though looked upon in such a matter-of-fact way, is really one of the most ingenious electrical devices of the present day. Its discovery—or rather, its development—was shown, and its diverse applications nowadays are pointed out.

Hon. Secretary, Mr. G. E. Lupton, 16, Clemente Road, Ilford.

OCTOBER 29th, 1930.

NEWS FROM THE CLUBS.

OCTOBER 12th, 1930.

The New York Show.—Several rosettes were included in the booths of some of the exhibitors, and the two crystal studios of the National Broadcasting Company proved as great an attraction as ever. At the opposite end of the basement were to be found the Tone-o-Graph talking film studios, where members of the public had an opportunity of not only seeing how talking films are made, but of actually taking part in the casts themselves to see if they could qualify as “talkie” artists. Also in the basement was the 75-watt 40-metre band transmitter of the magazine “Radio News,” which excited a great deal of interest. Not only was the transmitter in the basement of this steel-frame building, but the aerial was too, and yet two-way communication was established with points as far distant as England and Mexico. It was through the medium of this station, operated by enthusiastic members of the A.R.R.L., that I was able to send, direct to the editor of “The Wireless World,” a few first impressions of the Fair.

One feature of the Show remains unchanged—the radio sets are still silent. They have not yet learned to supply all sets with a common programme from a central gramophone record broadcasting studio. Instead, if you want to hear all the sets you have seen, try to walk miles from one hotel to another in the Times Square section, which is about half a mile from Madison Square Garden. The manufacturers take suites in the different hotels and demonstrate their sets there. Not only is a tour round these hotels very fatiguing and inconvenient, but the hospitality of many of the manufacturers is highly devastating, in spite—or because—of prohibition!

Of television there was none this year, with the exception of an impromptu exhibit by the Jenkins Television Corporation.
Unbiased.

I HAD intended crossing the Channel the other week in order to put in an appearance at the Paris Radio Show, as in previous years, but unfortunately fate, in the form of a wretched cold, kept me "confined to barracks" for several days, and as it happened I was only just fit again in time to get in at the tail end of the Manchester show. It is, I think, always interesting not only to make a comparison between the designs of the complete sets and components of our friends across the water, but also to exchange points of view with the French exhibitors, and for this purpose I generally dig out an old acquaintance of mine who is more or less permanently exiled in the gay city and is well versed both in the technicalities of radio and also in the intricacies of the French language. By doing this I save much time and trouble, as previous bitter experience has taught me that my ability to discuss the idiosyncrasies of the gardener's boy and his passion for pens is apt not to be appreciated at its true value by French exhibitors. I shall therefore have to make amends for my disappointment by exchanging points of view up in the North, where the language barrier is perhaps not quite so insuperable.

During my enforced idleness I have, naturally enough, been glad away the time with the aid of my wireless set, or perhaps I should say with several sets, as a friend who is fairly well blessed with this world's goods is contemplating the purchase of an all-electric receiver, and has dragged a number of sets which he has "on appro." to my place in order that I might advise him. This I will confess I have found no little difficulty, as there is not much variety in all cases rises to a level which but a few years ago was simply not attainable by any means. I think, however, that my final choice will fall on one which employs a power grid detector, and in this I am not swayed merely by theoretical considerations, as the quality is definitely better than from the others, which employ the older forms of rectification.

During my wanderings around the various stations of Europe with these sets I had ample leisure to observe the Sunday transmissions of one of the "permanent" type of moving-coil loud speakers. Being on my wrist it came well within the influence of the magnetic field, and I wonder how many people have had their watches ruined by experimenting with moving-coil loud speakers? Mine came to disaster recently when examining the magnet system of one of the "permanent" type of moving-coil loud speakers. Being on my wrist it came well within the influence of the magnetic field, and I have noticed has been rubbed with the French exhibitors, and for this purpose I generally dig out an old acquaintance of mine who is more or less permanently exiled in the gay city and is well versed both in the technicalities of radio and also in the intricacies of the French language. By doing this I save much time and trouble, as previous bitter experience has taught me that my ability to discuss the idiosyncrasies of the gardener's boy and his passion for pens is apt not to be appreciated at its true value by French exhibitors. I shall therefore have to make amends for my disappointment by exchanging points of view up in the North, where the language barrier is perhaps not quite so insuperable.

During my enforced idleness I have, naturally enough, been glad away the time with the aid of my wireless set, or perhaps I should say with several sets, as a friend who is fairly well blessed with this world's goods is contemplating the purchase of an all-electric receiver, and has dragged a number of sets which he has "on appro." to my place in order that I might advise him. This I will confess I have found no little difficulty, as there is not much variety in all cases rises to a level which but a few years ago was simply not attainable by any means. I think, however, that my final choice will fall on one which employs a power grid detector, and in this I am not swayed merely by theoretical considerations, as the quality is definitely better than from the others, which employ the older forms of rectification.

During my wanderings around the various stations of Europe with these sets I had ample leisure to observe things which under ordinary circumstances are not particularly noticed, and one thing which was brought very forcibly to me was the fact that the so-called gaiety of the Sunday programme of the B.B.C. to realise that we are a long way off the life of pleasure which ruined ancient Rome, but very little sold enjoyment was to be extracted from the medley of negro noises which filled the Continental ether on the particular Sunday of which I speak. Possibly, however, I struck a particularly bad patch, or my indisposition gave me a jaundiced view of things, and I will leave it at that.

Wanted: Another 5XX.

I suppose there are very few parts of the country in which I have not had experience of broadcasting, with the exception of Scotland and the wilder parts of North Wales. It has been my experience that the two parts of the country which are worst served by broadcasting are the extreme south-west of the country and East Anglia. In the first mentioned district I have very definitely found that 5XX was the only British station of any real entertainment value whatever, the medium-wave stations being subject to fading, and Morse interference. In East Anglia things were somewhat better, in the matter of fading, and ships' Morse the chief cause of trouble. I must say, however, that in the coastal districts of East Anglia I have always been compelled to rely on 5XX. This all goes to show, in my opinion, how much an alternative long-wave programme is needed, a fact which I have noticed has been rubbed in by The Wireless World. My experience has been confined, I will admit, to makeshift aerials, and I should be interested to hear what conditions are like on a pukka aerial and earth system in the districts I have mentioned. In Cornwall I found, by the way, that the average popular portable is almost useless.

Watch Your Watch.

I wonder how many people have had their watches ruined by experimenting with moving-coil loud speakers? Mine came to disaster recently when examining the magnet system of one of the "permanent" type of moving-coil loud speakers. Being on my wrist it came very well within the influence of the magnetic field, and is now hopelessly magnetised, so much so, in fact, that it not only loses, which is the customary symptom of a magnetised watch, but refuses to go altogether, so strong was the magnetising force. The remedy, of course, is to place it for a time in a strong alternating current field, this having a demagnetising effect, and this I intend doing.
CURRENT TOPICS

Events of the Week in Brief Review.

FINED FOR ILLICIT TRANSMISSION.
For transmitting by wireless telephony without a licence, D. E. Waddington, of Redland, Bristol, has been fined £3. Waddington's "talks" with a friend were overheard by a Post Office official.

MYSTERY VAN STIMULATES HONESTY.
How the appearance of the Post Office "mystery van" speeds up the issue of new wireless licences was shown at Athlone or Birr was recently discussed by Mr. P. W. Shaw, member of the Dail, in a newspaper interview. With a 120 kilowatts launched on the ether, British listeners will not be over-mechanisms, Athlone by any other name will sound as loud.

100 KW. STATION FOR LUXEMBOURG.
The latest budget of the Société Luxembourgeoise des Émetteurs Radiophoniques, which holds the broadcasting monopoly in the Grand Duchy, provides for the establishment of a 100 kW. broadcasting station within eighteen months. According to Radio Science (Brussels), a provisional station of between 6 and 8 kW. will operate before the end of the year.

MIDGET WAVE SET. A new German receiver constructed for sensitivity on wavelengths of 14 centimetres.

U.S. SPONSORED PROGRAMMES FOR EUROPE?
A scheme to broadcast American "programmes" throughout the world is being considered by the Federal Radio Commission, according to our Washington correspondent. Applications have been received from the General Electric and Westinghouse Companies for the removal of the experimental status of the short-wave auxiliaries of WGY (Schenectady) and KDKA (Pittsburgh) to enable these stations to transmit the ordinary, commercial programmes for world consumption. If the claims are allowed, arrangements will be set on foot whereby these trade propaganda transmissions are picked up in foreign countries and relayed by local stations.

SHORT-DISTANCE BEAM SERVICE.
A miniature beam wireless system for communication between Sicily and the surrounding islands has been authorised by the Italian Government. Six transmitters, each with a power of 10 kW., are to be constructed, and they will work on wavelengths between 1,200 and 1,500 metres.

WIRELESS TO FIGHT AMERICAN GANGSTERS.
That America is waking up to the value of police radio is shown by the decision of the U.S. Federal Radio Commission to permit twenty-four cities and two States to operate police wireless stations. Twenty other cities have been granted permission to build such stations.

POLICEMEN AS WIRELESS OPERATORS.
Wireless classes for policemen are the latest innovation in Prague. The classes have been formed to enable every officer to work the police radio apparatus which is to be adopted throughout Czechoslovakia for the suppression of crime. The students are given practical lessons with an up-to-date transmitter and receiver.

AMATEUR RADIO HOAX.
The famous "Paris Experimental" station, which for a long time secured publication of its programmes in leading French radio journals, has been dropped from the domain of mystery by the Paris police. According to the Antenne, the practical joker is a youth of eighteen, who announced the establishment a year ago of a short-wave "poste" with a power of 1 kilowatts and a wavelength of 31.65 metres. The announcement received a "good press," whereupon the youth, feeling under an obligation not to disappoint the world, collaborated with some amateurs of his own age in the construction of a transmitter which eventually came on the ether with a power of 26 watts, and broadcast a few gramophone records and newspaper extracts. It then closed down, but the "programmes" appeared as usual in the Press to the mystification of a number of genuine experimenters, who marvelled at the insensitivity of their receivers. It was only after an imaginary description published by one paper of the
**OCTOBER 29th, 1930.**

"Super station" in Suisses and its "auditorium in Paris," that the police became interested. According to the Antenne, the station owner is to be prosecuted for transmission without a permit.

**DR. LEE DE FOREST.**

Dr. Lee de Forest may shortly remarry. According to the Los Angeles Examiner, quoted by the New York Times, the inventor of the three-electrode valve intends to marry Miss Maria Mosquini, a film comedienne.

**AMPLION "TWO SCREEN-GRID CABINET."**

We are asked to state that the Amplion "Two Screen-grid Cabinet," referred to in our Olympia Show Report of September 24th, is obtainable for A.C. mains operation only, and not in D.C. and battery models as stated.

**THE LATE MR. R. B. WEAVER.**

News of the death last week of Mr. Robert Beresford Weaver, manager of the Wireless Department of the General Electric Co., Ltd., came as a real shock to his many friends and associates in the radio trade. Mr. Weaver suffered a serious illness a few months back, but seemed to have recovered. He took an active part in the Olympia Radio Exhibition. He was in his 55th year.

**"THE WIRELESS WORLD FOUR."**

We regret the occurrence of two typographical errors in the List of Parts relating to "The Wireless World Four," on page 421 of our issue of October 15th. The grid leak value appearing as 0.1 megohm should have been given as 0.01 megohm, i.e., 10,000 ohms. Also, a resistance value of 10,000 ohms should have read 15,000 ohms.

**R.S.G.B. AND R.L.S.**

One of the most interesting examples in recent years of collaboration between important radio societies is the arrangement worked out between the Radio Society of Great Britain and the Lensbury Radio Society. During the present session joint meetings are taking place at frequent intervals. Through the courtesy of the Anglo-Mexican Petroleum Co., Ltd., these meetings are held in the Lecture Theatre of their building at 16, Finsbury Circus, E.C.2. The proceedings, which are strictly informal, open at 6.15 p.m. sharp and continue for about an hour. Refreshments are then served, and those who wish can resume discussions until 9.15.

