CUTTING OUT BROOKMANS PARK

The Wireless World

AND RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, November 6th, 1929.

Public Opinion
("Wireless World" National Ballot)

"Ekco"

POWER SUPPLY UNITS

1st Place for Mains Supply Units

Write for Free Booklet on "All-Electric" Radios to:

W.B.

4-POLE BALANCED ARMATURE CONE UNIT

12/6


If you are building your own Loud-speaker the W.B. Chassis is what you want. Holds any Unit. Only 12/6, complete with cone and fittings.

WHITELEY BONEHAM & Co., Ltd.
Nottingham Road, Mansfield, Notts.

Green for Safety!

T.C.C.

CONDENSERS

Adv. Telegraph Condenser Co. Ltd.
BEAM AND THE REGIONAL SCHEME

Because of the increase in power from Brookman’s Park, the new 2LO, it is more important than ever to purchase a loudspeaker which will handle great volume without rattle or distortion.

"BEAM" SPEAKERS are constructed to give the finest possible reproduction on either weak or strong reception. The model illustrated is marvellous value, of excellent appearance, and harmonizes with all home surroundings.

"BEAM" H.T. BATTERIES are silent yet energetic workers. The elements of which they are built ensure steady flow of current without background noises.

All “Beam” products are obtainable from your dealer or direct.

Beam Ltd.
35, Farringdon Road,
London, E.C.1

Telephone: Holborn 7048.

Buy an H.T. Accumulator on Output

When you buy an H.T. Accumulator, buy it on its capacity. Choose a Peto & Radford R.H.T. because it has a true capacity of 5,000 Milliampere hours.

The P. & R. Type R.H.T. has been specially designed for radio work by experts with 40 years' experience. Its plates are sturdy, internal resistance is very low, the voltage remains absolutely steady under all variations in discharge, plug tappings may be taken without disturbing battery connections through hollow terminal tops.

Charging will cost nothing


Send for details of this and the range of P. & R. Batteries (L.T. and H.T.) to Peto & Radford, 93, Great Portland St., London, W.1 (Telephone: Loughton 173).
The decision of the Wireless World Olympia Ballot—

THE BEST SPEAKER

IS

THE

FERRANTI

In the ballot the Ferranti Speaker won the first place

FERRANTI LTD.

HOLLINWOOD

LANCASTER

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

When you can buy Ediswan Accumulators at these prices!

Major Lotus.
70 Amp. hrs. 11.

B.W.G.
20 Amp. hrs. 8/6.

Midlet Lotus.
12 Amp. hrs. 2/9.

Little Lotus.
20 Amp. hrs. 4/3.

Minor Lotus.
45 Amp. hrs. 8/3.

Your accumulator worries are ended if you install an Ediswan—your charging bills are reduced, too, because the new Edison type plates ensure maximum life per charge. From the lead used in the plates to the glass of the container Ediswan accumulators are 100% British.

If it's EDISWAN ....... it's better

Ask your radio dealer.

THE EDISON SWAN ELECTRIC CO., LTD.
123-5 QUEEN VICTORIA STREET, LONDON, E.C.4
SHOWROOMS IN ALL THE PRINCIPAL TOWNS.

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

IN a set built with Lotus units every component pulls its weight. Their close, clean fit, sound connections and infallible accuracy produce a set which is easily and quickly assembled and gives the highest efficiency. For your next set choose Lotus Components. Almost every unit you need will be found in the Lotus range at every wireless shop.

LOTUS COMPONENTS

Made in one of the most modern radio factories in Great Britain by

GARNETT WHITELEY & CO. LTD.,
LOTUS WORKS, LIVERPOOL.
London Representative: W. J. Holland, 155, High Holborn, W.C.1
Phone: Holborn 8970.
The sweetness of a mellow violin, the richness of a baritone, the volume of a military band or the level tones of the announcer...any and every programme real and faithful. Blue Spot 29 (Goliath) has set a new standard of broadcast interpretation, and at six guineas is a speaker that no lover of "truth in reproduction" can afford to miss.

Hear it at your dealer's to-day.

F. A. HUGHES & CO., LIMITED, 204-6 Great Portland St., London, W.1

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (SHEFFIELD & LONDON) LTD., 106 LONDON ROAD, SHEFFIELD. Phone: Sheffield 26066. 22 ST. MARY'S PARSONAGE, MANCHESTER. Phone: Manchester City 3329.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
This long-life Battery will better your reception!

66-volts

7'9

Fitted with the long-life Dubilier Battery, your Set will give better quality performance over a longer period. Get one to-day at your dealer's—it costs less than other makes.

DUBILIER CONDENSER CO. (1925), Ltd., Ducon Works, Victoria Road, N. Acton, W.3.

The effect of placing Polar Condensers behind your panel is equivalent to turning the world round the way you want it.

The combination of Slow Motion and Direct Drive, as fitted to Polar Condensers, is the surest method of quickly bringing in those evasive stations.

THE POLAR "IDEAL."

This is one of the most popular types of condensers because it can be used most effectively with practically any modern circuit.

PRICES:

0005 - 12/6 00035 - 12/3 0003 - 12/-

Supplied fitted with the POLAR DRUM CONTROL Complete with Escutcheon and fixing screws for 2/6 extra.

WINGROVE & ROGERS, LTD., 188-189, STRAND, LONDON, W.C.2.
Works: Polar Works, Old Swan, Liverpool.

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Hear Music . . . . . . as it really is!

When the "R.K." first appeared on the market it was hailed as the perfect reproducer and achieved instant leadership.

That leadership—so readily attained four years ago—is maintained to-day and wherever fine reproduction is desired the "R.K." is the speaker to use.

The Junior "R.K." Unit has a 6 in. straight-sided cone with moving coil having an impedance of 10/15 ohms at 50/4,000 cycles. Copper damping rings are fitted to reduce the impedance at the higher frequencies. Price £6 6 0

The Senior "R.K." Unit incorporates a 10 in. corrugated cone with moving coil having an impedance of 10/15 ohms at 50/4,000 cycles. Copper damping rings are fitted to reduce the impedance at higher frequencies. Price £7 7 0

Senior "R.K." Unit with A.C. Field Excitation.

This "R.K." Unit has a 10 in. corrugated cone with moving coil having an impedance of 10/15 ohms at 50/4,000 cycles. The pot magnet is mounted in a pressed metal base which also contains a mains transformer, Mazda U.U. 60/250 rectifier valve, and smoothing condenser for the supply of field current. Price £11 10 0
DUBILIER FOR DURABILITY

R.C. COUPLING UNIT. Complete with Dumetohms. £1

COMBINED R.C. COUPLING UNIT AND VALVE HOLDER. Complete with 7/6 Dumetohms.

H.F. CHOKE. Four Types to meet all uses. Each 4/6

If unavailable is from your dealer, write direct to us giving his name and address.

DUBILIER RADIO PRODUCTS

Have you got the Booklet—"A Bit about the Battery." If not, ask your local dealer for a copy.

STANDARDS

RAILWAY TRACKS and T.C.C.

All British railway tracks are of standard width or “gauge.” To complete a journey without frequent changes—to run to schedule, to permit interlinking of the various groups, and to avoid chaos generally standardisation is essential.

It’s the same with condensers—only by adhering to a definite standard can perfect working be assured. There can, however, be only one standard, and where condensers are concerned that standard is T.C.C. Whenever you see a condenser marked T.C.C. you know that it is a condenser designed and built to a standard—with a degree of accuracy and dependability approached by no other. It is, in a word, the standard by which all other condensers are judged.

Illustrated above is a .0003 mfd. T.C.C. Upright Type Mica Condenser. Price 1/6 each. Other capacities in this type are made from .0001 mfd. to .25 mfd. Prices 1/6 to 1/2.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
YOU can get over 40 different stations on the wonderful Brown Receiver! That is not a vain boast; it is a statement of sober fact—backed by the reputation of the oldest loud speaker firm in the country.

It has been done many times, and on Tuesday, October 1st, 41 stations were obtained at full loud speaker strength in less than an hour—33 on the short and eight on the long wave band.

The reason for such amazing performance is the careful balance of the circuit and the use of the finest components that money can buy—a 3½/- Brown Transformer, high precision Polar Variable Condensers, the world-famous T.C.G. Fixed Condensers and the highly efficient Brown Dual-wave Coils.

If you paid £100, you could not get a better 3-valve Set than the Brown Screened Grid Receiver. Good things always cost more than poor ones, but it is well worth the extra cost. Prove this for yourself at any Wireless Dealers'!

In 4 Models
for battery or electric mains operation.

Prices from:
£9 to £20
All obtainable on easy payments.

The Brown
3-Valve Screened Grid RECEIVER

Do you use a pick-up?

Every user of an electrical pick-up should immediately write for the “Novotone” Booklet.

The Novotone Tone Compensator invented by Dr. N. W. McLachlan not only compensates for the inherent losses in pick-ups but also for the even greater losses in recording.

Read this extract from “The Wireless World,” August 21st, 1929, Page 177.

“In ordinary records it is necessary to restrict the amplitude of notes below about 250 cycles in order that the vibrations may be contained within the standard pitch of the groove.”

TURN LOSSES INTO GAINS WITH THE NOVOTONE.

THE NOVOTONE PUTS IN BASS WITHOUT BOOM.

THE NOVOTONE IMPROVES REPRODUCTION BEYOND BELIEF OVER THE WHOLE MUSICAL SCALE.

REALISM FROM RECORDS CAN ONLY BE ACHIEVED BY USING THE NOVOTONE.

Write now for the 8 Page explanatory Booklet “W.N.”

See the Diagram illustrating the effect of the Gambrell Novotone on electrically reproduced records.

GAMBRELL RADIO LTD.,

6, Buckingham Street, Strand, London, W.C.2.

Telephone: Temple Bar 3273.
THE DIFFERENCE BETWEEN
A GOOD Filament WITH "TENACIOUS COATING"

A BAD Filament WITHOUT "TENACIOUS COATING"

Reproduction from an untouched micro-photograph showing the coating typical of all OSRAM VALVES. Notice the absolute evenness of the coating. There are no gaps, the coating clings, so that the full benefit of the coating is maintained. The secret is the startling discovery of the scientific process of "TENACIOUS COATING."

This reproduction shows part of the filament of a badly coated valve before use, showing a serious gap in the coating. A gap such as this starts the valve off in its life with a poor performance. The valve then prematurely fails.


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

You cannot afford to use any but the best Condenser in an eliminator circuit.

HELSBY CONDENSERS

are made and guaranteed by a firm with 30 years' experience in condenser making, from small telephone and radio condensers to Power Condensers weighing upwards of 2 tons.

Guaranteed working voltages:

Type M — 150 volts D.C.
Type 2A — 350 volts D.C.
Type 3A — 450 volts D.C.
Type 4A — 600 volts D.C.

All Helsby Condensers are vacuum dried and impregnated with a special non-hygroscopic material which renders them moisture proof.

If unobtainable from your dealer, write to us giving his name and address.

BRITISH INSULATED CABLES LTD
PRESCOT - LANCs.
Makers of PRESCOT and HELSBY cables

L.T. SUPPLY STRAIGHT OFF THE MAINS FOR 29/6

If you have not an All-Electric Receiver, have the next best thing:
Fit a Philips A.C. Filament Transformer and cut out your L.T. accumulators. Then your set will give better results and you will have none of the trouble or expense of recharging accumulators.
Philips A.C. Filament Transformer is low in cost and completely reliable in operation. Bring your set up to date by adding this valuable unit.

PHILIPS
A.C. FILAMENT TRANSFORMERS

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

AND AMPLIFICATION WITHOUT CHATTER

Eliminate rattling, grating noises from your reception by fitting Transformors which will give adequate amplification without any trace of distortion. No component is apt to make or mar your reception more than the Transformers. In future see that your set includes the best.

They are Entirely British.
RADIOGRAND ACE
12/6 8/6
Both in ratios 3–1 & 5–1

TELSEN ELECTRIC CO., LTD., MILLER ST., BIRMINGHAM.
If a record's worth playing it's worth playing well!

Use the MORE-MUSIC LESS-WEAR PICK-UP

A record is made electrically—unless it is reproduced electrically a great deal of its beauty may be lost. Use a B.T.H. pick-up with your radio set and hear record music as you've never heard it before.

Pick-up and Tone Arm—Price 45/- complete.

**M.P.A. COMPONENTS—BEST IN RADIO!**

Made to a Standard That Sets a Standard!

**M.P.A. ELIMINATORS**

Wide research and experience are behind these new components. Every Eliminator is tested to over 1,000 volts A.C. for breakdown, and complies in every way with I.E.E. regulations.


**GENERAL PURPOSE MODEL A.C.** For input voltages from 200-250 volts. Supplies H.T. in 6 Tapings from 200/60 volts, output at 200 volts 50 ma. L.T. (A.C.) 4.5-4.6 amps (and Marconi Royalties.)

**POWER MODEL A.C.** For Public Address Systems and Power Amplifiers. For input voltages from 200-250 volts. Supplies H.T. 400 volts and six for 200 volts. Output at 200 volts 50 ma L.T. (A.C.) 4.5-4.6 amps and 6 volt Grid Bias in 20 one-volt steps and one variable supply to 250 volts. Price £15.10.0.

**POWER SMOOTHING Chokes (Type NM 1000)** EXCEPTIONAL EFFICIENCY! FIRST-CLASS WORKMANSHIP! carrying capacity 500 milliamps, suitable for smoothing in power amplifiers. Tested to over 1,000 volts for breakdown. Complies in all respects with I.E.E regulations. Price 60/-.

**M.P.A. CHOKES**

L.F. Maximum inductance at full load. No increase in temperature. Comply with I.E.E. Regulations. Tested to over 1,000 volts A.C. for breakdown.

**"A" Series**

<table>
<thead>
<tr>
<th>Value</th>
<th>Carrying Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Henries</td>
<td>170 ma.</td>
</tr>
<tr>
<td>50 Henries</td>
<td>90 ma.</td>
</tr>
</tbody>
</table>
| 100 Henries | 55 ma. | Price 2/6

**"B" Series**

<table>
<thead>
<tr>
<th>Value</th>
<th>Carrying Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Henries</td>
<td>55 ma.</td>
</tr>
<tr>
<td>50 Henries</td>
<td>25 ma.</td>
</tr>
</tbody>
</table>
| 100 Henries | 10 ma. | Price 2/6

**M.P.A. MAINS TRANSFORMERS**

High efficiency with first-class workmanship. Tested to over 1,000 volts A.C. for breakdown. Comply with I.E.E. Regulations in every respect. Blue print of all units and all approved by I.E.E. regulations. Price £5.

**AMT/50—Primary** for all A.C. voltages. Secondary 200+200 volts. Full wave, 45 millamps output. Filament Heating: 1 volt; 4 volts; 4 amps output. 2 volts; 2 volts; 2.5 volts; 2.5 volts; 4 watts; 4 watts; 6 watts; 6 watts; 8 watts; 8 watts; 10 watts; 10 watts; 12 watts; 12 watts. Price £4 15

**AMT/100—Primary** for all A.C. voltages. Secondary 400+200 volts full wave, 45 millamps output. Filament Heating: 1 volt; 4 volts; 4 amps output. 2 volts; 2 volts; 2.5 volts; 2.5 volts; 4 watts; 4 watts; 6 watts; 6 watts; 8 watts; 8 watts; 10 watts; 10 watts; 12 watts; 12 watts. Price £6

**M.P.A. CHANGE OVER SWITCHES**

SILVER-GOLD ALLOY CONTACTS. HIGH CLASS PRECISION WORKMANSHIP. Rotary cam switches of very low capacity. Positive contact in each position. Highly efficient.

**TYPE "A"**—2-pole 2-way switch with additional adjustable pair of contacts. Ideal for radio gramophone combinations.

Price 2/-

**TYPE "B"**—2-pole 2-way switch

Price 7/3

**TYPE "C"**—2-pole 2-way switch

Price 6/6

**M.P.A. POTENTIAL DIVIDER**

For H.T. and G.B. supply. Another product of the M.P.A. Research Laboratory, 20,000 ohms resistance for Grid Bias and 2,000 ohms (heavy duty) for H.T. supply. 8 values H.T. 20 Tappings G.B. in one volt steps. Opening 50 ma. or H.T. Tappings. Price 7/6.

M.P.A. products above are best in the world, and can be purchased on easy deferred terms. Ask your dealer to-day.

M.P.A., Wireless, Ltd., Dept. 2, Radio Works, High Road, Chiswick, W.A.
You know that in your Ever Ready Dry Battery you have all the power necessary to operate your set efficiently—

COMPACT—CONVENIENT—EVER READY

Why depend on a power station? Not only does an Ever Ready give a purer and more perfect reception than any other form of supply, but it is

CHEAPER BOTH IN INITIAL COST AND UPKEEP

If in doubt as to the correct unit for your set, consult your dealer or write direct giving details of your set to Service Dept., The Ever Ready Co. (G.B.) Ltd., Holloway, N.7.
WHY PAY more than 5/6 for A UNIVERSAL VALVE

New Glass Bulb, Finer yet Tougher
New Super Strength Grid
New Non-microphonic Filament with Special Coating
New Large Size Anode, Easier Flow of Electrons

NEW 1930 TYPES!

NEW 1930 PRICES!

WRITE FOR FREE FOLDER!

TWO VOLT
Universal .1 amp........5/6
Resistor .1 amp........5/6
Super H.F. .15 amp....5/6
Super Power .15 amp....7/6
Hyper Power .3 amp.....9/6
Pentodion .3 amp........18/6

FOUR VOLT
Universal .255 amp... 5/6
Resistor .255 amp... 5/6
Super H.F. .255 amp... 5/6
Super Power .255 amp... 7/6
Hyper Power .15 amp....9/6
Pentodion .15 amp....18/6

Longer Life!

DARIO VALVES

Best way to all Stations

IMPEX ELECTRICAL, LTD., DEPT. C,
538, HIGH ROAD, LONDON, E.11

Input and Output:

The R.G.D. Magnetic Pick Up is designed

To avoid all record wear, give perfect tracking, and is specially developed for Moving Coil Speaker reproduction. Without these features, it is impossible to get good output and reproduction.