Members of the R.S.G.B. are requested to note that this programme in no way affects conventions or other meetings such as are usually held at the Institution of Electrical Engineers. Full particulars of meetings, etc., can be obtained from the Hon. Secretary, Mr. D. Wilkes (R.E.S.), Shell Corner, Kingsway, W.C.2, or Mr. J. Claricoats, R.S.G.B., 53, Victoria Street, London, S.W.1.

On November 7th the discussion will deal with radio rectifiers, and the lecturer will be Mr. A. Gay (G.N.F.)

**RISING FIGURES.**

At the beginning of September the number of wireless licenses held in Czechoslovakia was 267,604,—increase of 2,124 during the month of August.

**"RADIO NATIONALISATION" DEMAND IN FRANCE.**

The French Railways Radio Club—the largest club of its kind in France—now possesses 10,000 members, many of whom were present at the annual festival just celebrated in the Salle Wagram, Paris, under the auspices of the French Postmaster-General. A striking appeal for speedy State action in broadcasting affairs was made by M. Aboelos, the President, in the course of his address. He declared (writes our Paris correspondent) that French listeners were crying for "a body representing not merely commercial concerns, but the general interests of the nation," i.e., a policy of radio nationalisation.

Post office workers support this view, but the majority of commercial interests in France oppose the nationalisation policy on the grounds that it would put a brake on subsequent radio progress.

**TWO USEFUL DIARIES.**

The Autocar Motorist’s Diary for 1931 contains a mass of information useful to the owner-driver, including particulars of hills with single-figure gradients, Motor Racing History, List of Speed Records and winners of racing events, Conversion tables, and lists of the distances between the principal towns in Great Britain. In the Diary portion provision is made for recording the mileage week by week, and pages are provided for monthly summaries of running expenses. The Motor Cycle Diary for 1931 contains similar information and memoranda but adapted for: the use of motor cyclists. Both Diaries are strongly bound in leather cloth with pencil, size 8 x 3, to fit the pocket, and are obtainable, post free 1s. 7d. from the publishers, Messrs. Iliffe and Sons Ltd., or from bookstalls and stationers, price 1s. 6d.

**WIRELESS PICTURES AT SEA.**

Has wireless facsimile transmission and reception reached a stage of development which would justify its general introduction for marine purposes? A considered statement on the question is issued by the Marconi International Marine Communication Co., Ltd., in reply to certain suggestions made in American marine circles that the introduction of such apparatus is imminent.

Having regard to its possible value for shipping, the subject was one of those which came under discussion at the meeting of the Executive of the Comité International Maritime in Brussels last month (says the Marconi Company). The technical and commercial experts gathered there, representing some forty countries, were satisfied that on the data so far amassed, and submitted to them for consideration, it would be premature at present to undertake the inauguration of a service of facsimile transmission to ships at sea.

The difficulties are both technical and commercial. Sets to give reliable results such as would be required to inspire full confidence must be fairly elaborate, and the probability is that a weather chart service could not be conducted at a charge of less than one guinea a day per ship.

The technical difficulties still to be overcome include interference from other signals and from atmospheres and fading.
Making a 20-Henry Choke

Constructional Details of a Constant Inductance Choke to Carry 100 mA of D.C.

By H. B. Dent.

An L.F. choke of the type commonly used in output-filter circuits and battery eliminator smoothing equipment is probably one of the most simple pieces of apparatus to construct, as it involves little more than winding an appropriate quantity of wire on a bobbin and fitting it on to a core made up of easily procurable iron stampings. The determination of the amount of wire, the size of bobbin, and the method of assembling the core to result in a choke of a specific inductance, under the average conditions of use, is another story, and involves considerable calculation. For the inductance is a factor which varies widely with any change in the steady current passing through the winding, and, to a large extent, upon the value of the alternating component. Thus a choke designed to give an inductance of some 20 henrys when no direct current is flowing, but with an alternating component of, say, 70 volts, may quite likely show only half this inductance value when a steady current of a few milliamps is passed through the coil.

Furthermore, the inductance is not independent of the value of the alternating component, but in a well-designed choke it may be of small magnitude under the average conditions of working, and for all practical purposes may be ignored. As a matter of interest, however, a curve has been prepared of the choke described here, connecting inductance with the alternating voltage across its ends. This is shown in Fig. 1. As will be seen, the inductance maintains practically a constant value for all values of A.C. over 30 volts.

In an output filter stage embodying a good super-power valve the working condition will be well on the horizontal part of this curve, but in the case of battery eliminators the A.C. component will be, in general, less than 20 volts, with the result that the effective inductance of the choke will be somewhat less.

The steady direct current passing through the choke is the principal factor governing its inductance, and this may suffer considerable change with quite small variations in the value of the D.C. The aim in the present
Making a 20-henry Choke—

In order to design a choke whose inductance remains sensibly constant over a wide range of D.C. values, it is necessary to design a choke whose inductance remains sensibly constant over a wide range of D.C. values. That this state can be attained with reasonably simple construction is exemplified by the curve connecting inductance with the D.C. given in Fig. 2.

With no D.C. flowing the measured inductance is 22.5 henrys, and with 50 mA. of D.C. flowing, this falls to 21.8 henrys. On passing 100 mA. of D.C. through the coil the inductance falls to 18 henrys. Only in exceptional cases will a small choke of this type be required to carry more than some 50 mA. of D.C., and up to this point the inductance curve is sensibly horizontal, so that one would be justified in designating this component a "constant-inductance" L.F. choke.

Its constancy is achieved by introducing an air gap, suitably proportioned, in the iron core, and any alteration to the length of this gap will very seriously modify the slope of the curve, also the maximum inductance attainable. Therefore, during the assembly process particular care must be taken to assure that the air gap is the correct size.

The length of the air gap in the iron circuit is 0.018 in. in the present case. The stampings used for the core are the familiar "T" and "U" pieces, as shown in Fig. 3. This assembly gives two iron paths in parallel, so that if we visualise the core folded back along the line DE, so that the left-hand half is brought over to coincide with the right-hand portion, we shall have two gaps in the core, namely, at B and C. The gap at A will be in line with that at C. Therefore, the total air gap of 0.018 in. is divided equally between the joints B and C, and each is 0.009 in. long. In the assembly we must insert distance pieces at the three points, A, B and C. These can consist of any insulating material, such as paxolin, shellaced cardboard, empire cloth, etc.

For the benefit of those not in the possession of a micrometer a satisfactory substitute is a standard wire gauge. No. 34 S.W.G. is equivalent to 0.009 in., which is sufficiently accurate for our purpose.

The material required comprises 100 pairs of transformer stampings of the size given in Fig. 3, a bobbin suitable for assembling this quantity of iron and to fit into the winding space on the core, and 1 lb. of No. 32 S.W.G. enamel-covered wire. A suitable bobbin can be obtained from W. Bryan Savage, 292, Bishopsgate, London, E.C.2, and is styled size No. 4H, the stampings being listed as size No. 34. The thickness of the core will be 1.5 in., and the cross-sectional area 4.4 sq. in.

The bobbin should be wound with 4,000 turns of the No. 32 enamel wire, the turns to be run on evenly, but not necessarily in layer form with consecutive turns touching. Looseness and bunching in such a manner as to lead to waste of space must be avoided, as it is only by exercising reasonable care in this process that the requisite number of turns can be accommodated.

When the stage has been reached for assembling the core the "T" pieces can be inserted into the bobbin as many as possible being packed in, and the final two or three tapped home if necessary. If any looseness exists in the core when finally clamped up, the laminations will tend to respond to fluctuations in the coil current and emit the characteristic hum of the rectified supply if used as a smoothing choke, or act as a miniature loud speaker when employed as an output choke. These spurious effects should most certainly be avoided.

The spacing pieces can then be placed in position, and the "U" shaped laminations assembled, using the same number of these as there are "T" pieces. During the assembly of the laminations all paper-covered sides must point in the same direction. If a little Seccotine, or other suitable adhesive, is smeared on both faces of the air gap spacers, it will assist in keeping them in position, and act, also, as a binding agent when the core is clamped together.

The clamps are made from mild steel strip 1/8 in. thick and 1/2 in. wide, with the lower ends turned up to provide a means of fixing to the baseboard.

Before the steel clamps are placed in position a strip of insulating material, such as shellaced paper, or empire cloth, should be inserted between each clamp and the core to prevent partial short-circuit of the air-gap. The D.C. resistance of the coil is quite low, the actual value being 220 ohms. Thus, when passing 50 mA. of D.C., only 11 volts will be absorbed in the choke.
"EUREKA" VALVE HOLDERS.

Messrs. L. Person and Sons, 65, Shaftesbury Street, London, N.1, have recently produced a new type skeleton valve holder intended for assembling on sub-bases, raised above the level of the baseboard, so that all wiring can be laid out of sight. Although produced to meet the needs of set manufacturers in the first case they are now available to the home constructor, the prices being 6d. for the four-pin type, and 9d. each for the five-pin model. It required these can be supplied mounted on metal strips in gangs of two, three, four or more.

Each holder measures 2½in. x 1¾in. x 3½in. deep. Suitable hard copper is used for the contact springs, which are mounted on thin paxolin with a top cover of the same material; this serves to hold the springs in position. Slots are provided in the springs in which the connecting wires are placed and remain secure when soldered.

SPRAGUE MIDGET CONDENSERS.

Although tested to withstand a working voltage of 1,500, these condensers are extraordinarily compact, the space required being no larger than that occupied by an ordinary postage stamp. The condensers are of American manufacture, and are marketed in this country by Messrs. Howard Thomas and Co., Ltd., 94-96, Rosoman Street, E.C.1. Supplies are available from the British Blue Spot Co., Ltd., 94-95, Rosoman Street, E.C.1.

The majority of the samples tested came within 10 per cent. of the rated capacity; this tolerance is quite permissible in fixed condensers for general use.

BLUE SPOT TYPE 41K LOUD SPEAKER.

The movement of this loud speaker is the well-known type 66K, and the quality of reproduction is well up to the high standard set by this unit. The high frequency response, particularly between 5,000 and 6,000 cycles, is above the average for loud speakers of this class, while the middle register is uniform, with the exception of a slight increase—not sharp enough to be regarded as a resonance—between 2,500 and 3,000 cycles. In the bottom register the response is good down to 100 cycles, but in the particular model submitted slight frequency doubling was evident at this frequency, and the 50-cycle response was negligible. The general effect, however, is excellent, and at 50s. the instrument represents good value for money.

The cabinet is light, and is constructed of walnut-faced three-ply, the overall dimensions being 190 x 160 x 120mm. Supplies are available from the British Blue Spot Co., Ltd., 94-95, Rosoman Street, E.C.1.

POLAR PRE-SET CONDENSER.

This is a semi-variable condenser of the type now generally used where a capacity of the order not available in the standard range of fixed condensers is required. It is eminently suitable for inclusion in circuits which, once tuned, need no further adjustment, such as a rejector, to mention one of the many roles it will fill.

The plates are cut from phosphor-bromide, interleaved with thin sheets of mica, and the capacity is varied by altering the pressure applied to the sandwich; a small bakelite-shrouded screw with a saw-cut for insertion of a screw-driver serves as the adjustment. A locking nut enables the spindle to be fixed when the required capacity has been obtained.

These condensers are available with a maximum capacity of 0.001 mfd. or 0.003 mfd., the price in each case being 2s. A sample 0.003 mfd. size was measured, and the maximum capacity found to be 0.00330 mfd., while the minimum value was 0.000925 mfd. only. This provides a very useful range of capacity.

The makers are Messrs. Wingrove and Rogers, Ltd., Arundel Chambers, 188-190, Strand, London, W.C.2.
You'll get **highest effective amplification** with this new Valve

Greater *effective* amplification is definitely ensured by the New Cossor Screened Grid Valve. This is due to its minute inter-electrode capacity which has been reduced to the order of 0.001 micro microfarads — lower than that of any other Screened Grid Valve on the market. Because of this and because grid current has been eliminated the use of this new Cossor Valve will considerably increase the efficiency of your Receiver.

Cossor 215 S.G. 2 volts, -15 amp. Impedance 300,000 Amplification Factor 330. Mutual Conductance 1.1 m.a./v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80 Price 20/-

**The New Cossor 215 S.G.**

Greatest Effective Stage Gain

Write for fully descriptive folder No. L35 W.W. on "How to increase the range of your Receiver."
Thousands are making good battery sets All-Electric

They want “All-Mains” — they want to use the Six-Sixty Mains Valves — they want the best in radio! So they convert their sets with the Six-Sixty. Mains Unit only (H.T., L.T. and G.B.) — £6 6s.

All-Mains Conversion Equipment. Price, complete from — — — — — £8 5s.

No internal wiring alterations. The Six-Sixty 4/5 pin valve holder adaptors are the links to the specially selected Six-Sixty A.C. Valves for every A.C. Supply.

AND ALL SAY

SIX-SIXTY

(£V.A. Radio Valves and Equipment)


IGRANIC

MIDGET

TRANSFORMER

Price

10/6

Here is the Transformer you have been waiting for. Although only $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{3}$ in size, this Transformer may be termed a “Masterpiece in Miniature.” This “Midget” Transformer has a high primary inductance of over 60 henries, and the patented core embodying a new nickel alloy permits overload without ill effect. Ratio 3:1.

Have you a copy of our new Radio Catalogue? If not, may we send you one? Write to Dept. U.317.

146 Queen Victoria Street, London.

Mention of "The Wireless World" when writing to advertisers will ensure prompt attention.
NOTHING happens instantaneously, there is always a time lag between cause and effect. If a gun is fired a mile away, the sound or report is heard several seconds after the flash is seen at the muzzle. This point was brought out very forcibly at the last Schneider Trophy Race in the Solent. The seaplanes travelled so fast that the noise emitted from the exhaust appeared to come from a point well behind the plane. This showed clearly that the velocity of the plane was comparable with the velocity of sound in air. In loud speaker problems a similar effect occurs. Suppose we have a simple arrangement consisting of a flat steel or aluminium disc mounted on a reed type of movement as shown in Fig. 1. When the reed moves up and down, due to an alternating current in the windings, the disc emits a sound of the same frequency as the current. Now the force on the disc is exerted at the centre where it is attached to the reed. If the force acts upwards, say, its effect is not felt instantaneously throughout the disc, because of the time lag before the movement is communicated to the disc. This is due to the velocity of sound energy (in the disc) from the centre to the edge of the disc being relatively small.

We know that sound can be heard when the disc vibrates, so that energy is communicated to the surrounding air. If we concentrate our minds on the centre of the disc, we see that it sends sound waves out to the air in every direction. Some of these (X) travel at 90° to the disc, others (YY) at a smaller angle, whilst one bunch (ZZ) travels over the surface of the disc (see Fig. 2). Meanwhile sound travels in the disc itself (WW), but it travels at a different rate from that of the sound over the disc. It is this velocity in the disc itself which is important in the design of loud speaker diaphragms, and it is the one which we desire to discuss in this article.

In measurements of the velocity of sound in the open air, an approximate method used many years ago was to fire a gun some miles away and take the time which elapsed between seeing the flash and hearing the report. Where discs or diaphragms are concerned this method is obviously not at our disposal. Consequently we have to devise something more subtle which fits in with our particular case.

The following method of measuring the velocity of sound in a flat circular disc can be used by anyone having certain simple apparatus. Take a piece of sheet metal about \( \frac{1}{3} \) in. thick and cut out a circle 8 inches diameter (about 20 centimetres). Drill a small hole at the centre so that the disc fits over the screwed stem of a reed-type loud speaker movement (see Fig. 1). Screw a nut on the stem, then put the disc between two small washers, and screw another nut firmly on the top. Mount the movement in such a way that the disc is quite horizontal and the movement itself rests on felt or padding to insulate it mechanically from the table—to avoid resonance of the latter. Connect the movement to the power valve of a receiving set in the usual way. Obtain a beat note—by causing the receiver to oscillate or otherwise—and vary it by altering the tuning of the set. At one or more frequencies of the beat note the sound from the disc will be very loud. These points correspond to resonances.

Having found one of these resonances, sprinkle fine sand on the disc and vary the beat note. The sand will collect in one or more circles, of which the attachment to the movement is the centre. At these circles the disc is substantially motionless. Hence they are known to the physicist as "nodes" or points of zero motion. Suppose Fig. 4 represents the condition at a resonance frequency where there is one circle only. When the portion within the circle is moving upwards, that outside is moving downwards, and vice versa. Thus the sound radiated from these two portions will at any instant be of opposite
Velocity of Sound in Loud Speaker Diaphragms.—The average velocity of sound waves in the disc by simple measurement. Before indicating how this is done we shall digress to explain a simple point which it is essential to understand before calculating the velocity.

Fig. 4 shows a simple waveform. A and C are crests, whilst B is a trough. If we imagine the wave to travel to the right, it repeats its motion at intervals equal to the distance AC. This is known as the wavelength, and is designated by the Greek letter \( \lambda \) (lambda). Now the wave repeats itself every cycle, i.e., if there are 1,500 cycles per second, the wave repeats itself 1,500 times every second. Thus it travels 1,500 times the distance AC every second, so that its velocity (distance covered per second) is 1,500 AC. But 1,500 is the frequency (f) of the wave and \( \lambda \) is the wavelength, so that the velocity \( v = f \lambda \).

Returning to the case of the disc, the nodal circles at a certain instant are shown roughly in Fig. 5. The distance between the two circles can be regarded as half a wavelength. Here, we assume, the velocity between the two circles is constant, which is not strictly accurate, so that we shall obtain the mean velocity between the two circles.

We have now to ascertain the frequency at which the two circles occur. To those who have the necessary calibrating apparatus it is easy, but the reader may not be in this happy position. It is suggested, therefore, that the note should be matched against the pianoforte or violin. Care must be exercised not to mistake it for a harmonic. Having found the frequency, the velocity can be calculated from the formula \( v = f \lambda \).

Take the following example for a disc 7 inches diameter 0.023 inch thick. Five circular nodes 1.75 and 3.25 inches respectively at a frequency of 900 cycles per second. The wavelength is twice \((3.25 - 1.75) = 3\) inches, so that the velocity is \(900 \times 3 = 2,700\) inches per second or 225 feet per second. This is about \(\frac{1}{3}\) the velocity of sound in air, which latter is actually between 3,100 and 1,200 feet per second according to the temperature.

To obtain the best results the disc should be fairly thin. Large discs will give circles at low frequencies. At certain frequencies the disc will execute vibrations about one or more of its diameters, i.e., the sand will lie on one or more diameters. Sometimes the sand figures will be a mixture of diameters and circles. In one mode which appears at a lower frequency than the first circle the centre will be almost stationary, whilst the outer edge moves violently, the sand being nowhere at rest except near the centre.

As a matter of interest aluminium, cardboard, wood and other materials can be tested and the velocity of sound in them obtained. Cardboard is not always successful, and difficulty may be experienced with wood due to the grain. However, this is for the experimenter to discover for himself. The velocity will be found to increase with the frequency and with the thickness of discs of the same radius and material.

Following on this the reader can try his luck with paper cones. In this case the experiments are not so easy. The well known 'Kone' loud speaker is useful in this respect. Although sand will serve the purpose, better results are obtained with lycopodium powder. I should mention that a good deal of energy is required to make the sand or lycopodium jump on the diaphragm, especially at the higher audible frequencies. The surface of the paper should be fairly rough, and the sides of the cone not too steep or the powder will merely roll off.

At 2,000 cycles the velocity near the outer edge of a 'Kone' diaphragm is about 250 feet per second, i.e., about the same as in the steel disc discussed earlier in this article.

** GRAMOPHONE PICK-UPS AND LONG EXTENSION LEADS. 

ONE of the greatest difficulties in the use of a gramophone pick-up is experienced by those who possess a large cabinet gramophone which is, more often than not, situated in a different part of the house to the wireless receiver. This is due to the fact that, in the interests of efficiency, the wireless set is placed in a position near to the aerial lead-in—which sometimes means that it is in an upstairs room—where being extension leads to various rooms for the use of the loud speaker. Long leads attached to the pick-up usually mean that high notes suffer, since the effect is the same as if a condenser had been deliberately placed across the pick-up. Sometimes the position is so desperate that the possibility of an entirely separate amplifier placed near the gramophone has to be considered.

This method of overcoming the trouble, however, is unnecessarily expensive, and it can be averted by the use of a low-impedance pick-up. Although this does not eliminate the self-capacity of the extension wires, it removes the evil effect of it, which is just as good, from our point of view. The inevitable fly in the ointment is that the voltage output from these devices is very much less than from the more conventional high-impedance pick-up. Even this disadvantage can be overcome, however, by using a properly designed step-up transformer at the point of entry to the receiver. The transformer core should be earthed and experiments should be made with the earthing of one of the terminals of its primary, in order to improve results, more especially if electric light mains are in the vicinity of the extension wires. If the length of the extension wires is not too long, lead-covered wire is an advantage.
New American Valves

Notes on Three R.C.A. Radiotron Models.

ALTHOUGH they are not readily available in this country, it is thought that a description of certain of the latest American valves will be of interest to readers if only for the fact that they furnish a standard of comparison with the leading British types. The valves forming the subject of these notes are three new R.C.A. Radiotron models designed especially for districts where lack of accumulator charging facilities demands low filament consumption. In each case there is a 2-volt filament having a sufficiently small consumption to be supplied either from a small storage battery or a dry cell.

The general purpose member of this service consumes 0.06 amp. at 2.0 volts, and passes but 2.0 milliamperes of anode current when biased to 41.0 volts negative. The price paid for such extremely low current consumption is a reduced mutual conductance of the order of 0.7 m.a. per volt. The amplification factor is 8.8. Specifications as given by the makers for the other two valves are published in the Table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate Voltage (V)</th>
<th>Plate Current (mA)</th>
<th>A.C. Resistance (Ohms)</th>
<th>Power Output (Watts)</th>
<th>Undistorted Power Output (Milliwatts)</th>
<th>Amplification Factor</th>
<th>Approximate Interelectrode Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Output</td>
<td>2.0</td>
<td>0.15</td>
<td>123</td>
<td>22.5</td>
<td>2.0</td>
<td>4,000</td>
<td>2.5</td>
</tr>
<tr>
<td>Screen-grid</td>
<td>2.0</td>
<td>0.08</td>
<td>138</td>
<td>3.0</td>
<td>1.5</td>
<td>809,000</td>
<td>400</td>
</tr>
</tbody>
</table>

It will be seen that the mutual conductance is given in micromhos, which is undoubtedly the correct unit since conductance which is the reciprocal of resistance is expressed in milli-ohms; 1,000 micromhos are equivalent to what is familiarly called in this country one m.a. per volt or a slope of one. It is refreshing to see the publication of valve capacities in the case of an output valve. We are inclined to forget the important influence they have on the functioning of each intervalve coupling. Every valve in a receiver (a screen-grid valve offends us all) is a small transformer. The load is of two kinds, capacitative and resistive—the latter being positive (reverse reaction) if the anode load is chiefly capacitative and negative (normal reaction) if the anode load is inductive. These loads, both types of which are always present, are all produced by anode-grid capacity within the valve, and operate as a function of the effective amplification of the valve. With a pentode, for instance, the input load (capacity component) may profoundly modify the performance of a preceding L.F. transformer. When the same valve is used as a power grid detector the input load (resistive component) may seriously damp the tuned grid circuit to an extent that is far greater than the grid current loading. In band-pass filter circuits which are ganged, the replacement of a valve by another with a slightly different amplification factor will cause the grid-capacity to be changed and the ganging to be upset. Knowing the value of the static capacities the working loads can be estimated with reasonable accuracy, and it is hoped to see greater appreciation of this by our own valve manufacturers.

The general level of efficiency of these new American valves as shown by mutual conductance and residual capacity in the case of the S.G. valve, does not seem to be high.