In Oxidised Silver £3:3:0
In Bronze £3:0:0

The Speaker:

To give its best, must be specially designed from an acoustic principle, apart from the unit installed therein. With the R.G.D. Moving Coil Loud Speaker we can say that these points have been thoroughly dealt with. The case is of solid oak, and the instrument is of an exceptionally high-class nature. For D.C. mains the cost is £2:0:0. And it can be supplied with the equipment for A.C. mains if desired. Literature on application.

THE RADIO GRAMOPHONE DEVELOPMENT COMPANY
St. Peters Place, Birmingham
Get the best out of your receiver—volume, tone quality, distance—by using a Philips Battery Eliminator and thus taking your H.T. current from the electric mains. Also it’s cheaper than having to pay for new batteries every now and then. One of the three types of Philips Battery Eliminators meets your needs. Type 3009 and 3002 work off A.C. Mains, Type 3009 giving grid bias as well as H.T. For D.C. Mains there is Type 3005.

PHILIPS for Radio

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

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

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WONDERFUL NEW
BENJAMIN
PRODUCTS

ROTARY BATTERY SWITCH
An attractive alternative to the usual Push and Pull type of Switch. All insulated with "On" and "Off" and silver pointer knob and double contact. 1/9

PENTODE
The famous Benjamin Clearer-Tone Valve Holder, with Flexible connection for attachment to the terminal post of the pentode valve. Price each. 2/3

5-PIN VALVE-HOLDER
Specially designed for use with 5-pin valve with centre leg. The well-known Benjamin anti-microphonic feature is shown in picture and also patented screw fast, which assures perfect contact with either solid pin or split pin valves. Price each. 1/9

The original CLEARER-TONE VALVEHOLDER in face of considerable low price competition has more than held its own and will be continued at price of

2/-

The BENJAMIN VALVE-BRDLDER was last season's most successful accessory, the self-aligning feature ensuring positive contact with all types of Electron 5-pin Valves. Price each. 1/3

Without terminals, each 1/6

If we shall be glad to send you on request our Folder No. 101, showing you how to make up a very fine Loud Speaker from a Kit of parts, also Folder and blue print for building up a modern 3-Valve Set.

WATMEL WIRELESS CO LTD.,
Imperial Works, High St., Edgware, Mx.
Telephone: Edware 0323.

WONDERFUL NEW
BENJAMIN
PRODUCTS

The famous Benjamin Clearer-Tone Valve Holder, with Flexible connection for attachment to the terminal post of the pentode valve. Price each. 2/3

5-PIN VALVE-HOLDER
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WATMEL WIRELESS CO LTD.,
Imperial Works, High St., Edgware, Mx.
Telephone: Edware 0323.

SEE IT HEAR IT!

PRICE
18'6

ASK your dealer to let you see the Watmel Balanced Armature Unit. Note the heavy magnet of Cobalt Steel, the pole pieces and Armature of specially selected soft iron. See how the Armature is balanced between the pole pieces and how, at any given moment during working, the Armature is being acted upon by two pole pieces at once.

It is this true differential action that makes the Watmel Unit so famous for its sensitivity.

Now ask your Dealer to connect it to a suitable Chassis and Cone. If possible get him to compare it for you with any other Unit, irrespective of price. Notice particularly the sonorous way it handles the bass frequencies, and notice also that it does not "cut off" the upper registers either. No finer Unit is turned out either in this or any other country, and from none will you get better reproduction.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The
Pioneer
of Quality
Reproduction
& Low
Price!

The ORMOND
CONE-UNIT
& CHASSIS

A COMBINATION of the famous "Ormond" 4 Pole Adjustable Loud Speaker Unit with the new Ormond Chassis and Cone. Something to bring joy to the radio owner who delights in powerful volume yet has an ear for tonal quality.

The Chassis is constructed of aluminium, specially strengthened, 11½ inches in diameter and provided with two brass pillars, complete with lock nuts, to ensure easy assembly of the Unit. The whole may be secured to a baffle board if desired, screw holes being provided in the outer ring for this purpose.

Supplied unassembled and securely packed in carton at the exceptionally low price of 20/- complete.

Or supplied separately
Chassis and Cone, 7/6. Unit, 12/6.

ORMOND HOUSE, Rosebery Avenue, LONDON, E.C.1.
Telephone: Clerkenwell 5334-5-6.
Telegrams: "Ormondengi, Smith"
The battery that keeps interest at high tension!

60% longer life!

A most important consideration, is it not? A battery that lasts longer, that loses nothing of its power when out of circuit, that develops no "crackle."

Actually, a new era in H.T. Batteries began with the advent of "Pertrix." Try one, and never again will you be content with any other.

PERTRIX
DRY BATTERIES
PERTRIX LIMITED, BRITANNIA HOUSE
SHAFTESBURY AVENUE, LONDON, W.C.2
Factory — BRITANNIA WORKS, REDDITCH, WORCS.

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

See The Wireless World,
Page 375.
October 2nd, 1929.

40 WATT Model
£13-0-0

85 WATT Model
£19-0-0

Power Supply Units our Speciality.

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

M-L MAGNETO SYND. Ltd., Radio Dept.,
Telephone: 5001.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
November 6th, 1929.

THE WIRELESS WORLD

Advertisements.

All who prefer Quality in Cigarettes
Say Player's Please

5 for 3d. 10 for 6d. 20 for 11d.

Eliminate self-oscillation

by fitting the LEWCOS H.F. CHOKE

The Lewcos H.F. Choke provides an absolutely reliable and efficient performance on all wavelengths from 2,000 down to 20 metres. The diagram illustrates the percentage choking effect on all wavelengths from 20 to 2,250 metres of the Lewcos H.F. Choke as compared with three other makes on the market.

With the Lewcos H.F. Choke the position of the terminals, one at the top of the coil, the other at the base, is arranged in order to prevent additional self-capacity in the wiring of a receiver and thus eliminate oscillation.

LEWCOS FIXED POTENTIOMETER

The Lewcos Fixed Potentiometer consists of a high resistance winding connected between L.T. plus and L.T. minus—giving an exceptionally smooth reaction control on all Radio Receivers—whilst being suitable for all types and voltages of valves.

PRICE

4/9

LEWCOS

TH' LONDON ELECTRIC WIRE COMPANY & SMITHS LIMITED

Church Road, Leyton, E.10.

Telephone: Walthamstow 2355.


Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Get the Best from your Set—only the GROSVENOR can do it

The Battery with the New Vitalising Element

The wonderful new Vitalising Element ensures continuous and satisfactory service. No other battery can give you the same service. It's the new Vitalising Element unique to Grosvenor that does it. Fitted by all the Leading Set Makers after the most exhaustive comparative tests, and PROVED to be the best.

66 v. from 7/6 99 v. from 11/6

THE GROSVENOR BATTERY Co., Ltd.,
23, White Street, Moorgate, LONDON, E.C.2.

GROSVENOR BRITISH MADE BATTERIES

LISENIN

POSITIVE GRIP TERMINALS

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

Write for FREE copy of our latest descriptive leaflet “W.W.” Post free, of course.

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

POSITIVE GRIP CHUBBY WANDER PLUG. Ideal for portable sets and where space is limited. Various colours. Price 3d. each.

POSITIVE GRIP PIN END a new-comer. Price 2d. each.

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

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Funds for the New SSW.

In our editorial in the issue of October 23rd, we urged once again that some definite step should be taken towards establishing a satisfactory Empire Broadcasting service. We traced the history of the various stages by which SSW was established on its present inadequate basis, and showed how hard a struggle it had been in the face of opposition or inertia to achieve even so poor a start as SSW has proved itself to be.

Our editorial appears to have attracted immediate attention, for within a day or so a comment appeared in the daily Press suggesting that new plans were on foot at the B.B.C. in regard to Empire Broadcasting policy, although, on enquiry, we found that the Corporation was not prepared to say more than that the future of short-wave broadcasting from this country was being considered, and negotiations on the question were proceeding. Any news which indicates activity is better than no news, and so we look forward to some more definite announcement at an early date.

We have always questioned whether short-wave broad-
Some Hints on Improving the Performance of Existing Sets.

Although all the alarmist reports that have appeared in the daily Press need not be taken too seriously, it is now clear that many thousands of listeners in London and the Home Counties are seriously affected by the opening of the new 2LO, sometimes to the extent of being unable to receive even an alternative programme from Daventry 5GB. It will be small consolation to these sufferers to realise that the inauguration of the twin transmissions will intensify their troubles; in many cases there will be mutual interference between "London No. 1" and "London No. 2," and neither station will be received without a background of the other until their receiving apparatus is altered.

If it is admitted that the new scheme of transmission is beneficial to the majority, blame for this state of affairs must be laid to the general tendency to simplify broadcast receiving apparatus to a greater extent than is really permissible in view of the rather high standard of performance that is customarily expected. It is perfectly easy to produce a fool-proof and inexpensive set capable of receiving either of the twin stations only at a distance of even half a mile from Brookmans Park, but serious complications arise when a wider choice of programmes is demanded under such difficult conditions. Readers of this journal are in better case than the general public; since the Regional scheme was first proposed, special attention has been devoted in these pages to the question of eliminating interference. It has been made clear that, broadly speaking, exceptional selectivity is brought about by using tuned circuits of lower resistance than usual, or, better, by adding to the usual number of tuned circuits of average "goodness"; unfortunately, either procedure tends slightly to increase the complexity and cost of the receiver. Until ganged tuning becomes more popular and widely available, we must face the fact that many listeners (their number will increase as and when the Regional plan is extended to other areas) will have to master the niceties of handling a multi-control receiver. Approached in the right way, it is not a very difficult art to acquire.

It is admittedly none too easy to make internal alterations to an existing set, but fortunately it is possible to restrict the spreading of strong local signals by making comparatively simple external modifications and additions. All too often, many of the modifications that are customarily recommended add nothing to the real selectivity of the receiver, and are apparently more or less effective only because they reduce the signal input to the receiver. These methods have their uses, provided one does not expect too much of them, and realises that all signals, wanted as well as unwanted, will be reduced in strength. It is the purpose of this article to describe simple modifications whereby almost any set can be improved, and, as many readers will doubtless have non-technical friends...
Interference from Brookmans Park.—who are in difficulties, an attempt will be made to treat the subject in the simplest possible manner.

Before beginning to discuss the more helpful and important additions, it will be as well briefly to survey some of the minor alterations that can be introduced, and which contribute at least something to the overall selectivity of a receiver. The use of anode bend detection, if substituted for the more popular grid method, is certain to improve matters; not only does it impose less damping on the preceding tuned circuit (when matters are properly arranged), but its well-known lack of sensitivity to small signal voltages is of distinct benefit in eliminating a strong background of interference which might well be present when using the competing method of rectification.

Inherently Selective Circuits.
The selectivity of tuned circuits of the kind included in ordinary sets can always be increased by arranging to use a higher ratio of capacity to inductance than is usual—in other words, by using a comparatively small coil with a large tuning condenser. This plan can, in many cases, be tried without involving any serious changes; what one should do is to use the smallest coil which will enable the longest wavelength desired to be received with the particular value of tuning condenser fitted to the receiver. It may be added that this plan is generally most successful when applied to relatively simple detector-L.F. sets, and that in carefully designed receivers with H.F. amplification its inclusion is likely to give rise to an appreciable falling-off in range, and even in quality.

It will be generally appreciated that the design of an H.F. transformer is a compromise between the requirements of maximum amplification and selectivity, and that the designer’s original conception of the best ratio between primary and secondary turns may now stand in need of some revision, in view of changing conditions. It is quite permissible to try the effect of removing a few primary turns; for information to the reduction in signal strength likely to be brought about by this alteration, the reader is referred to a recent article on the subject in these pages.1

Turning to the subject of alterations of the kind likely to effect a definite and clearly perceptible reduction of interference, mention must first be made of the somewhat drastic expedient of reducing aerial length. This is widely recommended nowadays, but it always seems to the writer to be illogical, as exactly the same effect can be obtained by reducing aerial coupling by inserting a small (preferably variable or semi-variable) condenser in the lead from aerial to set, by reducing the number of turns in the aerial circuit when an “aperiodic” coupling is used, or by varying the inductive relationship between aerial and secondary coils where provision for this adjustment is made. This plan enables the user to make full use of a long aerial when the set is used at times when the interfering station is silent, or when receiving wavelengths on which interference is not pronounced.

It cannot be denied that, to the non-technical user who has no knowledge of the technical details of his set, and has not access to a well-informed source of information, the rather wasteful expedient of actual amputation of the aerial wire is likely to meet the case well enough, but to be effective in difficult situations it must be carried to such lengths that the reception of distant stations becomes next to impossible. It should be made clear that, even in North London, almost any set except a portable is susceptible to this treatment, and, always provided that nothing more than the Brookmans Park alternative transmissions are desired, satisfactory results are attainable by making progressive experimental reductions in aerial length.

For some time past, writers in this journal have urged the desirability of reverting to the loosely coupled and separately tuned aerial circuit which has found a place, almost as a matter of course, in commercial apparatus since the earliest days of wireless telegraphy—long before the era of telephony. It is by no means difficult to add it to the majority of sets in the manner shown both diagrammatically and pictorially in Fig. 1. The coil, which must be of a size suitable for the wave-range to be received—a No. 60 will be suitable for the medium broadcast waveband when used in conjunction with a normal aerial and a 0.0005 mfd. tuning condenser—is mounted outside the receiver cabinet, and in such a position that it is in inductive relationship with the normal internal aerial coil: a spacing of several inches is generally necessary, and the correct position is best found by trial.

Continuously Adjustable Condenser-coupling.
A somewhat neater arrangement is made possible by using the capacity-coupled aerial tuner shown in Fig. 2, in which transference of energy from aerial to grid coil is controlled by a variable condenser. For this purpose, a capacity of something considerably less than 0.0001 mfd. is generally sufficient—a neutralising condenser will often do quite well—but the value shown is recommended where an aperiodic coupling arrangement is included in the set itself. Connections of the aerial tuner under these conditions are as shown in Fig. 3.

Interference from Brookmans Park.—

It is essential that interaction between external and internal coils should be mainly through the coupling condenser, and any appreciable direct magnetic effect is to be avoided. To this end, it is desirable to interpose an earthed metal screen between the coils, or, best of all, to enclose the aerial tuner in a metal box. This plan has the advantage of neatness, as all the apparatus devices are adjusted in an effective manner from the point of view of selectivity.

Another minor difficulty may be encountered where the set normally includes a directly coupled aerial, as shown in Fig. 2. In such cases, the inherent capacity of the aerial is added to that of the tuning condenser, and when it is removed the circuit will generally be incapable of being tuned over the broadcasting wave-bands. The remedy is to fit suitable input coils.

How to Operate a Loose-coupler.

A still more ambitious loose-coupler is The Wireless World Selectivity Unit, described in the issue of April 25th, 1928; the circuit diagram of this device is reproduced in Fig. 4. It includes a standard "Everyman Four" aerial-grid coil, tuned by a variable condenser \( C_1 \) of 0.00033 mfd. The coupling condenser \( C_2 \) has a capacity of 0.0001 mfd. This unit is similar to the capacity-coupled aerial tuner shown in Fig. 3, and is connected to the aerial and earth terminals of the receiver in the same way.

Some little trouble—but not more than can be overcome by assiduous practice—will be encountered by the less experienced when first operating a reacting detector set (without H.F. amplification) to which a two-circuit aerial tuner has been added. Receivers without feed-back to the input grid circuit are quite easy to work if one remembers that all the tuned circuits must be kept approximately in step while searching for signals; this is quite easy when a few "landmarks"—stations of which the wavelengths are known—have been found.

It is usual to recommend that the beginner should start operations with a very close coupling between aerial and secondary circuits, but it seems to the writer to be very doubtful if this is the best course, as "double-humped" tuning may be produced; this is most confusing, as a given transmission may be receivable at two distinct condenser settings.

Generally speaking, it is best to acquire experience of tuning when the local interfering station is silent, and to concentrate on a transmission providing a large but not overpowering input. If the suggestion offered in the preceding paragraph is adopted, the coupling will be made very loose by moving the aerial coil to a distance of several inches from the internal grid inductance, or, if a capacity-coupled circuit is used, by setting the control condenser at a very low value.
MY visit to this year’s Paris Show has been a disappointing one. It was difficult to realise that twelve months had elapsed since I last toured the stands in the Grand Palais. The apparatus, in general, had undergone little or no change, and most of last year’s designs still flourished. I was again greeted as I went from stand to stand by the pairs of tuning dials indicative of the superheterodyne. Not even the dials themselves had changed, so I set out in search of departures from these highly selective sets which seem to have assumed a life eternal.

My comments of last year on the survival of the superheterodyne brought forth much criticism from French readers, and three reasons were brought forward as to why the manufacturers in France favour this class of set. These reasons were (1) that the majority of listeners are not permitted to erect outdoor aerials, partly because of the unsightly effect and also owing to a fear of damage by lightning, a seemingly futile reason, (2) a high degree of selectivity was demanded, combined with the reliable reception of programmes from abroad, and (3) patent royalties, not being based on the number of valves, permitted of this class of multivalue receiver. None of these reasons seems sufficiently convincing, yet it is the third which contains the truth, for in France the master patents have not been administered in the same convenient manner as they have in this country, and neither are those all-important patents just expired or expiring, as is the case here. Unless the problems of patent administration and validity are quickly solved France will find herself hopelessly handicapped in the production of radio gear.

This universal production of superheterodyne sets is not the only point indicative of the radical difference existing between two almost adjoining countries. There are practically no portables, and the home constructor, as a class, is non-existent. There are no kit sets, neither are there specialised components for the amateur comparable with the extensive production of such apparatus in this country. Components are exhibited, yet with the exception of ingenious condenser mountings there is no single example of a component in which progressive design or invention is revealed. Components shown last year appear again this year without modification, and, in fact, there are not even copies of those many specially designed parts found on the British market and so essential to obtaining the best results. French components sell to the set manufacturer, and not
Radio in France.—

the amateur, so that high technical merit is probably overruled by economic requirements.

As a stand-to-stand report would resolve itself into describing a multiplicity of circuit combinations of the superheterodynes, a few outstanding points of design are all that will interest the English reader. Tuned H.F.

sets a horizontal ebonite panel carrying the apparatus on the under side and the valve legs on the top is secured to the vertical front panel, behind which there is ample space to accommodate the two tuning condensers and the many forms of tuning indicators.

Last year I described some of these indicators, their action being based upon the graphical representation of the two-dial settings associated with pointers which are coupled to the condenser spindles. The Autorex Tavernier (Condensateurs Tavernier, 71, Rue François-Arago, Montreuil, Seine) is a typical example of a superheterodyne station indicator. Another model, the "Grillet" (Constructions Radio-electriques Grillet, Avenue de Geneve, Annecy, Haute Savoie), consists of a sliding indicator interlocked by rack work with the two condensers. Three separate slides are arranged in this model, and in moving from one to the other a wave-range switch and indicator are actuated. One of the most ingenious presented a rectangular screen on its front panel, and the operating of the knobs caused a spot of light to move to a predetermined point indicating the station required. Another useful form of station

stages preceding the first detector are now practically non-existent. A special two-grid type of valve is used in many of the sets as a first detector, as a means of combining the frequencies. As with the English receiver, two-wave ranges are invariably provided, a complicated switch being used to change the connections of frame, oscillator, and reaction. Screen-grid valves have in a few instances found their way into the intermediate amplifier, but as stable amplification already exists on the long intermediate wavelengths the advantages gained by the change are questionable. Long-wave interwave couplings are, in almost every case, simple air core transformers of the fine wire aperiodic variety. In the majority of the

A chassis-built set, with the components carried on stout aluminium frames. The Sicra IV, a leading French superheterodyne.

The two tuning controls are here conveniently placed and operate a pair of indicating drums through a two-to-one pulley drive. The Nirododyne Biplex with Area condensers.

The Radiola six-valve superheterodyne, possessing one of the most attractive of panel layouts.

indicator is found in the "Cryptadyne VII" (Radio-Industrie Cryptadyne, 25, Rue des Usines, Paris). In this receiver a pair of dials are labelled with the stations in the long and short wave bands. These dials are interlocked with scales, which are viewed through apertures immediately adjoining the scales of the tuning condensers. In the apertures one reads the condenser settings required for the given stations. Output L.F. amplifiers incorporated in these superheterodynes did not include
adios in France.—

those refinements necessary for distortionless amplification, a circumstance suggesting that the superheterodyne principle itself does not permit of quality reception. Prices differ widely, varying in the ordinary cabinet models between about 1,000 and 3,000 francs.

In the search for receivers following British practice two examples were found upon which comment might be made. These are really up-to-date sets, embodying screen-grid and pentode valves and designed for all-mains operation. Both were three-valve sets, and obviously designed with a view to mass production. The “Ondia” (Le Matérial Ondia, 2, Route de Paris, Boulogne-sous-Mer), is beautifully finished in a pressed metal case, with drum dial exposed in an aperture on a top edge bevel. Being completely sealed I had no opportunity of examining the interior, but it was obvious from certain details in design that the manufacturers were in a unique position in the matter of mass production, and it transpired that their principal business was that of pressings and turned parts. This receiver, it is hoped, marks a turning point in French radio practice.

The other receiver, the “Hervor” (Etablissements Herbelot et Vorms, 13, Passage des Tourelles, Paris), is contained in a large pressed metal cabinet with rounded corners, following Philips’ practice. Its three Philips’ valves correspond with the S4V, the 164T, and the PM24A, provision being made to feed this output pentode with an anode potential of 300 volts. Complete with

valves, the price of this set is about £20. It is interesting to note that the French sets designed for use with mains include a three-point connection to the supply, the extra lead being a tapping on the transformer primary to allow for voltage variation. In addition, the “Hervor”

is fitted with a control to further compensate for differences in the potential of the mains.

Over 120 different models were counted on the stands of the set manufacturers, of which probably not more than five per cent. are of the mains-operated straight-circuit type.

Oxide-coated filaments are now used in most of the French valves, giving to them greatly improved performance. Certain of the manufac-
Radio in France.—

Manufacturers limit their output entirely to triodes; but others include well-finished specimens of screen grid and pentode. Indirectly heated valves have also made their appearance. Those readers whose radio experience dates back to before broadcasting will remember how they depended upon France for their supply of valves, and, in particular, had a high opinion of valves bearing the name Métal and Fotos. During the intervening period these valves have not possessed the characteristics to be found in the British products, but now, I find, that by the use of the oxide-coated filament Métal and Fotos valves have been greatly improved. By way of example, the Métal type D.W.702 is a power output valve with an A.C. resistance of 2,250 ohms and an amplification factor of 7, so that the mutual conductance is no less than 3.2, while the permissible grid swing is nearly 30 volts. Its filament passes 0.23 ampere at 4 volts. Another output valve, the D.X.502, passes 0.75 ampere at 4 volts, and with an A.C. resistance of 2,000 ohms has a mutual conductance of 2.5. The price of this valve is about 10s. The Métal screen-grid valve type D.Z.2 has an amplification factor of 150, with an A.C. resistance of 150,000, and corresponds, therefore, with its British counterpart, and is priced at about 14s. A Métal pentode, the 3.D.X., which is known as the tri-grille, sells at 16s., has a mutual conductance of 1.8, and takes a maximum anode potential of 150, the grid bias being 10 to 12 volts.

Data given in respect of Fotos valves shows that many of the popular L.F. types have a mutual conductance of 2. The Fotos pentode has a mutual conductance of 1.8, and a maximum anode potential of 120, with a bias of about 7.5. This valve is priced at about 14s. 6d. Of similar price is the screen-grid valve with amplification factor and A.C. resistance of 150 and 150,000 respectively. When indirectly heated and having very similar characteristics, this valve is priced at 16s. There is another series of valves, bearing the name Vis-

seaux, with characteristics and prices closely corresponding to those just mentioned (J. Visseaux, 87 and 91, Quai Pierre-Seize, Lyon).

An interesting ultra short-wave transmitter with reflector.
(Ateliers J. Carpentier.)

Picture receivers for home use are the principal exhibit on the Belin stand. The Belinographe machines are fitted with driving clutch, catch and contacts, and closely follow standard practice. Traversing of the cylinder is obtained by an auxiliary shaft, and by means of a double pulley the rate of traverse may be readily adjusted to satisfy the standards of picture analysis adopted in the various systems. The price of the machine is about £20.

Moving-coil loud speakers are still little in evidence, the principal exhibitors being the French B.T.H. and the Stellor (Etablissements A. Charlin, 48, Avenue du Maine, Paris). A patent royalty is collected in France in respect of the moving-coil loud speaker, which is perhaps a contributory cause in restricting its popularity.
A Rumour Refuted.

Sunday, October 27th, was enlivened by the newspaper report that in the near future the B.B.C. would probably acquire its own cables for S.B. purposes. An astounding statement, which was instantly contradicted on enquiry at Savoy Hill. The Post Office maintains a jealous authority over all communications in this country, and considering the initial and upkeep costs of lines it is unlikely that another organisation would covet the honour. (The cost of installing a modern cable with the necessary repeaters between London and Glasgow would amount to more than £400,000.)

The Land Line Problem.

Nevertheless, mention of the land lines always give rise to melancholy reflections in the minds of listeners who live beyond the service areas of 2LO and 5XX. No existing line is ideal for broadcasting purposes, and no amount of amplification en route can give Ireland or Scotland the quality of transmission which the pampered London listener has been led to expect as his birthright.

When the completed regional scheme holds sway every listener will be entitled to at least one direct wireless programme from his nearest transmitter.

Hope for the North.

Meanwhile I hear that the Post Office (which, to its credit, has always striven to give the B.B.C. the best of the available lines) is taking broadcasting into account in the design of the latest cables. Before the end of the year Scottish listeners are likely to benefit from the opening of a new cable from Leeds, via Jedburgh, to Edinburgh, equipped with the most modern types of amplifier and capable of dealing with a much wider range of frequencies.

German Empire.

Probably the best cables in the world for broadcasting purposes are those now in use in Germany. The German Post Office has worked hand in hand with the broadcasting authorities in the production of cables specially suitable for musical transmissions, and the result is the evolution of a new form of cable in the centre of which are several heavily insulated lines reserved exclusively for broadcasting purposes. It is stated that relays with the new cable, which runs from Berlin to Cologne, are singularly free from extraneous noise and distortion. The British Post Office is watching the experiment with interest, and it is highly probable that similar tests may be carried out over here.

B.B.C.'s Birthday.

This year's broadcast birthday programme (from all stations on November 14th) is to be entitled "We are Seven." I understand that it is not intended to dignify the fact that the staff actually numbers 700, but is a reminder that this is their seventh anniversary.

Tatsfield's Black List.

The Tatsfield receiving station of the B.B.C. has been conducting what might almost be called an inquest upon the remains of the Prague Plan. Ignoring the chaos in the Continental ether, the engineers have been concentrating on the interference caused by British stations, with "distressing disclosures." At the present time, more than ten Continental transmitters are heterodyning B.B.C. stations every night. Here is the black list:—Petit Parisien, Radio Vitus, Leningrad, Zagreb, Lyons, Simferopol (Russia), Moravsko-Ostrava, Leipzig, Horby, and San Sebastian.

San Sebastian, by the way, is making honourable attempts to avoid Glasgow's fate, but seems unable to find a niche elsewhere.

Regional Scheme Disclosures.

The Moonside Edge station is to have a bigger service area than Brookmans Park. This is one of a number of interesting official statements concerning the regional scheme made in the B.B.C. Year Book for 1930, which is timed to appear in a day or two.

The service area will be greater, partly on account of the longer wavelength—the highest medium wave available—and partly because the B.B.C. has been permitted to use mast 500ft. high, whereas owing to Air Ministry restrictions Brookmans Park has been limited to 200ft.

The Unlucky Highlands.

When the London, Davenery and Northern regional stations are working it is estimated that a service of alternative programmes will be available to 75 per cent. of the population in the British Isles, leaving the remainder to be provided for by the Scottish and West Regional stations. The B.B.C. fear, however, that these two stations will have the hardest task, as they have to cover mountainous country. Indeed, it is frankly admitted that something like 2 per cent. of the population of Scotland will be left out in the cold. When the scheme is completed only 4 per cent. of the total population will be unable to get any alternative programme, and about 80 per cent. should be able to enjoy an alternative with the simplest receivers.

Regarding the completion of the scheme the writer says: "It is fair to give 24 years more before everything is as it is planned to be."
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<tr>
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<tr>
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<td>563</td>
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<td>590</td>
<td>508.5</td>
<td></td>
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<td>497.1</td>
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<td></td>
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<tr>
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<td>626</td>
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<td></td>
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<td>630</td>
<td>476.4</td>
<td></td>
</tr>
<tr>
<td>Langenberg</td>
<td>15</td>
<td>635</td>
<td>472.4</td>
<td></td>
</tr>
<tr>
<td>Lyon la Dem</td>
<td>5</td>
<td>644</td>
<td>465.8</td>
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<tr>
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<td>653</td>
<td>459.4</td>
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<tr>
<td>Aix-la-Chapelle</td>
<td>0.25</td>
<td>662</td>
<td>453.1</td>
<td></td>
</tr>
<tr>
<td>Aalesund</td>
<td>0.3</td>
<td>662</td>
<td>453.1</td>
<td></td>
</tr>
<tr>
<td>Bolzano</td>
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<td>662</td>
<td>453.1</td>
<td></td>
</tr>
<tr>
<td>Danzig</td>
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<td>662</td>
<td>453.1</td>
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</table>

General view of the Hamburg Station (Germany).
**STATIONS ROPE**

of Wavelengths.

References (a) to (k) will be found in the lists.

---

**Station.** | **Kilowatts in Aerial.** | **Frequency in Kilocycles.** | **Wavelength in Metres.** | **Dial Settings.**
---|---|---|---|---
Klagenfurt | Austria | 0.5 | 662 | 453.1 | .....
Porsgrund | Norway | 0.7 | 602 | 453.1 | .....
Salamanca | Spain | 1 | 662 | 453.1 | .....
Tromsoe | Norway | 0.1 | 662 | 453.1 | .....
Tammerfors | Finland | 0.8 | 662 | 453.1 | .....
Upsala | Sweden | 0.15 | 662 | 453.1 | .....
Moscow (SP) | Russia | 1 | 663 | 450.1 | .....
Paris (Ecole Superieure) | France | 0.8 | 671 | 447.1 | .....
Rijukan | Norway | 0.15 | 671 | 447.1 | .....
Rome (IR0) | Italy | 3 | 680 | 441.2 | .....
Stockholm (c) | Sweden | 1 | 889 | 435.4 | .....
Malmberget | Sweden | 0.25 | 889 | 435.4 | .....
Belgrade | Yugoslavia | 2.5 | 929 | 429.8 | .....
Kharkov | Russia | 4 | 922 | 427 | .....
Madrid (EAJ7) | Spain | 2 | 707 | 424.3 | .....
Berlin (Witzleben) | Germany | 1.5 | 716 | 419 | .....
Dublin (2KN) | Irish F.S. | 1 | 723 | 413.8 | .....
Rabat | Morocco | 10 | 727 | 412 | .....
Odessa | Russia | 1.2 | 729 | 411.2 | .....
Katowitz | Poland | 10 | 734 | 408.7 | .....
Bern | Switzerland | 1.2 | 743 | 403.8 | .....
Koursk | Russia | 1.2 | 747.5 | 401.3 | .....
Glasgow (58C) | Scotland | 1 | 752 | 398.9 | .....
Bucarest | Roumania | 12 | 761 | 394.2 | .....
Fredrikstad | Norway | 0.7 | 761 | 394.2 | .....
Frankfurt-on-Main | Germany | 1.5 | 770 | 398.9 | .....
Wilno | Poland | 0.5 | 779 | 385.1 | .....
Genoa | Italy | 1.5 | 779 | 385.1 | .....
Dnepropetrovsk | Russia | 1.2 | 783.5 | 382.9 | .....
Radio Toulouse | France | 8 | 788 | 380.7 | .....
Artemovsk | Russia | 1.3 | 792.5 | 378.5 | .....
Manchester (2ZY) | Britain | 1 | 797 | 376.4 | .....
Hamburg | Germany | 1.5 | 806 | 372.2 | .....
Tver | Russia | 1 | 810 | 370.1 | .....
Paris (LL) | France | 1.5 | 815 | 368.1 | .....
Seville (EAJ3) | Spain | 1.5 | 815 | 368.1 | .....

---

The masts and aerial system at Stuttgart (Germany).
NOVEMBER 6th, 1929.

lefiTg@OO
WOffid

5r4

1

Kilo- Kilo- Wavewatts cycles. length.

Station.

Breslau
Falun

iGtermany

1.5 923
2 932

Sweden
932
Sweden 10
Germany 0.25 941
France 0.5 950

Goteborg
Dresden (, )
Marseilles (
PTT)

Spain

Oviedo

Poland

Cracow
Cardiff (5WA)
Paris(Vitus)
Zagreb

Gt. Britain
France
Yugoslavia

Agen

France

Bordeaux-Lafayette
France
Aberdeen (2BD).... Gt Britain
Hilversum (g)
Tallinn

Holland
Esthonia

Kosice .. ,... Czechoslovakia
Limoges
"
France
Lyons
France
Viborg

Finland

Bournemouth (6BM) Gt. Britain

325
321.9
321.9
318.8
315.8

0.7 955.4
1 959

314
313

1
1
0.7
0.5
1
1

309.9
308
308
305.6
304.3
301

968
973
973
981.7
986
995

6.5 1004

298.8

1.5 1013
2 1022

296
293.6

0.5 1022
0.5 1029.3
0.4 1031

293.6
291.4
291

1 1040
0.13 1040

288.5
288.5

Cartagena
Cassel

Kiruna
Linz

Sweden
Austria

0.2 1220
0.5 1220

Pietarsaari
Säffle
Schaerbeek

Finland
• Sweden
Belgium

0.25 1220
0.4 1220

Cracow
Belfast (2BE)
Rjukan
Nimes

Poland
Gt. Britain
Norway
France

Nurnberg

Hull (61(H)
Gt. Britain
Liverpool (6LV)
Gt. Britain
Plymouth (SPY) : Gt. Britain

0.13 1040
0.13 1040

288.5
288.5

0.13 1040
0.13 1040
0.13 1040

288.5
288.5
288.5

1040
1040
1049
1058
1058

288.5
288.5
286
283.6
283.6

Helsingfors

Germany
Norway

0.5 1058
0.05 1058

283.6
283.6

Germany

0.5 1058
0.05 1058

283.6
283.6

0.3 1058
Copenhagen
Denmark 0.75 1067
Bratislava .... Czechoslovakia 12.5 1076
1.5 1085
Konigsberg
Germany
7 1094
Turin
Italy
0.5 1103
Rennes (PTT)
France
Kaiserslauten (e)
Clermany 0.25 1112

283.6
281.2
278.8
276.5
273.2
272
269.8

0.15 1112
0.25 1112

269.8
269.8

Sweden 0.25 1112
... Spain 10 1121
0.1 1121
France

269.8
267.6
267.6

1130
1139

265.5
263.4

1148
1157

261.3
259.3

1166
1175
1184

257.3
255.3
253.4

1193
1202

251.5
249.6

1211

247.7

...... Sweden
Sweden

Hudiksvall (e)

' Sweden

Norrköping (e)
Trollhâtten (e)
Barcelona (EAJ13)
Strasbourg
Lille (111')

Sweden

(1)

0.7
France
Morayska-Ostrava C'chosloyakia 10
1
Newcastle (5NO) ... Gt. Britain
1.5
Germany
Leipzig
Sweden 10
Horby
1.2
France
Toulouse (PM')
5
Gleiwitz
Germany
1
Spain
Prague (No. 2). Czechoslovakia Trieste
Italy
Almeria (EAJI8)

Germany

Bordeaux (S-0) .
France
Juan-les-Pins (Nice) (f). France
Orebro
Sweden

288.5
288.5

Uddevalla (e)
Varberg (e)

245.9
245.9

Germany
Sweden

0.13 1040
0.35 1040

NotoJden (e)
Stettin (e)

Sweden
Belgium

245.9
245.9
245.9

Kiel
Kalmar

Gt. Britain
Gt. Britain

Magdeburg (e)

Spain
',Germany

.