British valve manufacturers have reason to be proud of their achievements when it is reflected that there has been available for over a year a battery-heated screen-grid valve with an anode-to-grid capacity four times less than that of one of the latest products of the States. We have just seen another battery-heated S.G. valve at the Olympia Exhibition whose residual capacity is some ten times less than 0.02 µµF. In the matter of 2-volt output valves of modest filament consumption, we can also hold our own as will be evident from an examination of The Wireless World "Valve Data Sheet."
D.C. BAND-PASS THREE

H.T., L.T., and Grid Bias from Direct-Current Mains.

It cannot be denied that many multi-valve receiver circuits do not lend themselves particularly readily to D.C. mains operation. But the three-valve H.F.-det.-L.F. type of set is generally an exception, and so it can be taken that the "Band-Pass Three," which is, apart from its input filter, an inherently simple and straightforward example of this circuit arrangement, may be adapted for a direct-current supply without much difficulty.

As a basis for conversion it is suggested that the L.T. and H.T. feed system of the "All-D.C. Three" should be adopted, as it is suitable for voltages between 200 and 250, and is intended for use on supplies with either positive or negative "earths." The accompanying diagram shows how the tuning system of the one receiver may be superimposed on the filament circuit of the other, and, to simplify matters, the main L.T. connections are drawn in heavy lines. It is inevitable that a circuit of this nature should appear to be involved; even without the extra wiring of the filter, apparent complications are introduced by the peculiar connections of valve filaments and bias resistances which are necessary when the valves are to be fed in the most economical possible manner, and when grid bias cells are to be entirely eliminated. It will probably be easier to appreciate the essential features of the present circuit if it is considered in conjunction with a simplified diagram of the "All-D.C. Three," which was published in the "Readers' Problems" section of The Wireless World of September 24th.

By making a suitable choice of valves, the total consumption of the set need not exceed some 50 watts, which is no more than that of a single electric lamp. The H.F. amplifier filament may be rated at 2 volts 0.15 amp., and the detector at 2 volts 0.1 amp.; these valves are connected in parallel, but are in series with the output valve, which, to suit the resistance values given, should be of the Marconi or Osram P.625 type.

A Combined Smoothing System.

It is unnecessary to repeat such information already given with regard to the "All-D.C. Three," which obviously applies equally to any set with the same feed circuit. Attention should be drawn, however, to the L.F. choke (L.F.C.) which assists in smoothing both H.T. and L.T. circuits. This component must have a low D.C. resistance and a reasonably high inductance, even when carrying the normal current of from 270 to 280 milliamperes. It must be inserted in the negative lead when the positive main is earthed, and not in the position shown. Chokes made to the published specification are now available commercially.

There is considerable latitude with regard to the actual construction of the various resistances, provided that one uses the gauge of wire recommended, which is capable of carrying the necessary current without excessive rise of temperature. It is wise, however, to make reasonable provision for free radiation of heat, and so the coils should be wound in such a way that a large part of their surface is exposed. No. 28 double-silk-covered Eureka wire, as specified, has a resistance of slightly over 3.9 ohms per yard, and, if the wire is wound on formers of irregular shape, some care should be taken to measure off the required lengths of wire for each resistor with fair accuracy, although minor discrepancies can be made good by adjustment of the 50-ohm rheostat provided for fine regulation.

Specially constructed resistances for voltage regulation.

No value has been allotted to the resistance R, as it may be omitted entirely if the mains voltage does not exceed 200. Its purpose is to absorb any surplus above that figure without disturbing the distribution of poten-
A D.C. Band-Pass Three.

It should have a value of 160 ohms, with a centre tapping to which the negative input lead is joined when the mains voltage is between 220-230 volts; the whole resistance element is connected in circuit for supplies of between 240 and 250 volts.

It will be observed that the screening boxes are not in metallic connection with the mains, and that they are directly earthed. Alternatively, each box may be joined through a 1-mfd. condenser to the negative filament terminal of its associated valve; this is better from the point of view of safety, as no harm would be done by an accidental short-circuit between the mains and control device, with a semi-variable balancing condenser, as described at length in The Wireless World of September 24th; this is certainly worth its slight extra cost, as provision for the best possible regulation of input H.F. voltage, without appreciable change of tuning, is highly desirable in any set with band-pass tuning.

Although unwilling to suggest further complications that are not strictly necessary, the writer may point out that it is always as well to provide complete isolation between D.C. mains and the aerial-earth system; to do this, primary windings must be added to the input filter coils. These primaries should have the same number of turns as were originally included between the medium-

Complete circuit diagram, with values of components. The coil terminal points are marked with reference lettering corresponding to that in the original diagrams of the "Band-Pass Three."
CORRESPONDENCE

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.

POWER DETECTION.

Sir,—Mr. P. K. Turner, contending in your issue of October 8th that he was the first in this country to find that grid rectification, properly arranged, is superior to anode bend, alludes to our meeting in 1926, when Mr. Breereton and I had decided that the anode-bend detector was too imperfect for our needs, and were investigating the possible alternatives.

Mr. Turner arrived at an opportune moment. We had lately read, in the now defunct Radio Broadcast, the articles by Professor Terman on Grid Leak and Power Detection, and had ourselves begun to try them out in combination. I mention this because of a mild hint of accusation running through Mr. Turner's letters. He says, "if he remembers rightly," it was at that time my intention to use Kirke detection for the South Kensington set, and that a discussion arose because he stated that it was unnecessary. In proof that we had actually started our experiments in grid detection, I may remind Mr. Turner of a trilling conversation we had upon grid-leak values, which I mentioned that I had been using 100,000 ohms, and he replied that for commercial reasons he could not go below 250,000.

If Mr. Turner found us in active pursuit of the power-grid detector, and not just resigned to the diode, as he seems to have thought, we undoubtedly profited by his experience, and were quick to try some of the values he was kind enough to suggest. (Some of his "conditions for good-quality grid rectification" need not obtain for push-pull rectification, by the way.)

It is due to Mr. Turner to acknowledge his own claim to priority. It is due to ourselves, on the other hand, to point out that we never claimed anything at all!

London, S.W.2.

B. P. G. DENMAN.

WIRELESS EXHIBITION, MANCHESTER.

Sir,—Having won the premier prize in the open competition for home-constructed radio sets, I cannot let the opportunity pass without acknowledging the help I have received from the pages of The Wireless World.

In making up the set, I endeavoured to embody the very latest ideas as expressed by several writers, which, together with a few of my own, won me a total of 97 points out of 100.

Liverpool.

E. B. JONES.

SHIELDING AND H.F. RESISTANCE OF COILS.

Sir,—I have read with great interest the papers of Dr. Smith-Ross on the matter of "screening," or, as we term it, "shielding," and wish to correct the fallacy in this paper which is frequently used to substantiate the argument that shielding is as unnecessary as unshielded coils.

In your issue of September 3rd, p. 235, you printed a letter from Didsbury.

Sir,—I noticed at Olympia that the 1,000-hour rate of discharge has been adopted as the standard for calculating the capacity of slow-discharge accumulators, a rate which is almost always much slower than that of the average user. I consider that 200 hours would be a much more suitable period of discharge; the "2,500 milliamp. hour" H.T. accumulator would then be discharged at about 8 to 10 milliamperes, and the "25 amp. hour" L.T. accumulator at 80 to 100 milliamperes. Both of these discharge currents are close to the loads applied in ordinary use, and from the point of view of round numbers a 200-hour rate has the advantage of being ten times as long as the 20-hour rate of ordinary accumulators.

D. A. REIL.

BERKHAMSTED, HERTS.

A GERMAN EXPERIMENT.

Sir,—Your Editorial under the above heading is very interesting, as are your views addressed to the B.B.C. that a gramophone performance by first-class musicians would be better appreciated by listeners than a flesh-and-blood performance by poorly qualified amateurs.

There is, however, no reason to restrict such performances to musicians, for gramophone records cover the whole field of entertainment.

In your issue of September 3rd, p. 235, you printed a letter of mine on this same subject, which would appear to have been anticipated and may even have inspired both the Stuttgart experiment and your present Editorial, although I notice that you have omitted to refer to my views.

Your remarks concerning methods of transmission might at first glance appear to smack of sarcasm, although in fact quite to the point, elementary though they be, but the B.B.C. "mandarins" are analogous to present-day schoolboys, i.e., ignorant of such elementary subjects as reading, writing and arithmetic, but possessed of a smattering of biology, psychology and the other "ologies" such as tends to make modern life so stupidly complicated and slipshod.

STRAWBERRY HILL, Didsbury.

HERBERT S. COPPOCK.
A "Star" Programme—And Why.

Harry Lauder, Gracie Fields, Gertrude Lawrence, and Henry Ainley—all in one broadcast programme! The dates: November 8th and now the explanation of this seeming prodigality with the programme money.

Gramophone Announcements.

"Mechanical" vaudeville programmes are to be given on November 3rd and 8th, the complete performances—artists and incidental music—being provided by gramophone records. Further, all the announcements will be made by the same means.

The mechanised artists on November 3rd will include Maurice Chevalier, Socha Guttery, and Yvonne Printemps.

Questions of "Radiofusion."

The Continentals seem much more enthusiastic over land-line relays than the majority of listeners in this country. At the Budapest Conference of the Union Internationale de Radiofusion, concluded last week, plans were discussed for developing the present sporadic policy into a vast scheme of international exchanges.

Fighting Electrical Interference.

That the Conference carries weight no one can doubt. Eighteen countries were represented, and fourteen postal administrations actually sent delegates. Some useful talk was bestowed on the menace of electrical interference with broadcast reception. So serious has this become that the Conference has appointed 'competent committees to follow up the question."

The Tourist’s Portable.

For the first time, I believe, in the history of these conferences, the delegates discussed the question of tourists’ portables. It was high time.

Criminal tendencies are still imputed to the tourist. He is an outlaw. He passes furtively from one country to another, filling up a form here, dropping a pourboire there, until he begins to wonder whether it would have been less trouble to take the grand piano!

Wireless Passports?

The aim of the Radio Union is to bring about a standardisation of Customs charges for portables, or, better still, to institute a system of wireless passports whereby a single document would enable the tourist to take his set from country to country without further trouble.

Flaws in the plan may be discovered when the various countries begin to consider the portable as a possible weapon for espionage.

Future Meetings.

The next meetings of the Union are to be held at Semmering (Austria) in February, and at Stresa (Italy) in June.

OCTOBER 29th, 1930.

Wireless World

Broadcast Brevities

By Our Special Correspondent.

Armistice Day.

The Prince of Wales will broadcast the "Poppy Day" appeal on November 10th.

Armistice Day, in addition to the service from the Cenotaph, will include a special evening broadcast entitled "In Memoriam." The music of Elgar will form the background to a programme built up on the works of the War poets: Rupert Brooke, Julian Grenfell, Edward Shannon, and others.

At 10 o’clock British listeners will hear the "Last Post" and Reveillé played by the Belgian trumpeters at Menin Gate.

"KIR: RADIO TORINO!"—Signora Maria Corsius, the new lady announcer at Turin, who was chosen from 180 candidates. The necessary qualifications included not only the possession of a pleasing voice, but the ability to read market reports in a clever and original manner.

Mr. Baldwin to Broadcast.

Mr. Stanley Baldwin’s speech at Ashridge, the Bonar Law College, will be relayed to London Regional on November 8th. The ex-Prime Minister’s speech follows the first dinner of the Ashridge Fellowship, and is entitled "Education in Citizenship."

Something for Everybody.

"The best Diversion” hour yet” is the description which a B.B.C. official applied in advance to next Friday’s effort (October 31st). Although, of course, the exact details are not divulged, I can state that the ingredients include the full National Chorus, directed by Stanford Robinson; a glimpse in a broadcasting news room, showing how news is collected and prepared for the microphone; a relay of "El Dorado" from Daly’s Theatre; and the debut of a new quartette.

Friday’s "Diversions" will be staged at the usual hour of 8 p.m.

National Lectures Demand Alternatives.

I hope that the B.B.C. will provide a suitable alternative programme on November 28th, when Mr. Reginald McKenna delivers a National Lecture on “The Economics of Finance.”

When the Lord Chief Justice gave the last National Lecture, on March 24th, there was no alternative, and the address, fascinating as it was to most intelligent people, lasted fifty minutes.