0.5 1220
0.01 1220
0.4 1220
0.25 1220
0.2 1220
1220
0.25 1220
0.2 1220

Gt. Britain

Gt. Britain

Holland

Eskilstuna
Ghent

Dundee (2DE)
Edinburgh (2E1i)

Stoke-on-Trent (68T)Gt. Britain
Swansea (5SX)
Gt. Britain 0.13
France Mont-de-Marsan
France 0.2
Montpellier
0.5
Berlin No 2(e)
Germany
0.5
Innsbruck (e, h)
.Austria

Finland

Abe
Bloemendael (I)

Bradford (2LS)

Sheffield (6FL)

ilo- Kilo- Wavewatts cycles. length.
1

Station.

Dial
Settings.

Münster (e)
Lodz

Germany
Poland

Boras
Hälsingborg

Sweden
Sweden

Malmo
Umea

Sweden
Sweden

Biarritz

France

Cologne
Germany
Bucarest Univ. (e)
Roumania
Cork (li(' 1:")
Irish F.S.
Luxembourg (k)' .Luxembourg
rénmp
Flensburg

.

Finland
France
'Germany

Karlstad
Ornskeldsvik

Sweden
Sweden

Bjorneborg
Halmstad

Finland
Sweden

Warsaw (No. 2)
Palermo (f)
Jassy Univ. (e)
Beziers
Gavle
Kristinehamn
Jiinképing
Leeds ('LS) (e)
Karlskrona

Sweden
Sweden
(It. Britain
Sweden

245.9
245.9
245.9
245.9
245.9

1238
0.2 1247
1 1256

240.6

2

1256
1260

1285
0.2 1265
0.5 1283
1283
0.15 1301
0.2 1301

242.3
238.9
238.9
238
237
237
233.8
233.8
230.6
230.6

0.6 1301
0.2 1301
1.5 1313
1.5 1319
1328
1 1337

230.6
230.6

1346
0.9 1355
1364
0.5 1373

222.9
221.4

0.25 1373
0.2 1373
0.8 1373
0.2 1391

218.5

3.

Poland
Italy
Roumania . .France
Sweden

245.9

245.9
244.1

1

1400
1410

1420
1420
0.2 1470
0.25 1480
0.25 1490
0.13 1500

e2

1530

I.

••
• ......

228.4
227.4
225.9
224.4

219.9
218.5
218.5
218.5
216
214
212.8
211.3
211.3
204
202.7
201.3
200
196

(a) = Projected.
(b) 7-' After 6.0 p.m
Power to be increased to 60 iVg.
(c)
= Power to be increased to 35 kW.
Provisionally.
(e)
(f) = Under construction.
After '6.0 p.m.
(g) = Will
work on 213 metres if 283 metres prove
=
unsatisfactory.
Temporarily closed.
Sundays only.
,
{
)9): Experimental.
A

•

,

245.9

1220
1229

1

Dial
Settings.

34


How Electro-plating Affects High-frequency Resistance.

At the Radio Exhibition at Olympia the author noticed a display of low-loss inductance coils. They were of bright bare copper wire. A few of them were beautifully brightly finished—apparently silver-plated—but a notice in bold type proudly informed the enquiring visitor that "All coils are nickel-plated for short-wave work." The manufacturer had evidently seen such coils silver-plated and had made his coils bright also, but had forgotten not only that nickel is vastly inferior to silver, ordinarily, as a conductor, but also that it has para-magnetic properties which preclude its indiscriminate use at radio frequencies.

Although the average wireless amateur of to-day fully realises that "all is not gold that glitters," it is thought that a little information on the relative behaviour, at radio frequencies, of various conductors and the effect of electro-plating them with various other metals will be helpful to many, especially if expressed quantitatively. There are quite a number of simple problems encountered which demand a knowledge of radio-frequency conductivity.

Tinned Copper Wire.

Although at wavelengths round about 30 metres the resistance of a copper wire is increased from six to eight times its original value by nickel-plating it to a thickness of a few ten-thousandths of an inch only, tinning the same wire with a similar coating will only produce a 30 per cent. increase in its resistance, although the specific resistance of nickel and tin are of the same value. Many regard commercial tinned copper wire with the utmost suspicion and will not employ it despite the fact that soldering is greatly facilitated by its use. It can be stated, however, that the thickness of tin on the surface of this wire is such that it does not affect appreciably the resistance on wavelengths higher than 700 metres. It is hoped that the comfort they derive from this statement will more than compensate for the shock of the blow to one of their pet theories.

Another interesting example of the importance of the knowledge of radio-frequency conductivity is that of the relative conductivity of copper and silver. It is generally supposed that silver is a much better conductor than copper, but even for direct current it is only about 6 per cent. better. At high radio-frequencies, on all but the finest wires, this advantage is reduced to 3 per cent. -there being virtually no difference between the two metals. This also, of course, applies equally to the relative effectiveness of copper- and silver-plating of conductors. A little greater advantage may be gained in the case of silver-plating copper coils due to the fact that the silver deposited is pure electrolytic metal, whereas the copper is hard-drawn and consequently impure. In this connection it may be of interest to note that the high-frequency resistance of a hard-drawn copper conductor is reduced by 2 per cent. or 3 per cent. by copper-plating.

Again, the difference in the conductivities of copper and aluminium is reduced at high frequencies. At ordinary frequencies aluminium is about 70 per cent. higher in resistance than copper, whereas at radio-frequencies a 30 per cent. increase only is produced by the substitution of the lighter metal. This fact combined with its low specific gravity makes aluminium suitable for such conductors as plates for variable condensers.

Just one other instance of the reduction in the resistance of the higher specific resistance conductors at high radio-frequencies is to be found in the choice of aerial wire. A glance at any wire tables will show that phosphor-bronze has a D.C. resistance of five times that of copper, an increase which would make its use as an aerial a matter for serious consideration. At high radio-frequencies, however, this ratio is reduced to a little more than 2 to 1, and so the alloy (which has the advantage of a much greater tensile strength and much lower ductility than copper) may be employed without the introduction of serious loss in the aerial.

1 Even at 30 metres the increase of resistance due to the tin may be only 5 per cent., and it is thus seen that the effect is almost negligible on all but the lowest wavelengths.

2 In comparison with copper.
Radio Conductors Compared.—

High-frequency Resistance due to “Skin Effect.”

It will be noticed from the figures of the above examples that the ratio of high-frequency resistances of two conductors is always approximately proportional to the square root of the ratio of their specific resistances. This is because of the well-known “skin effect” of radio-frequency current conduction. The current which flows in a conductor at radio-frequencies only “flows” in the outer crust or “skin,” and its value is therefore limited (or the resistance increased) by this restriction of area. Under these conditions the resistance of the conductor, or the current it will pass, will not be materially changed if the centre of the conductor is cut away, leaving only the crust or skin in the form of a tube. The amount which could be cut from the centre without affecting the value of current passing at any particular frequency is a measure of the increase of resistance of the solid wire, at that frequency, above its D.C. value.

In order to be used as a criterion of resistance increase in this way the amount of this superfluous “core” should be expressed as a percentage of the total cross-sectional area of the solid conductor. The percentage will be greater for higher frequencies and for conductors of greater cross-section.

* This is only true for conductors having unity magnetic permeability, as will be explained later.

A Simple Explanation of “Skin Effect.”

In order to form some idea of the reason for this “surface flow” of high-frequency current, it is well to consider a conductor of circular cross-section and of large diameter—a copper rod. The reader will, of course, know that an alternating magnetic field is produced by an alternating current flowing in a thin wire—he will know also that this field takes the form of circular magnetic “lines” round the thin wire and concentric with it as shown in Fig. 1(a). This field, by virtue of the fact that it is linked with the current producing it, gives the conductor inductance L (even if it is a straight wire) an inductance which, at very high frequencies, gives to the wire a reactance (\omega L) sufficiently high to limit the current flow as seriously as or sometimes more seriously than its resistance.

Now let a large-diameter copper rod be considered to be built up of a number of thin copper wires, say 1,000, of equal diameter, and packed tightly as shown in Fig. 1(b). If the conductor forms part of a D.C. or low-frequency A.C. circuit, each wire will conduct its proper part of the total current carried by the complete conductor; the current through each wire being limited only by its resistance. If this composite conductor is made to form part of a radio-frequency circuit, however, the reactance of each of these fine wires becomes sufficiently high to share with its resistance in limiting the current flowing in it because reactance (2\pi f L) is proportional to frequency (f). The reactance of each fine wire is also proportional to its inductance (L) which is in turn proportional to the quantity of magnetic flux (or field) surrounding it.

It is obvious that a fine wire in the centre of the conductor shown in Fig. 1(c) will have surrounding it the magnetic field A inside the conductor as well as that of B on the outside. A wire on the outer skin of the conductor such as that of Fig. 1(d) will, on the other hand, have only the field B outside the conductor linking with it. It is easy to see, therefore, that the innermost thin wires will have a greater inductance than those near the surface. The current flowing in these innermost wires will therefore be less than that in the outer wires because of its greater limitation by their greater inductance and reactance. By this reasoning a simple idea of skin effect may be formed.

Properties of Iron and Nickel Wire.

Stated correctly, the current density rapidly diminishes towards the centre of the conductor, and in large-diameter conductors there is actually no current at all flowing in the centre of the wire at high frequencies. As one would expect, if the conductor is of high specific resistance then the diminution of current density towards the centre of the wire is less rapid, i.e., the “skin depth” to which the high-frequency current penetrates increases as the specific resistance of the conducting metal increases—as the square root of \( f \) as a matter of fact. The skin-effect is less, due to the fact that the limitation of current by reactance is less important because the ratio of reactance to resistance is less due to the higher resistance.

There is obviously another property of the conductor which influences the skin depth—that of magnetic per-
Radio Conductors Compared.—

meability. Unless the conductor be of a para-magnetic material, such as iron, steel or nickel, its skin depth will depend (for a given frequency) entirely upon its specific resistance, since the permeability will be unity. But if the conductor be of one of the above-mentioned magnetic metals, the skin depth to which high-frequency current will penetrate will be very much less. The reason for this is easily appreciated, because the magnetic field density inside the conductor will be much greater than that outside—greater by the value of the permeability of the conductor of course. This, in turn, causes a greatly increased magnetic linkage (inductance) at the centre of the conductor, or even at portions only just below the surface. It is due to this cause that the skin depth of a conductor, at a given frequency, is inversely proportional to the square root of the permeability of that conductor.

The Electro-plating of Conductors.

Thus it is seen that specific resistance is of less importance in radio-frequency conductors than in ordinary electrical circuits, but that iron, steel and nickel are to be avoided. Moreover, since the current at high radio-frequencies only penetrates into the skin of a conductor, it is obvious that in the case of electro-plated conductors it is the metal with which they are plated that determines largely the skin depth and resistance.

Wires of low resistance, such as copper, are rendered much less conducting by plating with high-resistance and permeable metals, such as nickel, and wires of high resistance and permeability are rendered much more conducting by plating with, say, copper. For short-wave circuits copper or brass parts and wires should never be nickel-plated for the purpose of finish unless the thickness of plating can be ascertained with accuracy. Copper or brass parts may be tinned, however, without greatly affecting their high-frequency resistance.

In Fig. 2 is shown the increase in resistance of one yard of 16 S.W.G. brass and copper wire, due to nickel-plating and tinning, to various thicknesses up to 1 mil. The measurements were effected at 10,000 kilocycles (30 metres), and the curves show well the great difference between the skin effect of tin and nickel, a difference which is practically wholly due to the para-magnetic properties of the latter, because the two metals are of roughly the same specific resistance.

A Costly Decimal Point.

The question of finish for short-wave coils of bare copper wire or braid always calls for much consideration, more especially as this has often to be done after the coil has been completed on its insulating former. Copper, if left exposed to the atmosphere, will tarnish very quickly. Lacquer cannot be applied readily after winding. Gilding the wire or braid prior to winding provides a very effective and enduring finish, but the specific resistance of gold is appreciably greater than that of copper, and the gold-plating thickness must, in consequence of this, be kept very thin.

For another reason—obviously that of cost—the quantity of gold deposited during gilding must be kept less than, say, one ten-thousandth of an inch. The author had occasion recently to have gilded some copper braid for short-wave coils, and through a misunderstanding, which amounted to the incorrect position of a
Radio Conductors Compared.—
decimal point, the thickness of gold deposited was
<0.001 inch, instead of <0.0001 inch.
A costly monument has thus been erected to remind
those responsible of the effect of too heavily plating high-
frequency copper conductors, for there is no use to which
yards of heavily gold-plated braid can be put. Not
only was the cost of gilding prohibitive, but the thick-
ness of gold was sufficient to cause an increase of resist-
ance greater than could be permitted in the coils of
which the lowest possible power-factor was an essential
quality.

The Use of Steel Wires as Conductors.
Iron, steel and nickel wires are tremendously reduced
in resistance at high radio frequencies by a thin coating
of copper. In Fig 3 is shown the reduction of resistance
of a yard of 16 S.W.G. wrought iron and hard piano steel wire at 30 metres by copper-plating to
various thicknesses up to 1 mil., the approximate skin
depth for copper at this frequency. The reduction of
resistance effected by one thousandth of an inch of
copper on the wrought iron wire is seen to be about
27 to 1, and the effect of such a reduction upon the
tuning sharpness of a resonant circuit is shown by the
comparative resonance curves of Fig. 4 for a circuit
formed with this wire before and after plating. The
length of wire was merely bent into a 6 in. diameter
loop and tuned by a variable condenser of about 240
µµF. at 30 metres. From Fig 3 it is seen that with
only one-thousandth of an inch of copper-plating on
the iron and steel wires their resistances are reduced
to the values of the solid copper wire of Fig. 2, proving
that the skin depth of copper at 30 metres is of the
order 0.001 inch. Where great rigidity or mechanical
strength is desirable, it is thus possible to use steel
wires as portions of radio-frequency circuits, providing
they are thinly coated with copper.

Fig. 4.—These experimentally obtained resonance curves show the extent to
which the tuning of a single-turn coil of 16 S.W.G. wrought iron wire is sharpened at 30 metres by electro-plating it
with one-thousandth of an inch of copper. One yard of the wire
was bent into a 6 in. diameter coil (with parallel ends) and tuned
by a variable condenser of the capacity indicated.

New Society for Sevenoaks.
A Radio Society is now being formed in
Sevenoaks. Readers of Wireless World
residing in that neighbourhood can obtain full
information from Mr. E. H. Denk, Cornwell
Lodge, Dunton Green, who is acting secretary
(probably from Mr. E. Benham, 45, High
Street, Sevenoaks.

At the Broadcasting End.
The Maintenance of a Modern Broadcast Station is the title of a lecture to be
given by Mr. Noel D. Cumming at a meeting of the Institute of Wireless Technology to be
held at 7 p.m. on Nov. 11th at the Engineers' Club, Coventry St., London, W. Those interested
in the activities of the Institute should communicate with the Hon. Secretary, Mr. H. J. King,

Home-constructed Loud Speakers.
Several loud speakers of the line-diaphragm type constructed by members were demonstrated
and compared at a well-attended meeting of the Southend-on-Sea and District Radio Society on
October 18th. The tests were conducted by means of gramophone pick-up and radio receive-
tion. The two best, in the opinion of those present, were described by their constructors.
Hon. Secretary, Mr. F. J. Walker, Lynthorpe, Orange Gardens, Southend-on-Sea.

Selectivity Problem in North London.
Now that Brookmans Park is transmitting the
whole of the London programme, listeners in the
area covered by the Tottenham Wireless Society are experiencing difficulty in receiving
the alternative programme from Daventry. Such
In a topic lecture on Selectivity and the Brookmans Park Transmissions at the
Society's last meeting, Mr. F. E. R. Neele gave
valuable hints on improving selectivity and
provided the theme for a rousing discussion. The
lecturer condemned the use of a wave trap, although such a device would cut out all trace
of the present transmissions. Within the next
few months a second programme would be trans-
muted from Brookmans Park at a similar
strength and a wave trap would be unable to
cope with such a transmission. The methods which the lecturer had found effective in
this locality were the use of an ordinary home-coupled circuit, with tuned aerial and
secondary, and coil reaction, if used, operating on the secondary, or the employment of an extra-
tuned circuit, the aerial side of which was
coupled to the aerial terminal of the set by a
small mistered condenser.
Hon. Secretary, Mr. R. C. A. Haynes, 139,
Lordship Lane, N.22.

Iford and District Radio Society.
Wireless enthusiasts of the Iford district
who decide to join the Iford and District Radio Society will be assured of a good
programme during the coming months. A cinematograph lecture was given on October 26th by Messrs.
Siemens Bros., the subject being Lamps, Bat-
teries and Cables. A lecture on Operation of A.C. Mains will be contributed by the Marconi Wireless Co., Ltd., on December 5th.
Hon. Secretary, Mr. C. E. Laingen, 16, Clements
Road, Iford.

Television Explained.
"The Principles of Television" was the sub-
ject of a lecture given by Dr. J. Denton,
A.M.I.E.E., at a meeting of the Maxwell Hill
and District Radio Society on October 23rd.
By means of a very comprehensive series of lantern slides and some novel experiments with tele-
vision apparatus members were able to gain an
excellent insight into the secrets that had been accomplished in the television field.
Wireless enthusiasts in the district who are interested in the activities of the Society are
invited to communicate with the Hon. Secretary, Mr. C. J. Witt, 39, Campton Road, N.10.

New Society in Sheringham.
The Sheringham and District Wireless Society, which has just been formed, is already in a
flourishing condition with a membership of 60, including a number of ladies. Vacancies for new
members still exist, however, and full particulars can be obtained from the Hon. Secretary, Mr. C. R. Hunt, Kensington House, Church Street,
Sheringham. Meetings held in the British Legion Rooms, Church Street.

Battery Eliminators.
Battery eliminators, a topic of special interest
at the present time, was the subject of a lecture by Mr. Ingham, of Messrs. Hill, Clarke and Co.
(Manchester), Ltd., given recently before Slade
Radio (Birmingham). The various circuits in-
volved were carefully described, and members
were able to inspect one of the latest types of
eliminators.

The fourth slide drive and dance, held on
October 23rd, was attended by over 120 people.
Forthcoming items in the syllabus include a visit
of the Hits to the National Telephone Exchange on November 16th, and a visit to one of the City Electric
power stations in the near future.

Full details regarding the Society's activities
can be obtained from the Hon. Secretary.
Frobisher House, Cumborne Road, Edginton.

A New Moving-Coil Loud Speaker.
The Celestion "Electrola" moving-coil loud
speaker was demonstrated at a recent meeting of the Bee (Streatham) Radio Society. The model
exhibited had a field, winding which could be
energised by a low-tension voltage of from 0 to
1, and was capable of being connected with
telephone receivers. A speaker was obtained
using a 5-volt receiver with screened grid H.F.
units, and gave excellent results.

An attractive syllabus has been arranged for
the coming weeks, and any new members will be
heartily welcomed.
Hon. Secretary: Mr. A. L. Odel, 171, Trend
more Rd., S.W.14.
EVENTS OF THE WEEK IN BRIEF REVIEW

LOOK YOU!

For the first time in the history of the National Eisteddfod of Wales wireless is to be included among the competition subjects. At the Eisteddfod to be held at Llanelli in August, 1930, a prize of £5 will be offered for the best home-constructed wireless receiver costing not more than £10.

The factors governing the choice of the winner will be quality of reception, workmanship, and value for money.

DUTCH APPARATUS FOR SIAM.

An order has been placed by the Siamese Government with the Philips Radio Co. of Eindhoven, Holland, for a twin wavelength broadcasting plant at Bangkok which will transmit on 300 and 30 metres simultaneously.

SA. TO OUTWIT "PIRATES."

The ordinary methods having failed, the South African Government has decided upon a drastic measure to secure adequate revenue for the broadcasting services. According to South Africa, the Government have in view the abolition of the present licence fees, substituting a 25 per cent. duty on the importation of all wireless goods. While the Government will retain 3 per cent., the balance will in all probability be handed over to the African Broadcasting Company.

It is felt that a system on these lines will not only popularise wireless, but compel the erstwhile "pirate" to contribute indirectly to the broadcasting service or give up listening altogether.

WIRED RADIO "CAMPAIGN IN U.S.

"Wired radio" will shortly be a household term in America if success attends the plans of the new Wired Radio Corporation which is about to launch its scheme publicly at the Cleveland Electrical Exhibition.

The company will there display for sale a small box-shaped attachment, containing a frequency filter, which can be attached to any existing radio receiver and permit its owner a choice of three programmes sent over the ordinary electric light wires by three-phase high-frequency transmitters.

One of the inducements offered to the

A TYPICAL GERMAN RELAY STATION. Kaiserslautern, which relays a number of transmissions in turn, including those of Nuremberg, Augsburg and Munich. The common wavelength of 270 metres is used.
PITY THE MAN UPSTAIRS.

A bylaw proposed by the Hornsey Town Council aims at prohibiting the use of loud speakers in wireless shops if disturbance to neighbours or to persons living over the shop.

LADY WINS SET-BUILDING PRIZE.

Miss C. Martaki has won the First Prize (£25 guineas) in Class 2 of the set - building competition organised in connection with the recent Manchester Wireless Exhibition. In Miss Martaki's set, the best among receivers designed specially for quality reproduction, the whole tuning arrangement consisted of a 40-turn coil and a single .00035 condenser. The wiring was well spaced on a baseboard over a yard in length and 10" in width.

AMERICAN RADIO MERGER.

The biggest radio merger yet planned in America is to become effective as from January 1st, 1930, when the Victor Tapping Machine Co., the Radio Corporation, the London Ericsson Co., and the General Electric Co., will combine in the production and sale of radio equipment.

The central manufacturing plant of the organisation will be situated at Camden, and it is expected to employ 2,000 men. The total sales are expected to reach £100,000,000 a year.

SUNBEAMS IN AUSTRALIA.

Shareholders in the amalgamated Wireless Company of Australia are praising Marquis Marconi for his invention of the beam, which has brought them dividend warrants for the first time. After an interval of twenty-one months, the company has published its balance sheets for the past two years. They show profits of £47,000 and $20,000, and dividends of 6 and 8 per cent, respectively. It is considered beyond doubt that the new beam services are responsible for the company's changed fortunes.

OLD TRANSMISSIONS RE-HEARD.

One of the 'tallest' wireless stories on record is related with a due amount of scepticism in Time and Tide. It appears that in the early hours of a recent morning a listener, endeavouring to get America was surprised to receive at exceptional strength a programme of classical music. This roused his curiosity, as American radio programmes at this time are usually devoted to commercial music, and it was increased when he heard the items announced in English as spoken in England. He wrote down the particulars of the music performed with the object of identifying the transmitting station. The mystery deepened when he obtained proof that the programme had not emanated from any station working at the hour he heard it.

His astonishment may be judged when, after what must have been a weary search, he discovered that the programme tallied exactly with that broadcast from 2LO in 1927, two years previously!

Here indeed was an echo from the depths of space which might well frighten the boldest. For how many programmes could we endure twice?

"SELECTIVITY AND QUALITY."

It is regretted that a typographical error occurred in the article bearing the above heading in the issue of THIS WIRELESS WORLD for May 1929. On page 472, column 2, line 21, the figure for side-band variation was given as 15 per cent., whereas the correct figure is 52 per cent. The figures for the same circuit are given correctly in Table 9.

HIGH-SPEED SPEECH.

Dr. Curt Stille, a well-known German engineer, whose considerable time has been at work on apparatus for the electro-magnetic registration of sounds, is reported to have constructed a Press talking machine, writes a correspondent.

When connected to an ordinary telephone instrument, the apparatus registers all incoming communications, which in their turn can be amplified and reproduced as required through a loud speaker. The main advantage of the invention, however, lies in the fact that it permits a species of high-speed telephony. If, for instance, a Berlin newspaper agency receives a telephoned bulletin lasting thirty minutes from, say, its Stockholm or Copenhagen correspondent, the entire message can be registered on a steel tape. It will be necessary to pass the information on to Paris or London correspondents, the mechanical transmission can be speeded up, with the result that the message can be sent over the usual long-distance cables, and compressed into some six months' duration, thus effecting a considerable saving in expense. When slowed down the receiving apparatus gives a intelligible message.

ARGENTINA TELEPHONES FOR FREE.

A telephonic appeal from the Argentine for a development of the short-wave broadcasting service from Britain was made today (November 6th) by Sir John Keith, Director-General of the B.B.C., to have a telephone call from Buenos Aires via Berlin. Those engaged in the conversation at the Buenos Aires end were Mr. Hendy, of the Marconi Company; Mr. G. C. Stille, manager of the River Plate Telephone Company; and Mr. Brumen, head of the English Speaking Radio Club of Argentina.

Mr. Brumen stated that plans were going forward for a new broadcasting station near Buenos Aires to serve programmes in English to the 100,000 English-speaking people of Argentina. Britishers in the Argentine were keenly interested in 55W and looked forward anxiously for an extension of its service.

FREE LICENCES FOR SICK POOR.

The Reich Broadcasting Society has announced that licence fees are to be remitted in the case of sick persons with limited incomes. Free licences have already been available in Germany to blind listeners and War invalids.

BOOKS RECEIVED.

Telegraphy and Telephony, Including Wireless, by E. Mallett, D.Sc. (Eng.) London.—An introductory text-book to the study of modern telephony and wireless, which is a part of communication intelligence. Comprising line telegraphy for short and long lines; line telephony, including a chapter on manual and automatic exchanges; wireless telephony, and an appendix of mathematical formulæ and tables relating to the subjects dealt with. Pp. 413+ix with 287 diagrams and illustrations. Published by Chapman and Hall, Ltd., price 21s. net.

B.B.C. Year Book, 1930.—Including special articles on matters of broadcasting interest; events of the past year; the history of the old B.B.C. from November, 1922, to December, 1926; general articles on musical, educational, and dramatic broadcasting. Technical articles, tables and formulæ. Pp. 463 with numerous illustrations. Published by the British Broadcasting Corporation, London, price 2s.
Wireless Theory Simplified

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

Part VII.
Alternating Current Circuits. (Continued.)
(Continued from page 492 of the previous issue.)

When learning the elementary laws of electricity we are shown that the power in a D.C. circuit is given in watts by the product of current and electromotive force. Then later we learn that the same laws apply to an A.C. circuit containing resistance only (see Part VI, last issue). Now we encounter the apparent paradox that when an alternating current is passed through a coil possessing inductance only no power whatever is absorbed! At first this discovery is rather disconcerting, but after a little consideration the reasons become fairly obvious.

In the first place, no heat can be generated where there is no resistance—this is a fundamental law. And yet it is equally true that at any instant the power is actually equal to the product of current and voltage at that instant in any circuit. The question is: What is becoming of the energy represented by this power if it is not being converted into heat? The answer lies in the fact that energy is required to build up a magnetic field and that this energy is all recovered by the circuit when the field dies away again. We shall now deal with this point in some detail because a clear understanding of it will enable the reader to follow more easily the workings of oscillating circuits—one of the main subjects we are leading up to.

The Effect of Phase Difference on Power.

Although there is no such thing as a perfect choking coil, that is, one without any resistance whatever, this condition can be fairly closely approached in practice. As before, we shall assume that we have a coil whose inductance is \( L \) henrys and whose resistance is zero. It was shown that for such a coil the sine waves of voltage and current are exactly 90° out of phase (or in quadrature), the current lagging behind the applied voltage. The current and voltage curves are shown in their correct relative positions in Fig. 1.

Suppose that the maximum value reached by the current every half cycle is \( I_m \) amperes. Over the first quarter cycle from \( O \) to \( P \) in the diagram the current builds up from zero to \( I_m \) in the positive direction, and a magnetic field is established, linked with the turns of the coil. It will be seen that during this first quarter cycle the current and voltage are both positive and therefore that energy is being put into the circuit. This is absorbed by the growing magnetic field, and when the current has reached the maximum value \( I_m \) the stored energy will be \( \frac{1}{2} L I_m^2 \) joules or watt-seconds (see Part V). Now during the next quarter cycle, from \( P \) to \( Q \) in the diagram, the current falls again to zero, the field collapses and the whole of the stored energy is given back to the circuit. Note that during this second quarter cycle the voltage is negative whilst the current is still positive although falling, showing that power is being given out by the circuit. As there is no resistance present the whole of this energy is returned to the source of supply.

Now consider the third quarter cycle, from \( Q \) to \( S \) in Fig. 1. During this time the current is building up again, but in the reverse direction, and energy is once more being expended in establishing the magnetic field. The current and voltage are now both negative and their product is therefore positive, proving that power is going into the circuit. Over the last quarter cycle from \( S \) to \( T \) we have the return of the energy as before.

To sum up, then, it appears that when we drive an alternating current through a circuit possessing inductance only, we put a certain amount of energy into
Wireless Theory Simplified.—

the field and then withdraw the whole of it once every half cycle, no portion of it being lost as heat. Thus the average power taken by a pure inductance in an A.C. circuit is zero. In any circuit where the current and voltage are exactly a quarter of a cycle out of step the conditions are the same, and the average power is zero. It will be seen later that a condenser in an A.C. circuit behaves in the same way.

We have already likened inductance to the inertia or mass possessed by a heavy body, and we can now extend the analogy a little farther to explain the principle of the total return of energy as exhibited by a pure inductance. When a body is set in motion energy is imparted to it and stored as kinetic energy (energy of motion), and when the body is brought to rest again the whole of this energy is withdrawn.

![Fig. 2.—A coil possessing both inductance and resistance is equivalent to a pure resistance in series with a pure inductance.](image)

As an example, consider the reciprocating piston of a steam engine. Assume that the steam has been cut off but that the engine is still running, driven by the momentum of the flywheel. At the beginning of a stroke the piston is accelerated, energy being imparted to it from the flywheel through the medium of the crankpin, connecting rod, etc. At about the middle of the stroke the piston reaches its maximum velocity, and beyond this begins to slow down again. Now if there were no friction between the piston and the cylinder walls (equivalent to no resistance in our electric circuit) the piston would tend to move forward, due to its own momentum without loss of velocity. But it is constrained to slow down again by the crank, and in so doing it exerts a forward pull on the crankpin, so restoring the energy to the flywheel. Thus if the engine were quite frictionless it would go on running indefinitely without steam, the energy given to the piston over the first half of each stroke being recovered during the second half stroke. The same thing is happening in our circuit of pure inductance, where once cycle corresponds to one revolution of the engine crank so that one stroke of the piston represents one half cycle. Energy is given to the circuit and then totally withdrawn again once every half cycle.

Coil with Resistance and Inductance.

So far, we have considered circuits where either resistance or inductance existed alone. In actual practice an inductive coil is wound with wire which necessarily possesses resistance, and in the majority of cases the effects of this resistance are not negligible compared with the effects of the inductance. So now we must consider the behaviour of an inductive coil possessing both resistance R ohms and inductance L henrys, and in so doing we shall make full use of our previous discoveries.

When an alternating current is passed through such a coil its passage is impeded by the combined effects of the resistance and the reactance. It is the same current which simultaneously generates heat in the resistance and produces the magnetic field linked with the turns of the coil. Therefore a coil having resistance R and inductance L, as shown at (a) in Fig. 2, will behave in exactly the same way as a circuit consisting of a pure resistance R connected in series with a pure inductance of L henrys, as shown at (b) in the figure.

Let I amperes be the R.M.S. value of a current driven through the equivalent circuit (b) of Fig. 2, the frequency being f cycles per second. We shall set out to find in terms of R and L what voltage E will be required to drive this current through the circuit, and the easiest way to do this is to determine separately the voltages E₁ and E₂ necessary to overcome the resistance R and the reactance X respectively of the circuit, finally adding them together in the proper manner.

Applying Ohm’s Law to the pure resistance R, we see that the necessary voltage for this part is E₁ = IR, where E₁ and I are in phase. The voltage E₂ required to drive the current against the back E.M.F. due to the effects of the inductance will be E₂ = IX volts, where X = 2πfL ohms (see Part VI, previous issue), and hence the current lags behind E₂ by exactly 90°, i.e., the voltage E₂ leads the current by 90°.

It follows, then, that since E₁ is in phase with the current and E₂ is 90° out of phase, E₁ and E₂ will themselves be a quarter of a cycle out of step and can therefore be represented by two vectors OE₁ and OE₂ mutually at right-angles, the current vector being parallel to OE₁, as shown in Fig. 3.

The total voltage E required by the complete circuit or by the coil of Fig. 2 (a) is therefore given by the length OE and not by the ordinary arithmetical sum of E₁ and E₂, as explained in Part IV of this series. From Fig. 3 we have

\[ OE^2 = OE_1^2 + OE_2^2 \]

whence \[ E = \sqrt{E_1^2 + E_2^2} \] volts and substituting in this equation the values found above for E₁ and E₂ we get

\[ E = \sqrt{IR^2 + IX^2} \]

\[ = I\sqrt{R^2 + X^2} \]

volts, where \( X = 2\pi fL \).
Wireless Theory Simplified.—

Modification of Ohm’s Law.

The quantity \(\sqrt{R^2 + X^2}\) is the number by which the current must be multiplied to give the voltage, or by which the voltage must be divided to give the current. It is called the impedance of the coil or circuit and is usually denoted by \(Z\). Since \(Z\) is the ratio of voltage to current it is expressed in ohms, and thus for an inductive circuit we have the relationship

\[
E = \frac{I}{Z} \text{ amperes},
\]

where \(Z = \sqrt{R^2 + (2\pi f L)^2}\) ohms.

In an A.C. circuit, then, \(Z\) takes the place of \(R\) in Ohm’s Law for a D.C. circuit. The impedance \(Z\) is the total opposition encountered by the current, being due to the combined effects of resistance and reactance. To obtain the impedance we must add the resistance and the reactance together as though they were two lines of lengths \(R\) and \(X\) respectively at right-angles to each other. If two lines \(ab\) and \(bc\) are drawn mutually at right-angles, the length of one being equal to \(R\) and the other being equal to \(X\) to some convenient scale as in Fig. 4, then \(ac\) will give the impedance to the same scale. Such a triangle is called the impedance triangle of the circuit.

Angle of Lag in an Inductive Circuit.

The angle of lag for a pure inductance is the angle \(90^\circ\), and therefore for a combination of both resistance and reactance the angle of lag must be less than \(90^\circ\) and greater than zero. Let \(\phi\) denote the angle between \(E\) and \(I\). Then

\[
\cos \phi = \frac{OE}{IR} = \frac{OE}{IZ} = Z.
\]

In a right-angled triangle the cosine of one of the smaller angles is the ratio of the side adjacent to that angle to the length of the side opposite the right-angle. Thus in the impedance triangle of Fig. 4 the angle of lag \(\phi\) is the one lying between \(R\) and \(Z\) as shown.

Numerical Example.

Before discussing the power absorbed by this circuit a numerical calculation of the relationship between current and voltage will be helpful. Suppose, for example, that we have a low-frequency choke of 20 henrys inductance and 1,000 ohms resistance under working conditions connected in the plate circuit of a valve whose internal resistance (so-called impedance) is 3,000 ohms. It is desired to find the A.C. component of the current through the choke and the voltage across it when 10 volts (R.M.S. value) at 100 cycles per second is applied to the grid of the valve, the amplification factor being 5. This means that a voltage of \(5 \times 10 = 50\) will be generated in the anode circuit. Neglecting battery resistance, the total resistance of the anode circuit will be \(1,000 + 3,000 = 4,000\) ohms, and the reactance \(2\pi f L = 2\pi \times 100 \times 20 = 4,000\) ohms at 100 cycles.

The impedance of the complete circuit will thus be

\[
Z = \sqrt{4,000^2 + (4,000\text{ ohms})^2} = 4,000\sqrt{1 + \pi^2} = 13,200\text{ ohms.}
\]

The current \(I = \frac{E}{Z} = \frac{50}{13,200} = 0.00379\) amp. or 3.79 milliamps.