Please, B.B.C., provide an alternative to "The Economics of Finance," if only to spare our feelings the financially embarrassed.

"Michael Faraday,"


A Good Idea?

Presumably to put us in a receptive mood for what is to follow, the B.B.C. is experimenting with a quarter-hour interval of silence before the opening of the Wednesday evening symphony concerts. I confess that the innovation leaves me frigidly calculating that it will rob listeners of 5½ hours of programme time between now and next May.

No.

Admittedly many musicians would be distressed if their evening with Bach or Beethoven were prefaced with fifteen minutes of comedy patter, but if such an item is on the bill between 7.45 and 7.55 they need not listen. Five minutes should be the maximum period of silence; this would give the music-lovers an ample chance to tune-in in good time without being outraged by the preceding items.

Big Receipts: Few Free Seats.

By the way, the rush for season tickets for these concerts has been mighty enough to suggest that financial success is already assured. The more optimistic prophets at Savoy Hill foretell a 200 per cent. increase on the total takings this winter as compared with last year.

The "free list" has been cut down by half.

To-day and To-morrow.

But the time is coming (as we saw at Olympia) when broadcast receivers will give so perfect a rendering of the original that no one will give two brass terminals for a seat at the Queen’s Hall. Meanwhile the B.B.C. is wise to make hay while the cone rattles.
A selection of queries of general interest is dealt with below.

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.

---

**Altering the local-station position in a multistage receiver.**

The purpose of the condenser C (which may be of the semi-variable compression type, with a maximum capacity of about 0.0003 mfd.) is to prevent any change in tuning due to removal of a large proportion of the available arial capacity. Adjustment of this condenser need only be made once, and should present no difficulty: with the switch in the "local"

---

**Filter Proceeding Neutralised Triode.**

A selection of queries of general interest is dealt with below.

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.
Radio Engineers from the earliest days of radio, equipped to produce quantity with the same meticulous perfection as a single part. That is why an Ormond product not only gives the best results, but proves easily the best value for money.

The Ormond name is a guarantee that satisfaction is certain.

The **ORMOND** Range of LOUDSPEAKERS

The Ormond House, Rosebery Avenue, London, E.C.1

Phone: Clerkenwell 5534-5-6 & 9344-5-6.

Grams: "Ormondegi, Smith."

**for PUNCH, POWER.**

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

Here is an opportunity to make permanent gramophone records of your children's voices, musical talents, greetings and messages of your relatives and friends or of your own voice. The records are made by a simple device connected to your radio set and gramophone. Complete apparatus with six double sided records, PRICE £4.12.0

Extra records 4d.

Parts may be bought separately.

INEXPENSIVE.

FAITHFUL REPRODUCTION.

PERMANENT.

ENTERTAINING.

Write for full details and descriptive leaflet explaining the secret of this wonderful home recording device to:-

CAIRNS & MORRISON, Ltd., 33 Percy St., LONDON, W.1

Telephone: - Museum 6564.

N & K INDUCTOR LOUD SPEAKER

"The performance is remarkable for the unusual output in the bass. . . . . The general effect is perhaps the closest approximation to that of the moving coil that has yet been achieved with a moving iron armature."

-Wireless World Test Report, July 30th

Chassis Complete £3 10 0

Also in Cabinets and on Sound Screens of distinctive and artistic design.

The N & K PICK-UP, developed on entirely new principles will reproduce Gramophone music at its best.

Illustrated catalogues free on request.

A. BRODERSEN,

11, Northampton St., Goswell Rd., LONDON, E.C.1.

'Phone: Cleekenwell 7286

S.O.S

SAVE OR SPEND?

YOU WILL SURELY SAVE if you adopt a REDFERN Accumulator TRAY

in which to stand your accumulators.

The Anti-Slipping Tubs of which 5" x 5" - 5d

These Tubs are made in 4" x 4" - 2d

Fertiliser, Pool Covers, Cables etc. 1 14"x4" - 5d

REDFERN'S RUBBER WORKS LTD., Hyde, Cheshire.

"READI-RAD"-PROVEN PERFORMANCE COMPONENTS

"HILO" H.F. CHOKE

A real "De-luxe" H.F. Choke—high inductance, extremely low self-capacity. Efficient over tuning range of 50 to 1,000 metres. Solid ebonite hand-turned form on bakelite base. Price 4/6

Ready Radio

159, Borough High Street London Bridge S.E.1

Phone: Boy 6015.

RADIO DATA CHARTS A SERIES OF ABACUS

Providing most of the essential Data required in receiver design

By R. T. BEATTY, M.A., B.E., D.Sc.

All keen amateurs will appreciate this book.

PRICE 4/6 net

BY POST 1/10

From all leading bookstalls, or direct from the Publishers.

The ELEMENTARY PRINCIPLES of WIRELESS TELEGRAHY and TELEPHONY


The standard book of instruction for wireless beginners and students.

This new and revised edition brings the whole subject into line with modern developments in wireless. The style is clear and simple and attention is given to the theoretical elements of electricity and magnetism: to the dynamo; to the properties of waves. A leaflet which gives full particulars of the volume, including a synopsis of the chapters, will be sent on request.

PRICE 10/6 net, by post 11/

From all leading bookstalls or direct from the Publishers:

ILIFFE & SONS LIMITED, DORSET HOUSE, TUDOR STREET, LONDON, E.C.4

DIRECT TO ALTERNATING CURRENT CONVERTERS.

FROM 50 WATTS UPWARDS.

PRICE, 50 to 100 WATTS, £10-0-0.

In order to show construction, end shields removed.

LANG & SQUIRE LTD., WALES FARM RD., ACTON, W.3.

Phone: Chis 0493.

Sent for Lists.

S.O.S -- SAVE OR SPEND

YOU WILL SURELY SAVE if you adopt a REDFERN Accumulator TRAY

in which to stand your accumulators.

The Anti-Slipping Tubs of which 5" x 5" - 5d

These Tubs are made in 4" x 4" - 2d

Fertiliser, Pool Covers, Cables etc. 1 14"x4" - 5d

REDFERN'S RUBBER WORKS LTD., Hyde, Cheshire.

"READI-RAD"-PROVEN PERFORMANCE COMPONENTS

"HILO" H.F. CHOKE

A real "De-luxe" H.F. Choke—high inductance, extremely low self-capacity. Efficient over tuning range of 50 to 1,000 metres. Solid ebonite hand-turned form on bakelite base. Price 4/6

Ready Radio

159, Borough High Street London Bridge S.E.1

Phone: Boy 6015.
NOTICES.

THE CHARGE FOR ADVERTISEMENTS in these columns is :—
10 words or less, 2/- and 3d. for every additional word.

Each paragraph is charged separately and name and address must go together.

Send copy to the nearest address, SCIENCE PRESS, 127, Stamford St., London, S.E.1.

SPECIAL DISCOUNTS are allowed to Trade Advertisers for annual or half-yearly reductions. Full particulars are given on application.

Without further delay, advertisers are requested to forward copy for insertion in the following issue. A set is printed at day, and in the absence of fresh instructions the entire "copy" is returned from the previous issue :— 13 consecutive insertions 6/-; 26 consecutive, 10/-; all consecutive, 15/-.

ADVERTISEMENTS for those columns are accepted up to the 1st 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, Mansion House, London, E.C.2; 590, Desangrand, Marseille; 101, St. Vincent Street, Glasgow, C.2.

Advertisements must be in typewritten form and be accompanied by remittance at the rate of £1 per word, to be charged with 2 1/2d. each extra for first typewritten word. 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 must be made payable to Iliffe & Sons Ltd., and crossed & Co. Notes being unpayable if lost in transit shall not be sent as remittances.

All letters relating to advertisements should quote the number and page of 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. Advertisers are warned against sending their material to account at their discretion.

NUMERED ADDRESSES.

For the convenience of Advertisers, advertisers, letters may be addressed to numbers of "The Wireless World" office. Where this is desired, the sum of 6d. to destroy the cost of not more than 50 addresses, or on request, at the rate of 1d. per word, to be added to the advertisement charge, which must include the words, "For..." or "Wireless World." Only the number will appear in the advertisement. All replies sent to "For..." or "Wireless World" must be accompanied by deposit of 1d. per number, otherwise they will be returned.

The seller takes the risk of loss or damage in transit, and the sender must inform the recipient thereof. If goods, or any part thereof, are not returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.

THE WIRELESS WORLD.

When you have read this number of the wireless world, and have decided not to retain goods, they must be returned to the seller, but if not, seller instructs us to return to the sender.

WIRELESS WORLD.

Have you had your copy of the wireless world by advertisement?—Yes, I have. Have you had your copy of the wireless world by advertisement?—Yes, I have.
20

THE WIRELESS WORLD

ADVERTISEMENTS.

OCTOBER 29TH, 1930.

Receivers for Sale.-Contd.

Chargers and Eliminators.-Contd.

23/10. -5 -valve Transportable. complete, less valves,

ROMPTON Rotary Convertor, 200-220v. D.C. input

-fitted turntable; snip, £3/10!-Frost, 132, St.

dew

evenings.-Olds, 102, Gaisford St., Kentish Town.

to --give 50 cycles R.C. output, with starter, fre
quency meter 50 cycles, voltmeter 0-250, and Zenith
D.W. transformer; £12 all; loco.-"Rhapsody-Twin,'
22, BunhrIl Row,-EA.1.
[1886

-VALVE Portable, receives Continentals, complete;
£5. --2, Dollis Hill Av., Cricklewood.
[1908

GILJAY 200-50 D.C. Charger, output 15 volts, 5
amps.; £3; guaranteed.-Harris, 67, Redlands
Rd., Penarth.
[1855

John St., E.C.1.
-.[1925
EVERYMAN Four; £8, bargain; demonstration
-

[1909

EVERYMAN Four, powerful and high quality, perfect, valves, coils; £6, or nearest. -27,- Sneath

--

Av., Golders Green, Ñ.W.11.-

SALE or Exchange. -210v.
Davenset station
charger; £18; would'entertain part exchange -for
garage type: or 6a Tungar.-Norton and Shapley, Lucius
St., Torquay.
[1858

[1906

NEW 3 -valve Receiver, good components and-"cabiIN net; £3; " W.W." deposit system.-R. Phillips,
48, Somerset Rd., Teddington, Middlesex.
[1906
3 VALVE S.G. Cossor "Melody` Maker, H.T. eliminator,

large Brown horn loud -speaker, complete;; ' £7.Battersby, 45, Stanley Park Rd., Carshalton, urrey.

ECG 1930 A.C. Eliminator, type 3F20, 200-250v.
input, output 150v. 60v. and S.G. tapping; £3/3.

Compiled by the

Staff of

[1893

AT Third Cost Price.-Burne-Jones special built Receiver, 2 R.I.R.C.C. stages, RI. push-pull output,
P625A, P625, P.M.5X valves, wired for gramophone
nick -up, exceptional tone and range (£12/10), with
Ecko 100m.a. 200-250v. D.C. Eliminator; £15.-Tetley,
9, Prince;Wales Teri., London, W.8.
[1836
PHILLIPS' 2 -valve Amplifier, cost 45/-, 16/6;
Celestion balanced armature unit," 12/6; Marconi H.T. unit, "D.C.; 18/6; c.o.d.-4, Brecon Rd.,
Ilandsworth, Birmingham.
[1943
-

--Bickerton, 21, Russell Gardens, Golders Green.
A BRIEF SURVEY

Claude Lyons Lta

SCIENCE" OF RADIO

SAVAGE'S Specialise in Wireless Power from the
Mains; reliable apparatus at reasonable prices.
SAVAGE'S Transformer Laminations and Bakelite

and dealing with

the varied

uses

Bobbins; intending home constructors should write

for list.

of "CLAROSTAT ' Products, etc.

- IT'S FREE -

SAVAGE'S Reliable Smoothing Condensers, 1,50C
volts D.C. test, 1 mfd. 2/-, 2 mid. 3/-, 4 mfd. 5/3:
500 volts D.C. test, 1 mfd. 1/6,-2 mfd. 2/3; 4 mfd
SAVAGE'S Power Chokes for the Power Pentode Two.

smoothing L:C.36G, 181-;
output L.0.36P.G.,
19/6; many other types available, write for list.

BRIEF SUMMARY

ACCUMULATORS-BATTERIES.

GUARANTEED H.T. Batteries Direct from Factory.
to You. -The Constant H.T. battery at factory
prices, 40% less than other well known batteries: 66
volt battery, 4/9; 99 volt battery, -6/9; -108 volt

A " Foreword " of considerable importance to you.Standard Clarostat, including Manufacturing Types.Power Clarostat, 35 Watt.: How to build a SuperEliminator.-The Volume Control : [[ow to use it :
Distant
12 Circuits.-The Table -Type Clarostat :
control of volume.-The Super -Power 'Clarostats
(250 Watts.) : How to use them.-" HUM-DINGER
Clarostats and their functions: 3 Circuits.-(The
Hum-Dinger" is essential in all mains -operated

Marchmont St., W.C.1.

Bias, Decoupling and Grid -Suppressor Wire -wound
Resistances : How to use them (Circuits).-The New

WET

Battery Replacements,

new

process

sacs,

approximately .30,000 ma.; 2/6 per dozen;
particulars free.-Scottish -$atteries, Braeside, Uphall
Station.

[1728

battery, 7/6; 120 volt battery, 8/9; each battery has
a guaranteed life of 250 hours at a discharge-. of 10
m.amp; postage 1/6.-The Constant Battery Co., 80,
,[1820

--

ACCUMULATOR HIRE.
DON'T Buy Dry Batteries, join our service; we keep
you continuously supplied with fully charged
C.A.P. high tension accumulators, by regular exchanges, anywhere within 12 miles of Charing Cross,

less than the cost of unreliable dry batteries;

for

nothing to buy-no deposit, payment on each delivery
or by quarterly subscription; if your dry batteries have
been in use for one month or more we definitely guarantee that accumulators will give better and more selective reception; we also give the same service with low
tension accumulators or maintain your own at equally
advantageous 'terms. from the smallest portable size
upwards; over 10,000 satisfied users:-Write or 'phone
now to London's largest, most efficient and complete
wireless accumulator service, for their interesting folder
132, post free.-Radio Service (London)
Ltd., 105,
Torriano Av., Camden ltd., N.W.5. 'Phone; North
0623 (3 lines).
[1466

CHARGERS AND ELIMINATORS.
PHILIPSON'S Safety H.T, Supply Units are Famous
for Reliability and Silent Working.

etUR New Prices Again Make Them Famous for
Value; for D.C. mains model D.C.4 gives 120v. at
15 ma., 27/6;;D.0.5. 150v. at 25 m.a., 1 fixed, 2 var.
tappings, 35/-; for.A.C. mains model A.0.7; 120v. at
20 ma., £3; A.C.5. 150v. at 30 m.a., 1 fixed, 2 var.
tappings, £311716; A.C.6, for 25 cycle mains, £5.
$.'T. Supply Units are Guaranteed for 12 months; write for our booklet,
pHILIPSON'S'Safety

" Radio Power."
PHILIPSON and Co., Ltd., Radio Engineers, Astley
Bridge, Bolton. 'Phone: 2038. 'Grams: Safety,
Bolton. Est. over 50 years.
[0318
TANTÁLUM and Lionium for A.C.Rectifiers, blue
11

-

-

[1209

CHESTER -BROS.-All: types- of mains transformers
kJ and chokes to any specification.-Chester Bros.,
fIRESTER BROS.-Type V3 220+220v., 35 ma., 5v:
lvJ 1.6a., C.T.,- 4v. 4a. C.T., 27/6.
CHESTER EROS.-Type W.10, for HT., 3 or, 4, output 135v. 50 m.a. and 4v. 4a., C.T.; 23/6.
CHESTER BROS.-Smoothing chokes, constant inductance, type C.B.2, 45 henrys, 25 ma.; 15/-.
ClIESTr,Zt BROS.-Write for lists of standard
models. Please note change of address.
[I477

[1856

ELIMINATOR Godwinex, D.C., 4 tappings, conddiI
Lion and performance as new; 25/ -,-Thomas, 75
St. Mary's Terrace, Bradford.
11855

THEIR A"PlICATIONS

SAVAGE'S Mains Transformers for the New Westing.
house Units; please write for list.
SAVAGE'S New Foreign Listeners' Four Equipment.
-Transformer, N.F.L.4, 33/-; smoothing. choke,
C32G, 20/-; output choke C32/0, 20/-.
SAVAGE'S " Wireless World " Four Equipment.
k7 mains teransformer, W. W.4, 34/-; smoothing and

radios).-The New Clarostat Type " F.W." Grid CLAROSTAT GENUINE CONTINUOUS WIRE HIGH -RESISTANCE POTENTIOMETERS : How to use them : 24

Valuable Schematic Circuits.-The New Clarostat
Type " F.R." Flexible Resistors and Type " F.C."Fixed Tap genuine wire resistors.- G.R." Type
365 Rectifier Transformers and Type 366 Double Choke "B.A.T." D.C., H.T. ELIMINATORS.-How
to make an entirely satisfactory D.C. Mains Unit at
home.-" B.A.T.' A.C., H.T. ELIMINATORS.-' KIT for the home -construction of satisfactory A.C.
Mains Units.-Scale wiring plan and instructions for

bias chokes, type W.W.4C, 16/- each; centre tappet

SAVAGE'S Mains Transformer, B.T.4, 500-0-500 volt:
120 m.amps., 71/2 volts 3 amps., 6 volts 3 amps.

4 volts 2 amps., 4 volts 1 amp., 4 volts 1 amp., all
centre tapped, specially developed to facilitate automatic bias in all stages; 57/6.
SAVAGE'S Mains Transformer, V.T.37, 250-0-25(

volts 60 m.amps., 4 volts 1 amp., 4 volts 1 amp.,
4 volts 1 amp., 4 volts 2 amps., all centre tapped, a
useful instrument for modern receivers with automatic
bias in every stage; 35/-.
SAVAGE'S Mains Transformers and Power Choke:
..

are carefully constructed from first class material:
with an exceptionally generous margin of safety;. they
are fully guaranteed and may be purchased with con-

SETS '

A.C. ELIMINATORS.-The ' C.R.A." New Filamentless,

fidence.

long -life, Rectifier Tube, " G.R." Type U.X. Socket
for American Tubes, ' B.A.T.," " Q.M.B.' Switches,
B.A.T." L.T. SUPPLY UNITS : How to build 1.0

SAVAGE'S Have Moved to Larger Premises; please
note .new address: 292, Bishopsgate, London.
Telephone: Bishopsgate 4297.
[1784,

or 2.0 Ampere Models satisfactorily at home. BATTERY
CHARGES (I and 2 Amp.).-High Voltage Smoothing

E.C.2.

METAL RECTIFIERS.-Five
' WESTINGHOUSE"
selected and recommended METAL RECTIFIER Circuits.-

RADIELLE Model R.K. (200-250v. A.C.), output
400 volt 80 ma., 2 variable. and 1 S. grid tappings; cost £15. sell £5; brand new.-Priestley, 8.

and Bye -pass Condensers and Condenser " Packs."THE


The New and Interesting " B.A.T." " UNIVERSAL "

MAINS TRANSFORMER.-" B.A.T." Power Transformers
for all Circuits.-" B.A.T." Power Chokes for all

BRYCE'S.-"Wireless World " Four - Mains trans.
formers, A.B.4;- 26/6; guaranteed; write for
lists.-Bryce's, - 54, Dawson St., Bury,

Circuits.-Recommended D.C. Eliminator Circuit:
" Raytheon" A.C., H.T. Unit Circuit: Adding
Variable Tapping to an Eliminator: Adding Variable
Grid -Bias to an Eliminator.-Recommended Gramo-

-

transformer
Lancs.

Luxe Push -Pull Output Battery -Operated and " PAM "
(Reg'd. Trade Mark) A.C.-OPERATED AMPLIFIERS.Four exceptionally useful "Gadgets": Wall -Insulator:
" G.R."
American to European Valve -Adapter ;
No. 446, 4 -Terminal Voltage Divider. " B.A.T."
Gramophone Pick-up Scratch -Filter."

[1920

MAINS Transformers and Chokes Made to Speeifica-

tion in 24 hours.-Challis, 22; Park Rd., Rugby.

[1915

Previous Editions of
the rE CLAROSTAT " BOOK:

CABINETS.

/925 -1st Edition xo,000 copies, 12 pp.
1926 -2nd
16
15,000
2928 -3rd
25,000
24 ,:
1929 -4th

1930 -5th

50,000

32

,

CABINETS to Your Own Requirements; quotation;
by return.-Hammonds, 1, Stratford St., Nun.

baton.

,,

50,000
48
TO BE RIGHT " UP TO DATE " IN
RADIO, YOU MUST HAVE THIS
VALUABLE BOOK.
POST FREE.

SEND NOW, IT IS FREE, AND

[1899

REGENTONE W5 H.T. Eliminator, L.T. trickle
charger, 230-250 A.C. mains; £4/15, listed
£511716.-" Redcot," Arthur's Hill, Shanklin,

phone Pick-ups and Turn -Tables.-" BAT." De -

i

[1234

DIGBY'S Cabinets.-Table models in solid oak ant
mahogany; from 11/6 to 71/-.
DIGBY'S Cabinets, fitted with Radion or Resistor
ebonite if required.
IGBY'S . Cabinets.-Pedestal model, with separate

battery components; from 56/- to £12.

DIGBY'SCabinets Made to Customers' own Designs

.

CLAUDE LYONS Ltd.
76 OLDHALL ST., LIVERPOOL.
40 BUCKINGHAM GATE, S.W.1.

TI IGBY'S Cabinets.-Write for new 16 -page art cata.

'Phone: Bishopsgate 6458.

V 63,

[0128

for All Requirements.-F. W.
Shaftesbury St., London, N.1. Clerkenwell

Mention of " The Wireless World," builtén writing to advertisers. will ensure profnjot attention.

DS2


A recent user writes:

"You will be pleased to learn that from my last advertisement in 'The Wireless World,' letters reached me from EGYPT, NATAL, SOUTH AFRICA, and goods were sold to a person residing in MALTA.

This undoubtedly proves the high value of your paper."

WILLIAM WINFIELD,
4, ARTHUR ST.,
HULL ROAD.
W.W.3.

---

Egypt

Natal

South Africa

Malta

High Value!

"You will be pleased to learn that from my last advertisement in 'The Wireless World,' letters reached me from EGYPT, NATAL, SOUTH AFRICA, and goods were sold to a person residing in MALTA.

This undoubtedly proves the high value of your paper."

WILLIAM WINFIELD,
4, ARTHUR ST.,
HULL ROAD.
W.W.3.

---

Make Use of The Wireless World DEPOSIT DEPARTMENT

A recent user writes:

"Please accept my thanks for the services rendered in the purchase of the Eliminator which I have decided to keep. You can therefore forward the money to the seller with my thanks.

"I shall always praise your Deposit System which is the safest way of dealing with strangers that I know of."

W. H. THEWLI,
49, Webster Street,
OLDHAM, Lancashire.

Full particulars of "The Wireless World" Deposit System are given on the first page of Miscellaneous Advertisements.

---

Malta

COILS, TRANSFORMERS, ETC.

COILS.

VAR Coils—Exclusive practical models in radio and phonograph coils. 50% cheaper than others, used and recommended by the most distinguished and discriminating radio experts.


- B. ALEXANDER. Creditors list free, radio; any make, from 7½; unbeatable value—Artcraft Works, Great Eastern Rd., Croydon. Established 1895. Phone: 1891.


- A. G. B. G. Co. We are the only manufacturers of the new type of Miniature Coils, with a resistance of 500 ohms, with high value of your money.

- A. C. W. W. Coils; D.C. Three coils, 37½ per set, as specified; c.o.d. or deposit.

- W. H. THEWLIS, 4, Arthur St., Hull Road, York.

- K. M. Motor Generator, 500r. c.p., output, 500v. 1250 watts; 6½, and 6v. simple; complete with H.T. and T.T. smoothing, practically new, cost £22, accept £11. Lythalls Lane, Coventry.