The impedance of the choke alone is

\[
Z_e = \sqrt{1,000^2 + (4,000\text{ ohms})^2} = 12,600\text{ ohms,}
\]

and so the 100 cycle voltage across the coil will be

\[
E = Z_e = 0.00379 \times 12,600 = 47.8\text{ volts.}
\]

*(To be continued).*

**TRANSMITTERS’ NOTES.**

**PAOF** F. Baron Sloet tot Everlo, Emmalaan 49, Hilversum.

**PAOG** Th. C. van Braak, Halseweg 466, Varsseveld.

**PAOI** J. J. J. van Roo, Spoorstraat 23, Hilversum.

**PAOL** W. B. M. Blonkmaart, Wilhelminastraat 392, St. Janisstraat (Z).  

**PAOM** J. Lindeman, Maratabakstraat 25, The Hague.


**PAONF** N. Fender, Groeneweg 83, Rijswijk (Z.H.).

**PAONWE** J. van der Wijk, Fahrenheithavenstraat 379, The Hague.

**PAOF** F. Dubbels, Bronchhorststraat 11, Amsterdam (C).

**PAOGA** C. A. Gehrels, Nic. Beestraat 92, Eindhoven.

**PAST** Ir. H. Leb, Dombrecht.

**PAZEE** C. Jobbe, Stokroosstraat 5b, Rotterdam.
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," Dorel House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

NON-RADIATING SETS.

Sir,—This letter is inspired by the fact that my attempts to receive the broadcast lecture given recently by Mr. H. G. Wells were frustrated by the heterodyne hounds of neighbours who could not leave their receivers alone.

Some years ago a serious attempt was made to prevent oscillation by the prohibition of reaction. As everyone knows, that attempt had to be abandoned owing to the fact that reaction, either by the swinging coil or by capacity control, or disguised as H.F. transformers with an amplification of unity, was essential to obtain either sensitivity or selectivity. In other words, none but a receiver capable of passing back energy to the aerial was worth possessing. The introduction of neutralized H.F. amplifiers did little to alter the position owing to the fact that their users for the great part upset the neutralizing condenser settings sufficiently to pick up carrier waves by heterodyning.

It seems to the writer that the advent of the screen grid valve has sufficiently altered the position to justify legislation to prohibit the use of receivers capable of energising the aerial and, it is suggested, that it would prove of considerable interest to obtain the views of your readers on this point.

Huddersfield.

HENRY W. MOES.

EMPIRE BROADCASTING.

Sir,—As you point out in your leader of October 23rd, what a splendid opportunity exists at the moment for a definite policy with immediate action in regard to Empire Broadcasting.

In the light of present technical knowledge there is no earthly, et cetera, or financial reason why arrangements for a twenty-four-hour Empire service should not be put in hand forthwith.

Your own endeavours, coupled with those of Mr. Gerald Marcuse, were very much appreciated by all your Overseas readers, as I found out on my tour to the Dominions in connection with Empire broadcasting.

Now that the project of Empire Free Trade is so very much to the fore, I would like to suggest that a committee be formed, sponsored by yourselves, whereby we should be in a position to answer any pertinent questions regarding a greatly extended broadcasting service within the Empire that may be put forward by responsible authorities.

It is not necessary to enlarge upon the assistance that would be given to the cause of Empire Free Trade by a really efficient Empire broadcasting service.

London, W.C.

H. ANTHONY HANKEY.

B.B.C. TRANSMISSIONS.

Sir,—The letter regarding the B.B.C. transmissions published in the October 23rd issue of The Wireless World was read by request at an open meeting of the Edinburgh and District Radio Society on Wednesday evening.

The observations of Mr. McCormack received so cordial an endorsement from every member present that I was asked to convey their appreciation to him through the medium of your valued periodical.

He summarised very tersely the points submitted by our council to the B.B.C. secretary last winter. I crave your permission to add the following comments.

The members of our society, about 100 in all, rank the "wireless link" transmissions as worse than tenth-rate—so bad in fact that they defy classification.

In the sweet by and by we are promised a Scottish regional station. And so there are probably at least two more years of land-line relays, two more years of continued depression for our excellent receiving sets.

In conclusion I submit the following questions:

1. Cannot the B.B.C. or the Post Office, or both, set about immediately improving, by extension or otherwise, their land-line service?

2. Will these land-line relays go on as merrily, even after the regional station is erected and in operation?

3. Or will the B.B.C. install, along with the mechanical and electrical apparatus of the new station, a resident body of artists, musical and otherwise, equal to the best that London can provide?

W. ANDERSON
(Chairman of Edinburgh and District Radio Society).

Edinburgh.

Sir,—I have read with very great interest the letter in the current issue of The Wireless World by Mr. K. McCormack, of Newcastle-on-Tyne, on the subject of B.B.C. transmissions. He stresses the very important fact, which is not, I think, generally recognised, that to obtain a perfect transmission the microphone must be near the transmitter.

I quite agree with his point that Devany is a second-rate transmission, and remember five years ago the night on which SXX transmitted from Devany for the first time, being delighted with the increased signal strength but disappointed with the quality, which I did not think so good as previously received from Chelmsford due, as I thought at the time, to the longer land-line. Long relays, though clear and distinct, are indeed of very poor quality, and it does not need the transmission of music to prove this, as it is apparent in the transmission of the speaking voice, and I could not help thinking as I listened to Mr. Shaw's broadcast 10 days ago from Plymouth, how much more real his voice would have sounded had he been broadcasting from ZLO.

Unfortunately, there seems to be no remedy for this state of affairs, which is due to the fact that 75 per cent. of transmissions emanate from London, which city could hardly be in a worse position from a wireless point of view, being at one end of a long narrow island.

E. P. HARDING.
Beverley.

SPARE APPARATUS.

It is regretted that by an oversight we omitted to include the address with the letter which was published appealing for spare wireless gear for the Society of Big Brothers in the East End. The address of the headquarters is St. Jude's Hall, St. Jude's Church, Old Bethnal Green Road, E.2.

Many readers have written asking for the address and offering to forward apparatus, and we have arranged to put them in touch with the Society.

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.

**An Expensive Failure.**

Can you tell me why the output value of my . . . . . . receiver does not last more than a few weeks? Value after valve has been returned to my dealer, who tells me that the manufacturers advise him that emission has failed, due to overrunning. An H.T. accumulator with a voltage slightly below the maximum recommended pressure of the valve is used, so there can be no question of my having exceeded the manufacturers' limit. To assist you in making a diagnosis it should perhaps be said that the set worked very well for about six months after it was purchased, but quality has been distinctly poor since the output valve trouble manifested itself. The fault does not lie in the batteries, as all voltages (H.T., I.F., and grid bias) have been checked with a voltmeter.

L. P. W.

The set you are using includes resistance coupling in each of its L.H. stages, and we are fairly confident that the trouble will be traced to a disconnection in the grid circuit of the output valve; this would prevent the necessary negative bias from reaching its grid, and consequently anode current would be excessive, and the valve would quickly lose its emission.

It should be an easy matter to test through the circuit with a pair of phones and a dry battery, and we think that in all probability it will be found that the grid leak is at fault; it should be replaced by a new one.

**Portable Sets with Aerials.**

At different times I have tried several commercial portable sets connected to an outside aerial in the manner prescribed by the manufacturers, and notice in every case that, used in this way, the sets are far from selective. Is there any way of overcoming this disadvantage?

J. W. D.

Most portable receivers include either one or more stages of "aperiodic" H.F. amplification, which does not in itself contribute anything to their overall selectivity; it must not be forgotten that they are primarily designed for use with a frame, and it is hardly fair to expect them not to suffer from interference troubles when an outside aerial is added.

**Modernising the "Everyman Four."**

Would it be possible to use the coils as specified for the "1930 Everyman Four" in the original set? I refer particularly to the long-wave windings; it would be an advantage to have H.F. magnification on this band.

L. F. P.

The long-wave transformers described is unsuitable for use with a neutralised triode H.F. amplifier, and even if it were modified by adding a neutralising winding, we do not think that satisfactory results would be obtained unless fairly sweeping modifications were introduced; it is not particularly easy to devise a set with a really efficient neutralised H.F. stage combined with waveband switching.

**Raw A.C. for Filament Heating.**

I believe that it is quite common practice nowadays to use ordinary battery valves with their filaments connected directly across the low-voltage winding of a suitable transformer in the output position of an "all A.C." receiver. Has this plan proved itself as being entirely satisfactory in practice? If so, I am thinking of incorporating it in my new set. R. P. S.

It may be stated definitely that a large number—perhaps the majority—of commercial A.C. sets include this arrangement, which, incidentally, has also been used in *Wireless World* sets. You need have no hesitation in adopting it.

**An Inexpensive Eliminator.**

Will you please criticise my circuit diagram of an A.C. eliminator for the N.G. Regional receiver? I am going to use a Westinghouse B.T.3 metal rectifier, and, as you will see, have followed the general idea of the makers' recommended circuit, but have made provision for only one main output, and a critically controlled voltage for the screening grid of the H.F. valve.

With a suitable mains transformer, an eliminator on these lines is stated to have a voltage output of 120 at 20 milliamperes. I assume that this will be sufficient for the S.G. Regional receiver? S. C.

As the set in question is inherently free from interference troubles, there is no reason why your proposed circuit arrangement (which is reproduced in Fig. 1) should not be entirely satisfactory, and the output from it should be quite sufficient for average requirements.

![Fig. 1 — A simple eliminator circuit using a Westinghouse metal rectifier.](image-url)

We would point out that, although your diagram is correct in essentials, the relative values of the resistances of the potentiometer for controlling screening grid supply are incorrect; you show both the fixed and variable elements as having a resistance of 30,000 ohms. With this combination it is impossible to obtain a supply voltage of more than 50 volts; this will be reduced if the circuit happens to consume an appreciable current. We suggest that the fixed resistance should be reduced to 10,000 ohms, and have shown this alteration on the diagram.
H.F. By-pass Condensers.

It is noted that by-pass condensers are generally used in association with decoupling resistance in the H.F. circuits of receivers described in your journal. I take it that a somewhat lower capacity would be effective in a set designed only for the medium broadcast band; I have a number of 0.01 mica condensers; would these be suitable? A. F. E.

Yes. It is necessary that by-pass condensers in these circuits should have a negligibly low reactance over the band of frequencies covered by the receiver; in the case of a set with a maximum wavelength of, say, 600 metres this condition would be amply fulfilled by a condenser having a capacity of 0.01 mfd. The fact that your components have a mica dielectric is all to the good.

A "1930 Everyman" Addition.

Will you please give me a diagram showing how a pick-up may be inserted in the detector grid circuit of the 1930 Everyman Four? I take it that this is the best position for the insertion of this additional piece of apparatus.

E. P. M.

When the pick-up is placed in the detector grid circuit, it will be followed by three amplifying stages, and connecting a short-circuiting switch across it. Bias would, of course, be adjusted by operation of the potentiometer, and the H.F. valve would be turned off by means of its rheostat.

We would refer you to our reply to "T. C. A." in this issue.

Alternative Pick-up Connection.

Will you please show me how a pick-up may be connected in the grid circuit of the first L.F. valve of the 1930 Everyman Four, preferably by means of a plug and jack? If possible, I should like to use the present volume control resistance \( R \), for regulating intensity when the pick-up is in use.

T. C. A.

Provided your pick-up is moderately sensitive (see our reply to "E. P. M.") there should be no difficulty in connecting the pick-up in the manner you desire, and it will be possible to use the present grid input potentiometer as a volume control for both radio and gramophone reproduction.

Suitable connections are shown in Fig. 2 (b).

In the interests of economy it will be necessary to make some provision for breaking the filament circuits of H.F. and detector valves; this can be done by means of a pair of extra contacts on the jack, or by an extra single-pole switch, as you prefer.

In Anticipation of Trouble.

I am about to build a new receiver, and am attracted by the design of "The Wireless World Kit Set." My problem is this: I live about twenty miles from the proposed Moorside Edge regional station, and am not sure whether the receiver will be sufficiently selective when the new twin transmitter starts operations. Will you give me your advice on this matter?

T. B. A.

You can rest assured that the "Kit Set" will be sufficiently selective for use in your locality, even if radiation from the new twin station is greater than that from Bromsgrove Park. Even if the set were operated with optimum aerial coupling (from the point of view of signal strength), there should be very little "spreading" at a distance of twenty miles with a receiver of this type, and any tendency in this direction could be still further restricted by slightly loosening the coupling between open and closed circuits.

FOREIGN BROADCAST GUIDE.

Huizen
(Holland).

Geographical position: 52° 18' 00" N. 5° 12' 00" E.

Approximate air line from London: 235 miles.

Wavelength: 1,875 m. Frequency: 180 kc.

Power: 6.5 kw.

Time: Amsterdam (20 minutes in advance of G.M.T.).

Standard Daily Transmissions.

G.M.T. 10.10 sacred service; 11.40 concert; 13.40 schools; 16.40, 18.10 and 20.00 musical entertainments.

Male announcer. Call: Hier Huizen, with initials of society presenting radio programme. Announcements are made in the Dutch language only.

Time signals (Westminster chimes) are given almost hourly throughout the day.

Programmes are transmitted by N.C.R.V. (Netherlands Christian Broadcasting Company); K.R.O. (Catholic Broadcasting Company); V.P.R.O. (Protestant Freethinkers' Radio Association), these initials being associated with the call (q.v.).

Under the heading "Foreign Broadcast Guide," we are arranging to publish a series of panels in this form, giving details regarding foreign broadcast transmissions.
You can rely on British Products—you can rely on them still more when they are Varley.

Look at the prices of these new Varley Power Potentiometers—the most expensive is only 11/6 complete—and think what you had to pay for imported Power Potentiometers last year.

Look, too, at their outstanding advantages. The resistance—wire-wound on the famous Varley Bi-duplex principle—is detachable, and you can buy a spare one for 3/6-4/6. An ingenious device ensures accurate contact over the whole range. Special provision is made for heat dissipation.

Enormous interest has already been shown in these Varley Power Potentiometers, and we confidently anticipate that they will be among the most popular components of the year.

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**Varley**
RESISTANCES & CONDENSERS

Loewe Radio Resistances never vary. They eliminate cracking noises and "false fading." Current up to 100 watts carried without appreciable heating or change of resistance value. Elements independent of applied voltage. Perfectly homogeneous. Values available from 10,000 ohms to 70 megohms. Complete length approx. 15". Retail price 1/6.

Loewe Radio Condensers safeguard against losses. Dielectric values 50,000 megohms. Tested under potential of 400 volts A.C. Values available from 0.002 to 0.005 M.F. Retail price, 0.002 to 0.005 M.F. 1/6.

FOR YOUR RADIO SET

CUT OUT YOUR H.T. BATTERY TROUBLES

Why submit to the uncertainties of constantly exhausting H.T. Batteries, which produce cracking and loss of volume in your set? Replace with the "GOLDTONE" H.T. Battery and operate efficiently and economically from your lighting mains.

Model "C.P." Alternating Current Type. Output 12 millamps, Voltage 80 volts and Power, Suitable for "COWCUB" and similar sets utilizing Screened Grid Valves.

Direct Current Models from £1 1s. 6d.

Celesion

The Very Soul of Music
LOUD-SPEAKERS

1866-1930
Sixty-four years of success—

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THE "CHRISTIAN HERALD" is read every week in more than 250,000 homes, representing more or less a million readers, and for years many well-known Advertisers have proved from "keyed" announcements its value as an Advertising Medium. Thus it pays to advertise in the "CHRISTIAN HERALD."

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6, Tudor Street - - - London, E.C.4

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CUT OUT INTERFERENCE!
Specially Tested and Recommended.
READY RADIO UNIT . . 20/-
TUNEWELL UNIT . . 10/6
HARLIE UNIT . . 12/6
G.E.C. UNIT . . 18/6
INCLUDE ONE IN YOUR SET
FREE, OUR LATEST CATALOGUE
(By Post 6d.)
DETAILS OF OUR EASY PAYMENTS
ON REQUEST. MODERATE TERMS.
WILL DAY LTD.
19, LISLE STREET,
W.C.2.
PHONE . . . . REGENT 0921-22.

REVELATION IN 4 POL UNITS
Price 15/6

This new Super Power balanced armature Unit has the quality and tone of the best moving-coil loud-speaker.
— Ask your dealer —
TELEPHONE BERLINER (LONDON) LTD.
COLINDALE AVENUE, HENDON, LONDON, N.W.9.

THE NEW UNIVERSAL (No. 97) and the new Power Model (No. 98), fitted with 9½" and 12" cones respectively, will take every unit at present on the market, including the new Amplion HA2. They will take yours. In each case the cradle is of aluminium, cone of the latest Volume type, and the beautifully polished octagonal front gives the speaker a really finished appearance. This is entirely in keeping with the magnificent reproduction afforded. We shall be pleased to send a fully descriptive leaflet on receipt of a post card.

9½ Aluminium Cored, Enamelled and Polished, fitted with Volume Cone and Octagonal Front, back leg and bracket included. 15/6-
98 Similar in every respect to the above, Universal Fitting, etc., with 12" Volume Cone and Octagonal Front, back leg and bracket included. 18/6

FREDK. SQUIRE
24, Leswin Road, Stoke Newington, N.16.

A WORD TO THE SERIOUS AMATEUR
PARMEKO

It you take your wireless seriously you will thank us for telling you about PARMEMKO wireless mains apparatus. PARMEMKO components—transformers, chokes and eliminators—are technically correct. They are used by some of the largest Radio-Gramophone and Talking-Picture Companies, for whom only the best is good enough. Though our range of models is extremely wide, we make a speciality of apparatus to your own specification. This is a great boon to the experimenter, who need no longer be content with the nearest. Send us your specification and we will quote return.
Write for price list of Wireless Mains Apparatus:
PARTRIDGE & MEE LTD.,
26, DOVER STREET,
LEICESTER.
449 Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
The advantage of BEITKAM RUBBER FABRIC for MOVING COIL LOUD SPEAKERS

12"x12" .. 1/- each.
18"x18" .. 2/3 each post paid.

PURE RUBBER SHEET.
12"x12" .. 1/8 each.
18"x18" .. 3/9 each post paid.

Ebonite Panels cut to any size to fit your cabinet—Polished, Matt, or Red Marbled.

Wholesale prices on application.

BRITANNIA RUBBER & KAMPTULICON Co., Ltd.