- GRAMOPHONES, PICK-UPS, ETC.

- B. T. M. Pick-ups and Tone Arms, crafted, 22½ each; send for list—G.V.M., 714, Bridge St., Rugby.

- EISEN 3½ Codes, 10/-, perfect; volume control, 2½; magnet, 1½, 1½—Briggs, Carlton Rd., Hull.

- ULTRA-CRAFT Cabinets, in mahogany, walnut and oak.

- LOUD-SPEAKERS.

- GRAHAM FARISH 42!

- MAJOR Farish Speaker.

- SHELBURNE RADIO 36-page booklet, "Sound Advice is Yours for the Asking!" write now for new edition; see displayed advertisement on page 21.

- "REALISTIC Speakers, true to name, the greatest advance in perfection, and a cone or horn type, write today for particulars; Realistic phonos and speakers demonstrated daily—Realistic Speakers, 78, Preston St. N.1; also 52, Broadwater Rd., Worthing."

- We make no extravagant claims for the new Graham Farish Speaker. It simply tells the truth—without distortion. We only invite your comparison with any other Speaker near the price, or treble the price if you will....we will let your ear decide. You will agree that never before was such value offered at such reasonable cost.

- Driven by adjustable pole unit, the Graham Farish Speaker is obtainable in three distinctive finishes, mahogany, walnut and oak. Price 4½!"
**POWER CHOKES guaranteed twelve months**

substantially built, for smoothing circuits in eliminators dealing with currents 200 to 300 milliamperes, inductance 30 henries.

**REPAIRS**

8/6 C.W.O. to any make of L.F. Transformers, Loudspeaker or Headphones. All repairs dispatched within 48 hours. TWELVE MONTHS' GUARANTEE with each repair. 4/- Post Free. Cash with Order.

**Transformers Repair Co.**

Dept. W.,

953, Garratt Lane, Tooting, London, S.W.17.

**ARE YOU ON D.C.??**

If so you can make your set a MAINS Receiver for 30/-

A most marvellous Eliminator.


Charge your accumulator. Improves set 30%. Perfect reproduction and no hum whatsoever.

*FULLY GUARANTEED.*

Solo Notes:

E. PAROUSSI,

40, Featherstone Buildings, High Holborn, W.C.1.

Phone: Chancery 7010

**Polar Condensers**

A Universal Range.

**NEW 24-PAGE CATALOGUE ON REQUEST.**

WINGrove & Rogers, Ltd.,

188-9, Strand, London, W.C.2

**Metal Cabinets**


PRICE 5/- each.

Suitable cabinets from 22/- each.

Standard Brace Frames from 2/- each.

Oak, Mahogany and Mahogany on above.

Rigby and Woolfenden, Rochdale.

Tel. 3146.

**Exide Batteries at Less than Half List Price.**

Surplus stock, slightly used, supplied fully charged and guaranteed with acid. Inspection invited.

70-volt High Tension batteries consisting of heavy capacity 85-10 volt units in Exide cases. £1 6/6. An opportunity not to be missed for giving up noisy dry batteries or eliminators and installing a really satisfactory source of high tension supply.


10-volt units, 2-volt tapping for grid bias type W.J.G. 27.

Terms—cash with order. Seven days’ approval.

J. Weaver, Britannia Works, King’s Road, Camden Town, W.1.

**March 3556.**
OILYMA’S BEST!!
Our 1931 model
SUPER POWER MOVING COIL SPEAKER
WRITE NOW for free copy of 32 PAGE BOOKLET on REALISTIC REPRODUCTION

THE VERY BEST of all Electro-Magnet and Permanent Magnet Moving Coil Speakers are MADE BY

Baker’s 'Selhurst' RADIO

OFFICES: 89 SELHURST ROAD, S. NORWOOD, S.E.25.
WORKS AND DEMONSTRATION ROOM: 42 CHERRY ORCHARD ROAD, E. CROYDON.

OCTOBER 20TH, 1930.

THE WIRELESS WORLD

Advertisements for “The Wireless World” are only accepted from firms who pay the rates set by the Wireless World.

LOUD-SPEAKERS—Contd.

Genuine Blue Spot 66a Units: 8/6 each. 
Baker's 'Selhurst' Radio

APPLY Lion Speaker L18, power chassis: £3— 
N.E. 

SPEAKERS, 18 x 1 x 1/4 polished oak, 17/2, floating boom, tuned for 400 cycle. Telephone unit, specified tones: 2H/6; other units fitted—Parke Radiograms, 7/2, Lymnape Lamps, 3/6.

APPLY Cabinet Loud-speaker, 3/6; Hope's chassis, 4/6; latest types, newly new.-22, Pur- 

chaser Sq., W. 2.

Poch Moving Coil 6 volt, complete in heavy oak cabinet; £4 10s-Pinchbeck Brandon, 


COMPONENTS, ETC., FOR SALE.


COMPONENTS Lent on Hire. Details from Alexander Block, Wireless Doctor, 55, Ebury St., S.W.1. £15 15s. (ditto)

AMETERS. Hot wire, 0.1, 0.6; new moving coil milliammeters, 0.5 upwards. 0/6; portable milliammeters, 50m. scale. 0.200 upwards. 0/6; double range voltmeters, 0.2, 0.5; instruments repairs and alterations of every description; send for list. The Victor Electric Co. 47, High St., Battersea, S.W.1. (1922)

VALVE Screens, 5/6; coil screens, 2/6; choke screens, 2/6; as specified in "Wireless World." (1922)

C, Speakers, pick-up, cone speakers, microphones, transformers, etc., send for list.-G.V.M., 91 Bridgert St., Rugby. (1923)

M.T. VICK 200/130 Rectifying Transformer, 10/6; 250/20 micro transformers, 1/-; Eischeid 5/08 holding trans. 1/-; 50, 100 micro transformers, 1/-; (1922)

M.T. VICK 200/130 Rectifying Transformer, 10/6; 250/20 micro transformers, 1/-; Eischeid 5/08 holding trans. 1/-; 50, 100 micro transformers, 1/-; (1922)

BARGE.—Brown’s horn speaker, perfect condition, 12/-, cost 20/-; Radio thermometer, 2/- cost 4/6, 135 yards about suitable electric wire, 2/6, cost free—not, "N. Woodville," Llandrindod. (1923)

A.R. Force 2-volt Transmitters, Mark II, contains transformer, chokes, high voltage condensers, am- 


used by those who know.

COLVERN COMPONENTS are SPECIFIED in ALL THE LEADING SETS.

Price

Type TCSC with ganged wave-change switch. Coupling condenser and tapping points.

THE "WIRELESS WORLD" FOUR

By F. G. Haynes.

COLVERN wire wound resistances.

THE D.S.G. FOUR in the "CHRONICLE" WIRELESS ANNUAL.

2/6 and 3/6 Accurate to within 2 per cent.

VARIABLE COLVERNSTAT

5/6 Wire wound, smooth movement and continuously variable.

HAVE YOU THE COLVERN BOOKLET?

COLVERN Ltd.

MAWNEYS ROAD, ROMFORD, ESSEX.
For any or all of the following yards, also strongly amplify and transmit speech and music over a distance through Loud Speaker.

A new Instrument, BRITISH MADE THROUGHOUT,

ON SHORT WAVES FROM ENGLAND

WITH OR WITHOUT VALVE AMPLIFIER

IN USE ALL OVER THE WORLD

27, FITZROY STREET, LONDON, W.1

THROUGH LOUD SPEAKER

IN USE ALL OVER THE WORLD

AUXILIARY DEAF-aid, Loud Speaker, Valve Amplifier, or Wireless Set

Nect Super -Microphone to Radio Headphones, all

SPECIAL MICROPHONE TRANSFORMER for connecting Super -Microphone for purposes-

EQUIPMENT KNOWN,

EQUAL SENSITIVENESS KNOWN,

LOUD SPEAKING

FOR DISTANT DEAF AID, M.0

FOR CALL FROM BEDROOM, THROUGH BABY ALARM

FOR DEAFNESS IN INVALIDS

FOR ELECTRIC SOUND DETECTION

FOR DETECTING RECEPTION THROUGH LOUD SPEAKER

DURING DINNER PARTIES

FOR ELECTRIC WIRELESS BELL

FOR AUTOMATIC WIRELESS HORN, Etc.

FOR COUPLED WIRELESS BELL, Etc.

FOR TRANSMISSION TO USES PAINTING, ETC.

FOR TELEPHONE, DEAF AID, SUPER -MICROPHONE

FOR USE IN COMMUNICATIONS TO AND FROM AUTOMATIC FAX DEVICES

FOR TELEPHONE, DETECTAPHONE, ETC.

FOR TELEPHONE, AUTOMATIC TELEGRAPH, ETC.

FOR AUTOMATIC TELEPHONE, DETECTAPHONE, ETC.

FOR USE IN THE SERVICE OF THE HANDICAPPED

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

FOR USE IN ANY OF THE FOLLOWING OCCASIONS

A GREAT DEAL SAVED—FOR SALE.

BY POST 2/10.

IF YOU ARE PLANNING A Wireless installation, let us give you the best advice. We have a wealth of experience in all branches of Wireless work.

Contact us for full information on the subject.

ILIFFE & SONS LIMITED

Dorset House, Tudor Street, LONDON, W.C.2

TUNING COILS and METHODS OF TUNING (1925)

By W. James

A VERY useful manual giving the maximum of information on the subject of tuning circuits, with explanations of spade, condenser and variometer tuning. Other chapters treat in detail of the choice, construction and design of coils, and give particulars as to size of coil required, the best shape, size of wire, type of insulation, and the various coils.

Price 2/6 net.

By Post 2/10.

From leading bookstallers or direct from the Publishers:

ILIFFE & SONS LIMITED.

Dorset House, Tudor Street, LONDON, W.C.2

THE WIRELESS WORLD

October 29th, 1930.
The Tuner for ALL circuits

This tuner is practically indispensable for all circuits now that the new broadcasting arrangements are being developed. The Watmel Tuner selects—it gives absolute separation. It is efficient—volume and tone do not suffer. Its special winding and loose aperiodic coupling make it a Universal Dual-Range Tuner and a wave-trap as well. It is specified for many successful circuits, including The Sunday Pictorial "FAMILY TWO". It is beautifully finished in Walnut-Bakelite, and order direct to us, and the article is concealed in the base.

Price

WATMEL BINOCULAR H.F. CH OKE

The Watmel Binocular H.F. Choke gives maximum efficiency, very low self-capacity and an extremely restricted field.

**TYPE DX3**
- Inductance: 200,000 mH
- Self-Capacity: 1.6 muf. mfd.
- D.C. Resistance: 1.4 ohms

**PRICE 6/-**

**TYPE DX2**
- Inductance: 40,000 mH
- Self-Capacity: 1.2 muf. mfd.
- D.C. Resistance: 9 ohms

**PRICE 4/-**

Components, Etc., For Sale.-Contd.


SECOND-HAND Coops, guaranteed, any c.o.d. or post. "The Wireless World" deposit system.—L.S., 10/6; Mazda P.P. 4/6, 12/6; Coosser 610 H.C., 7/-; 610 H.F., 7/-; P.M. 20/-, 6/-.

VARLEY Pick-up, with Varley universal am., 3£; Hartle wave trap, 4/-; Watmel tuner, 7/-; Marcus universal universal transformer, 10/-; Ferranti O.F.E., 15/-; B.P. Hyperna, 15/-; Consor transformers, 8/9, O.A.V. printed acoumat, 2 and 7, perfect, 9/-.

HYDRA Condensers, 4 mfd., 700v, working, 5/-; ditto, 500 volt, 5/-; Hydra 2 mfd., 700v-working, 3/-; ditto, 1 mfd., 3/-; ditto, 1,000 volt, 1/-; working., 4/-; we only unused 2 mfd., 4 mld., 500v-working, 10/-; each; ditto, one 8/-.

RETAILER'S Bazaar Stock, Rail clearance A.F.—Call and compare 10/-; Philips 500 test valves, 8/-.

MULLAR'D Ferramore L.F. Transformers, 10/-; Consor, 9/-; Ferranti push-pull A.F.3C, can be used as ordinary, 16/-; Ferranti O.P.4C 25/-, 12/-; all goods sent, satisfaction, or cash refunded.

DUBLERIE R.C.C. Unito, 3/-; Polar Ideal slow motion condensers, 0.0002, 5/-, or pair 13/-; Hydra condensers, Fixed 2 mld., 650v, test, 2/6; Hydra 4 mld., 500 volt, 3/-; Hydra 4 mld., 375v-working, 5/-; Hydra 0.01, 6d.

GRAHAM Parish Condensers, guaranteed carry 10,000 v., in various sizes 3, 4, 5, 100, 150, 250, 500, 1,000, 5,000, 50,000, 100,000, 200,000, 500,000, 1,000,000, 5,000,000, 50,000,000 volts; prices 1/6 each up to £5,000,000 and 1/- each over per pound. A. G. A. Ryal, 182, Kennington Rd., London, S.E.11.

MISCELLANEOUS.

SCOTT SESSIONS and Co.—New sets constructed with your or our components, Guaranteed finished workshopmanship, we specify the best in "The Wireless World" circuits; receive, we have satisfied customers throughout the British Isles and in three Continents; if you so desire, we will design and construct high grade private (garrard model) or home (Varley) coupled or un-coupled equipment. For quality, range and selectivity.—Tel. Tudor 5576. Mass Hall, London, N.10.

ALEXANDER BLACK.

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

CONSULTATIONS by Appointment without Obligation.—Will visit. All Electric H.T., L.T., D.C., Grid, Universal transformer—coupled moving-coil speaker, slow speed motor, illuminated dials. Prices from 45 cts.

Write for full particulars and demonstration to:

**TANNOY PRODUCTS**
1-7 Dalton Street,
WEST NORWOOD, S.E.27.
CLIX
For every form of contact
CLIX VALVE HOLDER
Extract from a recent test report in a leading technical journal:

"We have no hesitation in saying that for the short wave receiver it is the best on the market. It is as nearly air supported as possible. An excellent feature is to be found in the new patented clodk giving positive contact to either split or solid valve pins."
Situations Vacant.—Contd.

MANAGER Required for Old Well Established Wireless Manufacturers' Concern, must have had some years' experience in the trade, with knowledge of latest methods of production, tools, etc., and real organisation ability; only men with the highest references and abilities need apply.—State salary, experience, etc., to Box 7888, c/o The Wireless World.

TEST Assistants Required, with previous factory experience essential.—Write, stating age, salary, and experience, to Box 7865, c/o The Wireless World.

TEST Assistants Required, previous factory experience essential.—Write, stating age, experience, and salary required, to Box 7900, c/o The Wireless World.

SITUATIONS WANTED.

ADVERTISER (29), P.M.G. certificate, 12 years' operating experience, good technical knowledge modern radio, seeks position broadcast receiver development, design or maintenance; London preferred.—Box 7897, c/o The Wireless World.

ADVERTISER (26), diploma radio, requires situation South London, design, repair, etc., experienced serviceing; references.—Slater, 8, Whittam Av., Blackpool.

BOOKS, INSTRUCTION, ETC.


1929 and 1929 "Wireless World" for sale; 7/6 per year.—Lejeune, 57, Great Portland St.

"TELEVISION To-day and To-morrow," the complete authorised book on transmission and reception (Baird Experimental): By S. A. Moseley and H. Barton Chapple. Fully illustrated. 7/6 net, from a bookseller, or Pitman's, Parker St., Kingsway, W.C.2.

WIRELESS AS A CAREER.

FULL TRAINING FOR POST MASTER GENERAL'S CERTIFICATE AND STATION ENGINEER'S WORK. Complete Marconi equipment including Auto-alarm. Modern laboratories. Low Fees. Prospectus free. Apply:

TECHNICAL COLLEGE, PARK ST., HULL.

A reader who recently advertised components for sale in the Miscellaneous Columns of "THE WIRELESS WORLD" writes as follows:

"I disposed of everything the next day, and had to send quite a lot of money back.

"On each occasion my advertisement in 'The Wireless World' has proved very satisfactory."

A. E. Gardener,
53, Alexander Road,
W.W.90
Wimbledon, S.W.

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

"TELEVISION To-day and To-morrow," the complete authorised book on transmission and reception (Baird Experimental): By S. A. Moseley and H. Barton Chapple. Fully illustrated. 7/6 net, from a bookseller, or Pitman's, Parker St., Kingsway, W.C.2.

For present broadcasting conditions your set must have selectivity with great amplification, ease of control and complete operation from the mains.

Correctly proportioned, all these features are incorporated in the new Regentone 4-Valve A.C. All-Electric Receiver. This new Receiver is the result of exacting tests in laboratory and workshop and in all parts of the country.

The Regentone 4-Valve A.C. All-Electric Receiver has two stages of amplification, a power detector, and single power output stage having choke coupling to the loudspeaker. True single knob tuning is employed. A further adjustment for volume has been added, and also a wave-change switch.

The cabinet is of polished walnut, designed with modern simplicity. A small escutcheon on the grained centre panel contains an illuminated dial. It is a really beautiful cabinet for a remarkable instrument.

Regent Radio Supply Co., Regentone House, 21, Bartlett's Buildings, Holborn Circus, E.C.4
Tel.: Central 8745 (8 lines)
INDEX TO ADVERTISEMENTS.

GILBERT, Cabinet Maker, SWINDON.

Thirty -page Models RADIO-GRAMOPHONE CABINET.

IRE ACME OF CRAFTSMANSHIP. hand carved ball and claw legs, hand

approved carving. French polished.

ACCUMULATORS ELITE, Hebble Mill, Salterhebble, HALIFAX.

Buy on Deferred Terms—

Buy on Deferred Terms—

THE WIRELESS WORLD

October 29th, 1930.

INDEX TO ADVERTISEMENTS.

Ferranti, Ltd. ............................................ 8
Fenico Co. ............................................ Cover III
Gam-Freden, Ltd. ...................................... 19
Garnett, Whitney & Co., Ltd. .................... 19
General Electric Co. Ltd. ......................... 28
Gilbert, J. C. ......................................... 28
Graham Pursh, Ltd. .................................. 21
Grant, J. H., Ltd. ..................................... 24
Hall Technical College ............................... 15
Ibafic, Electric Co., Ltd. ........................... 12
Lang & Squire, Ltd. ................................. 12
Leicester Ltd. ......................................... 28
London Telegraph College ......................... Cover 1
Lyons, Cables, Ltd. ................................. 26
Marquette Telephone Co., Ltd. .................... 26
McMichael, L. ......................................... Cover 2
Millet Wireless Co. .................................. 14
Mullard Wireless Service Co., Ltd. ............... Cover IV
Percuss, E. ............................................ 17
Pigweel Mfg. Co., Ltd. .............................. 28
Pertin, Ltd. ........................................... 21
Philips Lamps, Ltd. .................................. 5
Pico Radio Gramophone Development Co. .... 28
Rexby Radio ............................................ 4
Reitler's Rubber Works, Ltd. ..................... 18
Regent Radio Supply Co. ......................... 27
R.I. Ltd. ............................................... 4
Rutland Corporation, Ltd. (Electrical) ........... Cover III
Singer Radio Co. ............................ Cover III
Sutherland Magnet Co. .............................. 28
Six-Sixty Radio Co., Ltd. ......................... 16
Sovereign Products, Ltd. ......................... 23
Tayce Products .............................. Cover II
Telegraph Condenser Co., Ltd. .................... 8
Tamsen Electronics, Ltd. ........................... 24
Telford Radio, Ltd. .................................. 12
Telsen Electric Co., Ltd. ......................... 15
Tomlinson, Ltd. ...................................... 28
Tranquility Radio ..................................... 25
Watmote Wireless Co. Ltd. ....................... 22
Weaver, J. ............................................. 22
Westeringhouse Electric & Supply Co., Ltd. .... 9
Western Electrical Instrument Co. Ltd. .......... Cover V
Wingrove & Rogers, Ltd. .......................... 22

TO THE TRADE

We will supply one sample Skylark Speaker to any bona fide trader on approval for ONE MONTH.

THE SKYLARK COMPLETE

Send for our comprehensive illustrated list. QUICK SERVICE. QUICK SERVICE.

THE QUALITY HOUSE.

PERSEUS MANUFACTURING CO., LTD. (Dept. W.W.), BEASTON RD., BURTON-ON-TRENT.

Buy on Deferred Terms—

HUNDRED'S HUNDRED'S HUNDRED'S HUNDRED'S HUNDRED'S
HUNDREDS HUNDREDS OF OF OF OF OF
HUNDREDS THOUSANDS
OF THOUSANDS THOUSANDS THOUSANDS THOUSANDS
OF THOUSANDS

DEFERRED TERMS—

1 Down & 5/- per

5/- per month.

4/- per month. 

THE RADIO WONDER OF THE YEAR

IT TESTS EVERYTHING!

12/6

PICO FULL IN ONE

RADIOMETER

THE QUALITY HOUSE.

PERSEUS MANUFACTURING CO., LTD. (Dept. W.W.), BEASTON RD., BURTON-ON-TRENT.

BONA-FIDE TRADERS’ GUIDE.

Send for our comprehensive illustrated list. QUICK SERVICE. QUICK SERVICE.

THE QUALITY HOUSE.

PERSEUS MANUFACTURING CO., LTD. (Dept. W.W.), BEASTON RD., BURTON-ON-TRENT.
TO TRACE DISTORTION

It requires the accuracy and sensitivity of a Weston Mil-Ammeter to tell you exactly at which particular stage in your receiver distortion begins. Try it in your H.T. leads in turn. Should the needle kick strongly either backwards or forwards when signal strength varies, it indicates transformer distortion, over-saturation of the valve, incorrect grid bias, filament temperature or H.T. Potential.

A Weston Mil-Ammeter is the only instrument sufficiently accurate to be of any value to you when making readings. Weston Instruments are standard the world over, and since 1888 have been unrivalled for scientific precision, uniform accuracy and unvarying reliability.

Weston Model 596 Mil-Ammeter Price 35/-

WESTON
ELECTRICAL INSTRUMENT
CO., LTD.,

And Now--ELECTRAD Royalty Potentiometers

Now you can purchase the famous Electrad Royalty resistances in potentiometer style at greatly reduced prices. Remember when you purchase wire-wound high resistances be sure to specify Electrad Royalty, the original units used by the leading manufacturers, experts and in laboratories throughout the world. Do not accept imitations and infringements. Manufacturers should note that special models are available for production use.

TYPE A 1/8th to 7 megohms. 7 ma. 5½ each
B 1,500 - 2,000 ohms 1 2 6½
C 300 - 5,000 ohms 7 5 6½
D 5,000 - 100,000 ohms 2 6½
E 6 6½
F 6 6½
G 6 6½
H 6 6½
J 6 6½
K 6 6½
L 6 6½
M 100,000 ohms 1 6½
N 6 6½
O 6 6½
P 6 6½
Q 6 6½
R 6 6½
S 6 6½
T 6 6½
U 6 6½
V 6 6½
W 6 6½
X 6 6½
Y 6 6½
Z 6 6½

Complete with bakelite arrow knob.

If you have not received the complete Electrad catalogue of Royalty resistances, Toroidal fixed and variable resistances, Nichrome wire resistances, Super Tomtrodes and Lufiax which Amplifiers, write for your copy to-day. It's free and post free.

Specify ELECTRAD and Insure Dependable Resistances.

THE ROTHERMEL CORPORATION LTD.,
24, Maddox Street, London, W.I.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
The highest power pentode yet produced, the P.M.24B gives a very large A.C. output. It is intended for operating powerful speakers including moving coil instruments. It is specially suitable for use in receivers or gramophone amplifiers operated from the A.C. electric light mains, its filament being rated to consume 1 ampere at 4 volts.

When operated at the maximum rated anode voltage (400 volts) and auxiliary grid volts (300 volts), the valve is capable of handling large signal voltages without distortion.

PRICE 30/-

Mullard THE MASTER VALVE