Now Ready!

Sixth Year of Publication!
The convenient size and informative character of "The Wireless World" Diary have made it deservedly popular. It contains many useful facts and figures to which keen wireless users constantly refer.

The Wireless World DIARY for 1930

Full of Useful Information for all enthusiastic wireless amateurs, and with ample space for memoranda and notes concerning individual sets and other radio matters.

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PARFAIT THE PERFECT EBONITE

SUPPLIED IN SIX FINISHES
Semi-Polished Black, Highly Polished Black
Matt, Highly Polished Mahogany
Cube Surface

Obtainable from most wireless dealers.

Advertisements of H. R. Potter & Co., Ltd, Station Buildings, ROCHELLE.
NOW THAT
BROOKMANS PARK
IS WORKING

... foreign stations and 5GB are difficult for many people to obtain. A shorter aerial may be helpful in some cases, but in all cases a TROLITAX Panel will be an aid to clearer reception.

The difference between TROLITAX and the old style of panel is as great as the difference in power of Brookmans Park and the Oxford St. transmitter. There is a handsome finish of TROLITAX to match any set or cabinet. Consult your dealer.

TROLITAX
F. A. HUGHES & COMPANY, LIMITED
204/6, Great Portland Street, London, W.1.


*Phone: Manchester City 2339.

HYDRA
FOR ORGOLA

The Bakelite-cased HYDRA non-inductively wound will prove the most satisfactory condenser in the Orgola circuit, because it is non-inductively wound; other makes are inductively wound.

PRICES:

25 mfd. - - 1/9
5 mfd. - - 1/10
1 mfd. - - 2/-
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THE ROTHERMEL CORPORATION LTD.,
24, Maddox Street, London, W.1.

Phone: Mayfair 0578/9.

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

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ADVERTISEMENTS for these columns are accepted up to 8 days previous to date of issue and are in the hands of the Head Offices of "The Wireless World," Dorset House, Tavistock Street, London, E.C.4, or on WEDNESDAY MORNING at the Branch Offices: 16, Hertford Street, Coventry; Guildhall Buildings, Newcastle upon Tyne; 296, Dale Street, Manchester; 101, St. Vincent Street, Glasgow, C.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 reserve the right to refuse or withdraw advertisements at their discretion.

Corrections for errors sent in payment for advertisements should be made - A Co. payable to LLIFFE & SONS Ltd., and crossed - Notes being uncontrollable if lost in transit will not be sent as remittances.

All letters relating to advertisements should quote the number of the issue containing the advertisement, and the date of the issue in which it appeared.

The proprietors are not responsible for clerical or printer's errors, although every care is taken to avoid them.

NUMBERED ADDRESSES.

For the convenience of private advertisers, letters may be addressed to numbered offices, e.g., "45, The Wireless Office." When this is desired, the sum of 6d. to defray the cost of registration and to cover postage on replies must be added to the advertisement charge, which must include the words Box 00, c/o "The Wireless World." Only the numbers will appear in the advertisement. Advertisements should be addressed to No. 00, c/o "The Wireless World," Dorset House, Tavistock Street, London, E.C.4. Readers who reply to Box Nos. advertisements are warned against sending remittance through the post except in registered envelopes; in that case the words Box 00 must be quoted.

The DEPOSIT SYSTEM.

Readers who hesitate to send money to unknown persons may be dealt in perfect safety by availing themselves of our Deposit System. If the money be deposited with "The Wireless World," both parties are advised accordingly.

The time allowed for decision is three days, counting from receipt of goods, after which period, if buyer decides not to retain goods, he must be returned to sender. If a sale is effected, buyer informs us to remit amount of invoice, but will never require the amount to deposit. Carriage is paid by the buyer, but we are sometimes instructed to make different arrangement between buyer and seller, each pays carriage one way. The seller takes the risk of loss or damage, and is responsible for defects, but if there be differences in price, for all transactions up to £1, a deposit of fee of 1/- is charged; on transactions over £1 and under £10, the fee is 1/-; over £10, 5/-.

All deposit matters are dealt with at Dorset House, Tavistock Street, London, E.C.4, and cheques and money orders should be made payable to LLIFFE & Sons Limited.

THE SALE OF HOME-CONSTRUCTED UNLICENSED APPARATUS.

A Service to our Readers.

We have made a special effort with the Patentees whereby readers who wish to dispose of a home-constructed receiver not licensed under the patents made use of, can license the set by means of the Deposit System referred to above.

Any person desiring to sell, in sending us particulars for his advertisement, will in every case make use of a Box No., and should add to the price which he requires the amount of royalty customarily paid by manufacturers.

For instance, if a purchaser estimates that in his purchase, the sum realised will be forwarded to the sender the amount due in respect of royalties, which amount will be paid by "The Wireless World," all parties own the price, and a certificate will be handed on to the purchaser of the set.

SPECIAL NOTE. - Readers who reply to advertisements and receive no answer to their inquiries are requested to guard the situation, as the probability that the good advertised may have already been disposed of. Advertisers often receive so many inquiries that it is quite impossible to reply to each one by post.

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

3-VALVE All-wave receiver, latest type, powerful, perfect; £9-V. Taylor, 57, Stonley Rd., Stock- well, London.


3-VALVE 7-valve Superhet. 1926-27, £15; Burn- side 8-valve Superhet. £15; 'Surprise' Ephem- eone IV, £7; 'Bombo' £5. J. Scott and Co, Radio Engineers. Hounstorne.

50 5-valve Portable 144 season's sales. £10-
these rights from factory to you, suit case type 2-valve, R.T. letter, English accumulator, Mullard or General tube coils, swivel, set complete in each, equal to any 144 valves on the market; satisfaction guaranteed, mention your order, £15, 701, Oldhouse, Victoria St, Westminster, S.W.

1929 Everyman Cylinder, with all panel compo- nents fixed, coils, screen, Gambrel mixers, vernier and various small condensers; also Marconi Ideal 6.5, £50. 913, Croydon, with chassis, 32/-; and after offers; seen after 6 p.m.-B, 70, Cheolmar Rd., Putney.


BARAINGS - Marconi 3-valve superhet receiver in excellent condition, £25.00. 500, Bayswater Rd., W., 8.


OHAM Music Magnet, assembled and working superbly, big accumulators and batteries, special loud speaker, £10. 7, Dorset St., W., 9.

MYRLE and Maloney Receiver; 3 tubes. £5.00; or nearest offer. Bish., 45, Russell St., Reading.

OSHAM Magic Magnet, assembled and working superbly, big accumulators and batteries, special loud speaker, £10. 7, Dorset St., W., 9.

AEG American Cylinder, 3 tubes. £15.00, complete with valves, space valves: £20; no mains reason for sale. H. Lightwood, 86, Oxford Rd., Middlesbrough.

EXPERIMENTAL Returned from abroad has As- sortment of S.W. Kit for Sale; 3 sets in cabin- et, motor, connections, 2 tubes, £10. 15, Dorset St., W., 9.

MARCHONI 3-valve Amplifier Set, complete with microphone, large loud speaker cone type, glass microphone, generating set, batteries, 2 sets of batteries, leads, etc., all contained in two cases, new in cases, sound brilliant through microphone and loud speaker and for relaying speeches or musical entertainments: price £100.-Reply BM/SML.

D.G. and H.W. Senior D.C.R.K. speaker and amplifier, B.T.I. pick-up amplifier, B.T.I. jek-up and earphone, telephone, motor and connections, very neat and complete, and Senior Panatrones magneto cabinets, commercially very neat, £10, or nearest offer. 7, Wilmot Rd., Camberwell.

MARCHONI 9-valve Amplifier Set, complete with microphone, large loud speaker cone type, glass microphone, generating set, batteries, leads, etc., contained in two cases, new in cases, sound brilliant through microphone and loud speaker and for relaying speeches or musical entertainments: price £100.-Reply BM/SML.

A.G. Main's 3-valve Receiver, excellent results; new, £17; demonstrated anywhere near London. 7, Wilmot Rd., Camberwell.

BARGAIN.-Complete set of parts for Silver Chrysanthemum capsule receiver with enterprise cost trouble; also Igricite pick-up, 10/-.-Collins, 271, Wellesley Sq., London, E.1.

1920 Cosmos Melody-Maker Three, complete with all accessories, including Marconi speaker, set is only one of its kind and cannot be purchased in this country at A. M. Ellis, 35, Whitehorse Lane, South Norwood, London, S.E.25.

EVERYMAN, Four, 2-season, in cabinet, 4x, valves, 1x, less following parts: 2 variable condensers 1/2 valve, complete; speakers 4; balance of parts and speakers complete, perfect order; £4/15/- Box 3726, c/o The Wire- less World.

4-Y.A.T. Receiver, 3 Coax 410 P, 4 210 valves, one 4-valve accumulator, one loud-speaker £20, or nearest offer.-A. B., 45, Trenchard St., Fulham.

MCMICHAEL Screened Grid Tube, complete, less glass, 15/-, or nearest offer.-J. H. B., 12, Hwarz Road, Manchester.

MCMICHAEL Super Range 4-valve Portable, 3 tube, all oils in good order, £4.00.-A. B., 45, Trenchard St., Fulham.

MCMICHAEL Screened Grid Tube, complete, less glass, 15/-, or nearest offer.-J. H. B., 12, Hwarz Road, Manchester.
famous
the linen
double diaphragm
speaker!

Model U14
£5 5 0

ULTRA
AIR CHROME
British Patent No. 298,625.

Ultra Electric Limited, 661-663, Harrow Road, N.W.10.

Chassis Prices:

Type L 12" x 10" x 3½" 42/-

Type F 12" x 9" x 3½" 52/-

Type G 12" x 5½" x 3½" 62/-

Type J 24" x 24" x 6½" 105/-

In attractive Cabinets from £3 19 6

BATTERIES.

B.B.S. Accumulator Hire and Maintenance Service
(5 mile radius) - 98, Cherry Orchard Rd., Groy.

Battery Replacements - Cases (capped or uncapped), highest grade, No. 1, 10d. per cell; No. 2, 8d. per cell; No. 3, 6d. per cell; No. 4, 5½d. per cell; No. 5, 5d. per cell; No. 6, 4½d. per cell; No. 7, 4d. per cell.

B.B.S. - Quality Wire - No. 1, 13d. per pound; No. 2, 12d. per pound; No. 3, 11d. per pound; No. 4, 10½d. per pound; No. 5, 10d. per pound; No. 6, 9½d. per pound; No. 7, 9d. per pound.

B.B.S. - Electrode Wire - No. 1, 17d. per pound; No. 2, 16d. per pound; No. 3, 15½d. per pound; No. 4, 15d. per pound; No. 5, 14½d. per pound; No. 6, 14d. per pound; No. 7, 13½d. per pound.

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Chargers and Eliminators.—Contd.

MARCHWIND PHONE D.C.I All-power Units, as new, for L.T., H.T. and Grid Bias; list 26/10, will accept 1½ amp. for mains changed to A.C—Sherburn and Son, Radio House, Cowes. [4666]

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November 6th, 1929.

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Advertisements. 33

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<th>111</th>
<th>210</th>
<th>222</th>
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<tr>
<td>Voltage</td>
<td>100-106</td>
<td>207-214</td>
<td>200-214</td>
<td>213-228</td>
<td>220-256</td>
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<th>Tapping</th>
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<td>1</td>
<td>2-H.F. Valves</td>
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<td>3-L.F. Valves</td>
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<td>4-Last Valves</td>
<td>150 v.</td>
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Type No. 210 | 212 | 213 | 222 | 226 | 235 | 238 | 240-250 |

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<td><strong>EFCO ALL-ELECTRIC 2-VALVE RECEIVER</strong></td>
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<tr>
<td>Detector and Pentode. For D.C. mains.</td>
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MECHANICAL MUSIC AND THE MUSICIAN.

The vexed question of whether broadcasting constitutes a menace to the professional musician has been a subject of discussion ever since broadcasting was introduced, and the fight between societies of musicians and broadcasting is still an undecided battle in this country. In America, where broadcasting had a considerable start over our own country, it had seemed that some sort of understanding between the musician and the broadcaster had been reached; but the arrival of the “talkies” and the great advances which have been made towards perfecting the gramophone record appear to have been watched with the greatest anxiety by professional musicians in the United States. Recently we have seen large advertising spaces in American newspapers taken by the American Federation of Musicians, with the object of trying to arrest the encroachment of mechanical music where it is feared the new art will out the professional musician.

Some of the arguments put forward by the American Federation of Musicians do not seem to us to ring true, as, for instance, a statement that “The cultural menace of this movement to supplant Real Music with the flat, savourless monotony of Mechanical Music becomes apparent upon a moment’s thought.” Is it not the generally accepted view that broadcasting resulted in a vast extension of the musical public and an enlarging of the appetite of the world for music of all kinds?

The extension of the use of what is described as mechanical music must, we fear, result in less employment amongst individual performing musicians, but may not this prove to be only a temporary objection and not one which is likely to have any lasting effect to the detriment of music generally, nor to the disadvantage of the community, for surely the increased taste for music must stimulate the demand for creative musicians in every grade of the art.

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“THE WIRELESS WORLD” OLYMPIA SHOW COMPETITION.

We are now able to announce the names of the winners of the prizes which were offered by The Wireless World in connection with our Olympia Show Competition. The prizes, it will be remembered, were to be awarded to the competitors who succeeded in correctly forecasting the outstanding single exhibit at Olympia, as decided by the majority of votes, and who also had the largest number of correct forecasts in the other classes of apparatus.

The first prize of £50 goes to Mr. A. Vernon, 214, Bradford Road, Manchester. The second prize, of a voucher for the purchase of apparatus to the value of £30 from firms who exhibited at the Olympia Show, is gained by Mr. Albert Maunder, 95, Bradshaw Street, Nelson, Lancs; whilst third, fourth and fifth prizes, of similar vouchers to the value of £15, £10, and £5 respectively, go to Mr. H. J. Whitehouse, 12, June Avenue, Bromborough, Cheshire; Mr. William M. Moore, 30, Mariners’ Cottages, South Shields; and Mr. Walter R. Johnstone, 5, Linden Road, Levenshulme, Manchester. The winners have already been notified of their successes by letter.

Elsewhere in this issue, as we had previously announced, we illustrate and describe the apparatus which has gained the largest number of votes in each of the classes into which we divided the exhibits at Olympia as a whole, and we have made this an occasion for introducing photogravure reproduction to illustrate the apparatus, as we felt that the winning products merited some special distinction such as this method of illustration provides.
Modifications to Suit Individual Requirements.

By H. F. Smith.

Before attempting to supplement the information already given on the subject of the new Kilo-Mag Four receiver, it would seem advisable to deal with the highly topical question of selectivity—undoubtedly the burning problem of the hour to a great number of wireless users, and a matter of interest to the majority of listeners who look ahead, even though they may, at the moment, be unaffected by the changing technique of broadcast distribution.

The set as described seems to have proved itself to be sufficiently selective for use under average conditions, and experience has shown that it is hardly practicable to improve its performance in this respect without sacrificing H.F. amplification, increasing operating difficulties, or decreasing circuit resistance to a point where high-note loss becomes apparent.

When dealing with a receiver that is frankly designed for long-distance reception one naturally hesitates before suggesting any palliatives for interference troubles that will bring about any considerable reduction in sensitivity, but it must not be forgotten that the amplification provided is sometimes greater than can be conveniently handled, and it is with a clear conscience that one can recommend such practices as reducing the number of primary turns on the H.F. transformers. It is quite permissible to reduce the medium- and long-wave primaries to, respectively, 20 and 70 turns. It should be made clear that such a drastic reduction as this is seldom necessary, and that it is best to take off a few turns at a time. These should be removed from the ends of the winding nearest to the anode connection.

Mention was made in the descriptive article of the fact that interference can be lessened by moving medium- and long-wave aerial connections nearer to the earthed ends of the appropriate input coils. As a refinement, alternative connections may be provided.

Another way of increasing selectivity—but still at the expense of amplification and high-note retention—is offered by increasing the ratio of capacity to inductance in the tuned circuits. To make this alteration variable condensers of 0.005 mfd. should be used, and a few turns should be removed from the aerial-grid coils and from the H.F. transformer secondaries.

It is hardly suggested that the above rather drastic expedient should be applied to existing sets; instead of going to the expense of obtaining a new set of condensers it is certainly better to fit a loosely coupled and separately tuned aerial circuit, which is a real remedy as opposed to a mere palliative. This addition was mentioned tentatively in the earlier article; it can now be advocated without apologies, as there are definite signs that a general return to the two-circuit aerial tuner, consistently advocated by writers in this journal, is at last in sight.

Increasing Both Range and Selectivity.

There are several ways of making this addition to the receiver as it stands, and useful hints on the subject may be gleaned by studying the articles describing The Wireless World "Kit Set" (September 18th) and the 1930 Everyman Four (October 16th). Perhaps as suitable and convenient a method as any is that given in Fig. 1, which shows an arrangement with continuously variable capacity coupling. This requires the addition

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Notes on the New Kilo-Mag Four.—

of an extra pole to the existing wave-range switch S, but this component need not be replaced if interchangeable coils, mounted externally at the back or side of the cabinet base, are used in the aerial circuit. These extra inductances are marked L(a) and L(b) in Fig. 1, and may conveniently be constructed in the same way as those specified for the "Kit Set." The general arrangement of components adopted in this latter receiver may be imitated as far as possible, bearing in mind that the aerial tuning condenser, of 0.0005 mfd., must be of exceptionally small overall dimensions. The same applies to the coupling condenser, which may have a maximum capacity of 0.0001 mfd., with a small minimum value.

The spindles of these condensers may be mounted through either the front or left-hand side panel of the base compartment; in the latter position small edge-wise dials should be used. Incidentally, it is here assumed that the set is (or will be) housed in a special Wireless World metal cabinet; although this course is to be recommended on the score of easy construction, it should be made quite clear that more conventional methods may be adopted, always provided that screening is adequate.

It is reassuring to have to report that the majority of constructors seem to have had no difficulty in getting the set into a state of satisfactory operation, and that puzzling faults have been few and far between. Where trouble is encountered, it is usually traced quite easily by systematic testing.

A Rapid Method of Fault-finding.

These tests may be made quickly by the stage-by-stage method. To assure oneself that the detector, its preceding H.F. transformer, and its succeeding L.F. amplifier are in order, the plate lead of the second H.F. valve should be removed, and the aerial joined to this lead through a 0.0001 mfd. fixed condenser. The receiver should now work as a simple detector-L.F. set, and, as such, would be expected to provide good signals from a local station. Both H.F. valves are either switched off or removed.

Carrying the test a step farther, the aerial wire (still via a fixed condenser) is transferred to the plate lead of the first H.F. valve, after disconnecting this lead from the valve cap. This gives us a medium-range H.F.-det.-L.F. combination, and good results will show that the second H.F. valve and its associated apparatus are in order. Obviously, then, failure to obtain the performance to be expected when the aerial is restored to its original position will indicate that the fault lies in the first H.F. valve or in the apparatus connected in one of its circuits, although, if instability is encountered under these conditions, the blame may possibly be allocated between the two H.F. stages—most probably to defective screening.

There seems to be some uncertainty as to whether the set can be used with the Mazda 215 S.G. valves, which came on the market shortly after it was first described. Although the characteristics of these valves are not quite in line with more conventional types, they can be used with complete satisfaction without any modification of the transformers, and they will afford a very high amplification. If 6-volt valves are used in the remaining positions, it is convenient to reduce the value of the rheostat R, to some 15 or 20 ohms, and, as a safety measure, to insert in series with it a semi-fixed resistance set at 13 ohms.

The connection of a gramophone pick-up has already been described in the "Readers' Problems" section of The Wireless World of September 4th. There are several possible ways of making this addition; all that one has to do is to arrange to insert the pick-up in series with the detector grid circuit, and at the same time to make the appropriate reduction in negative bias. As a refinement, means can be provided for automatically switching off the H.F. valve filaments, but this operation can be carried out by means of the rheostat already fitted.

Two minor errors were allowed to pass into the original description; the writer takes this opportunity of apologising and again drawing the reader's attention to them. In the "List of Parts" the value of the variable volume-control resistance R, was given as 20,000 ohms. This should be 200,000 ohms. Referring to the practical wiring plan, there was a fairly obvious transposition of the reference lettering on each of the H.F. valve-holder filament terminals. The terminals "earthed" to the metal screening base should be connected to L.T. negative, and consequently should be lettered r and t; they are joined to the soldering tag on the jack frame by separate leads bearing corresponding identification marks. The remaining filament terminals should be marked s and w (instead of r and t), and are connected by flexible leads to the same terminal on the rheostat R.
A Switch-operated Receiver

A FEW months ago I built myself a new house. The opportunity was thus afforded and the excuse provided for the design and installation of a new wireless receiver. What did I really want?

I started listening before the War to the Eiffel Tower news and to ships. A set at Marlborough College, largely contrived from gas tubing, crystals and odd pieces borrowed from the "stink's" laboratory, formed the basis of my experiments. I listened to amateurs before broadcasting began, and have possessed or borrowed or made almost every possible kind of set. In my experience distant stations are amusing to "get" but seldom worth listening to, owing to incidental noises. I have come to the conclusion that the keen amateur should have a set for his own use, perhaps two or more if he can afford them, but that for his own sake and that of his family his household set should be separate and different. It is the household set I propose to discuss here.

For a residence in or near London such a set should, I think, receive 2LO and Daventry 5GB at full strength without the bother of tuning, and should come into operation by means of the pressing of a switch. If possible one switch button should operate "on," "off," and also the change from one station to the other.

The first problem was to devise this switching mechanism. Doubtless there are other methods of doing this job than that which I have chosen, but as it took me some time and two or three unsuccessful experiments and numerous enquiries before it was finished, it might be worth while describing it in detail.

The set is in a safe place in an out-of-the-way cupboard. This pleases the aesthetic eye, and prevents interested friends from tuning it in. The receiver feeds four loud speakers, and close to where these are located is a neat switchboard upon which are two controls. One is a press button to put the set on or off, and to change stations, and the other is a variable control for the volume of the particular loud speaker with which it is associated. A three wire lead-covered cable connects the loud speakers to the set. We shall call the three wires black, red and white, because it will facilitate explanation. Black and red are connected to the output side of an output transformer from the receiver. Their other ends are connected to the terminals of the loud speakers or to a second transformer, according to the type of loud speaker employed. White and red are the wires which operate the switching mechanism. The primary relay circuit consists of a nine-volt dry battery, the relay coil, the wires, red and white, and the press button. The armature operates an eight-toothed sprocket wheel, moving it one tooth every time the circuit is closed. On the sprocket wheel spindle is an ebonite rod or small diameter drum upon which are the necessary contacts for two switches.

The first switch is responsible for putting on the current to operate the set. Positions 2, 4, 6 and 8 of the ebonite rod make contact, and positions 1, 3, 5 and 7 make no contact. Hence, so far as this switch is concerned, successive presses upon the press button will put the receiver on and off from any remote control point indefinitely or, to be strictly accurate, until the dry battery runs down. It is to be noted in passing that the current is not flowing all the time in this switch circuit but only at the moment of operation, with a corresponding economy in the use of the dry battery.

The other switch, mounted upon the same ebonite spindle, is used to operate the wavelength changing device. This is so arranged that with one press-button switch we get the results following successive pressings of the button: "on" "London--" "off" "on" 5GB--"off" "on" London--"off" "on" 5GB--"off," etc., ad infinitum.

The switch I have described could probably be constructed to operate the set and the wave change directly, but there is not, I think, such a switch on the market, and I had to use a second stage of relaying or have a switch made. I chose the former course. I secured a remote control switch from Messrs. Gamages, which was a slight variation of their standard arrangement. It had larger silver contact points than is usual and two switches upon the spindle instead of one. I then ordered two relay switches from Messrs. Isenthal, consisting of

The author photographed in his laboratory. Captain Fraser has been a leading amateur for many years and is a Past President of the Wireless Society of Great Britain.
My Household Set—a
armature carrying a mercury bottle, and operated
by a magnet coil wound for 240 volts D.C. The switch
that puts the set "on" and "off" is a single-pole
mercury switch; the other, which changes the wave-
length, is a two-pole mercury switch. The "on" "off"
switch is simply connected to the main supply to the set
for H.T. and L.T.

The double-pole switch connects two independent
0.0003 variable condensers to the two existing tuning
condensers of the set. The earthed sides of these con-
densers are permanently connected, and the high
potential sides are the two
which are switched. When
the two independent con-
densers are brought in in
parallel with the existing condensers the requisite
increase of capacity and consequently of wave-
length is made to raise the tuning from that required
for 2LO to that appro-
priate for 5GB.

The more sensitive the
receiver the more care
would have to be taken
not to let these added con-
densers and their connect-
ing wires, etc., introduce unwanted capacities. I
find no difficulty on this
account, and the apparatus
is instant and reliable in
its operation.

The Isenthal relays are
held on all the time they are operating and are using
current therefore, but this is of the order of a few
milliamperes from the main and can be ignored. When
twin transmissions from Brookmans Park begin we shall
have two signals of equal strength coming from the same
point, and it will be much easier to deal with this than
with the alternatives of 2LO and Daventry Junior.

Doubtless a single detector valve, without H.F. ampli-
fiers, will suffice, and the double-mercury Isenthal switch
described above, which is constructed for use as a
double-pole double-throw switch, can be used for dis-
connecting one condenser tuned to the lower wavelength
and connecting another tuned to the higher wavelength
station.

The set I am now using works entirely from the mains
except for a grid battery, and being of standard practice
damp. I think the mounting in the wall is ideal. It
is hardly noticed, and is not unsightly. It provides a
very large baffle, which these loud speakers need to
produce their best bass notes. There is, moreover, no
cabinet booming or sympathetic vibration from the
baffle which is so often noticeable with the R.K. in a
box.

The individual control of each loud speaker for
volume is very necessary. You cannot control the whole
set without interfering with the volume at all loud
speakers, and you may want silence momentarily or
for some time at one speaker. Local individual control
is afforded by a resistance varying with the loud
speaker put across its movement or moving coil. In
the case of the R.K. it is a ten-ohm rheostat of standard
type.

"THE WIRELESS WORLD" BUYERS' GUIDE TO SETS.

Next week's issue will contain this annual feature. Readers desiring to select or make
reference to specifications of any commercial set will find the Guide invaluable.
When the screen-grid valve first made its appearance on the market somewhat wild claims were made concerning its performance as a high-frequency amplifier. Time proved, however, that as regards amplification little benefit was to be derived as compared with a well-designed balanced three-electrode valve. The reason for this was not far to seek. Stable amplification was limited to a comparatively low figure on account of the energy fed back through the anode-grid capacity of the valve.

Those who have built a set embodying the new Mazda AC/SG valve, which is a great advance over its predecessors, will agree that its position as winner both of class 6 and class 8 of the Competition is well merited. It is safe to say that with this valve a greater stage gain can be attained than with any other commercial valve existing. The inter-electrode capacity which has such an important bearing on stable amplification has been reduced to the remarkably low figure of 0.0045 μF. by the expedient of arranging two screening grids in cascade. When extreme care is taken with external screening and when the tuning circuits are designed with low losses, a stage amplification of approximately 250 times can be obtained before the threshold of instability is reached. This performance is about six times better than that of the best neutralised triode.

The valve is designed to be fed from A.C. mains, and has an independently heated cathode, but the heater consumption of 1 ampere is hardly in excess of the capabilities of the average L.T. accumulator, where the absence of lighting mains demands this form of L.T. supply.

That the cathode has an equipotential surface (i.e., no voltage gradient) and no field around it, means that the electron flow is less restricted than in an ordinary filamented valve, and there is the further advantage in the valve under review of the "short-path" characteristic. The combined effect of these is a valve with an amplification factor of approximately 1,200 and an A.C. resistance of about 800,000 ohms under working conditions, giving a mutual conductance of 1.5 mA. volt.

In designing a suitable inter-valve coupling for this valve one's thoughts naturally turn to the tuned transformer which has the advantage of preventing L.F. impulses from reaching the grid of the subsequent valve. To extract the maximum amplification from the valve in these circumstances it is necessary that the dynamic resistance of the primary of the transformer should be equal to the A.C. resistance of the valve, but up to the present it has
An Echo of Olympia.—
not been found possible to design a coil with a dynamic resistance greater than about half the A.C. resistance of the AC/SG. This would mean a step-down ratio which is unfortunately inconvenient in that the screen-to-anode capacity which is shunted across the primary winding would cause unwanted resonance and curtailment of wave range.
A compromise has perforce to be effected in the use of a one-to-one transformer. Where selectivity must be of the highest order due to the presence of a local powerful transmission it may be necessary to remove primary turns and sacrifice part of the amplification. For instance, with a three-to-one step-up transformer of The Wireless World type having sixty-eight turns of 27/42 Litz on a 3 in. former an amplification of 160 times will be possible, while with a one-to-one ratio transformer of the same type a stage amplification of over 350 could be obtained. The latter figure, however, exceeds the threshold instability amplification of 250 mentioned earlier, so that neutralisation would be necessary. In this connection the reader is referred to The Wireless World Record III Receiver, in which an unprecedented stage amplification averaging 500 was obtained using an earlier form of the Mazda AC/SG valve. The choke-fed tuned-grid circuit which is equivalent to a one-to-one transformer is also suitable, and was employed in "The Flat Dwellers' A.C. Three" receiver, which had a measured stage amplification of about 225 times.
The constructional details of the valve are interesting—particularly the cathode assembly. Instead of a separate heater and insulator the heater is dipped into a liquid porcelain "slip" to become coated with an adherent insulator. The cathode—a metal tube coated with the oxides of barium and strontium—which is arranged around the surface of the porcelain, can therefore have a small diameter and be of considerable length resulting in the watts dissipation per centimetre being small. By this means the control grid is kept cool, and grid emission—one of the chief bugbears in A.C. valves—is prevented. The heater is bent into the form of a hairpin and is thus non-inductive; this, together with the equipotential cathode, assists in the prevention of hum.
In designing a receiver with a large stage amplification it is advisable to return the cathode to the centre of the heater winding of the transformer and to pay special attention to decoupling and metal screening in three dimensions. The optimum anode voltage is 150, the screen voltage about 60 and the control grid voltage a little under a volt. The 0.9 volt bias cell developed by Messrs. Siemens for The Wireless World is suitable. A remarkable property of the duplex screening grid is to restrict the screen current to a small fraction of a milliampere—in fact, conditions may arise in which the screen current is negative.
With the advent of Brookmans Park it should be pointed out that the signal voltage which may be impressed on the grid of one of these screened valves may cause an excursion into the lower bend and to the region of grid current. Not only does this state of affairs cause distortion but selectivity is adversely affected. The implication is a volume control between the aerial and the first valve.

* * *

**BURNDEPT
A.C. SCREENED SEVEN.**

THE Burndep A.C. Screened Seven has been specifically designed to meet the requirements of those who wish to receive broadcasting at a reasonable cost both as regards maintenance and initial outlay, and with the minimum of technical complication. Just as the Burndep Universal Screened Five may be regarded as a "sports" model for the enthusiast, so the A.C. Screened Seven fulfils the role of the "utility model," which can be relied upon to give a first-class performance in the hands of the layman.
By distributing the H.F. amplification over two stages it has been found possible with only one main tuning control to attain sufficient range and selectivity to guarantee the uninterrupted reception of all the stations worth receiving from a pro-

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1 See The Wireless World, September 4th and 11th, 1929.
2 The Wireless World, May 1st and 8th, 1929.
An Echo of Olympia.—

and the layout of parts. The A.C. Screened Seven is no mere adaptation of previous conventions in receiver design. Having settled on the functions which the receiver will be required to perform a completely fresh start has been made. Technical considerations have been studied in conjunction with production problems, with the result that the final design can be sold at a very reasonable price.

Energy is picked up on a frame aerial in the lower part of the cabinet. The use of a frame not only gives greater selectivity, but conduces also to a neat exterior appearance of the set. Provision is made, however, for the attachment of an external aerial for use in special circumstances.

The two screened H.F. stages are tuned anode coupled, and together with the frame aerial circuit are tuned by a triple gang condenser of ingenious design. All three sets of moving vanes are mounted on a common spindle which is driven through a single slow-motion dial calibrated in metres. In order to overcome variations in the maximum and minimum capacities due to slight changes in the centring of the moving vanes, double spacing has been employed for both sets of plates. Accurate ganging is further simplified by dividing the wave range into three bands—two for medium waves and the third for long.

A three-way rotary switch, with groups of contacts in each compartment of the condenser screening unit, short-circuits sections of the tuned anode and frame inductances not in use. The tuned anode coils are made by precision methods, and a continuous record in the form of a chart is kept showing variations in the inductance. The curve must fall between specified limits or production is stopped and the trouble investigated. Each section of the gang condenser is provided with small trimming condensers for bringing the minimum capacity up to the value for which the curvature of the vanes has been designed. In the case of the frame aerial circuit the trimming condenser is of slightly larger capacity, and is provided with a separate control on the front of the cabinet.

The H.F. stages are followed by an anode bend detector resistance-coupled to a first L.F. stage which is in turn coupled to the output valves through a Ferranti push-pull transformer. A push-pull output transformer feeds the double-diaphragm balanced armature loud speaker incorporated in the base of the cabinet, and terminals are provided for operating an external moving coil speaker if desired.

A gramophone pick-up can be connected to the detector input, and a fourth position on the wave range switch operates contacts which bring about the necessary changes in grid bias, etc. A system of resistances and condensers has been introduced at this point to suppress extraneous pick-up in the gramophone leads.

All supply currents and potentials for working the receiver are derived from A.C. mains through a rectifier unit connected to the receiver chassis.
NOVEMBER 13th, 1929.

The Wireless World

OLYMPIA COMPETITION
WINNING APPARATUS

MAZDA S.G. A.C. VALVE

INTER-ELECTRODE CAPACITY 0.0045 mfd.

GAM-BRELL NOVOTONE.

Wireless World

NOVEMBER 13th, 1929.

BURNDREV A.C. SCREENED SEVEN

TRIPLE GANG CONDENSER WITH DOUBLE SPACED VANES

WAVE RANGE SWITCH OPERATING IN THREE COMPARTMENTS

AERIAL TRIMMING CONDENSER

24TH H.F.

13TH H.F.

PUSH-PULL OUTPUT VALVES

POWER RECTIFIER

13TH L.F.

DETECTOR

RECEIVER UNIT

ELIMINATOR UNIT
PHILIPS FOUR-VALVE ALL-ELECTRIC RECEIVER TYPE Nº2511.

LOCKING DEVICE

TOROID TUNING COILS

GANGED CONDENSERS

2-A.C. SCREENED GRID H.F. VALVES

TUNING KNOB.

ILLUMINATED TUNING DIAL

MAINS AND WAVELENGTH SWITCH

VOLUME CONTROL

SOCKETS FOR MOVING COIL, CONE AND PICK-UP

DETECTOR

SUPER PENTODE

RECTIFIER
FERRANTI MOVING COIL LOUD SPEAKER

U.B. FULL WAVE RECTIFIER

L.T. RECTIFIER

4 MFD.

MAINS TRANSFORMER 220, 230, 240 VOLTS

MAINS TRANSFORMER

H.T. SMOOTHING CHOKE

GRID BIAS POTENTIOMETER

ELECTROLYTIC CONDENSER

L.T. SMOOTHING CHOKE

ANODE RESISTANCES

H.T. BRIDGING CAPACITORS

FILAMENT VOLTOMETER

EKCO A.C. ELIMINATOR TYPE C2A.

L.T. CONTROL
An imposing array of special test jigs have been developed for checking the electrical constants of such components as coils, variable condensers, and power transformers, while a special unit is used for matching the push-pull power valves. The final test on the complete chassis is made in an inverted position on a special jig with a standard loud speaker and frame aerial mounted above the chassis in the same relative position they would occupy in the cabinet. At this stage final adjustments are made to the trimming condensers of each tuned stage, and check readings are made of anode currents, etc. Each unit is required to pass further tests on actual signals, and is then ready for packing and despatch.

PHILIPS FOUR-VALVE RECEIVER. Type 2511.

NO possessor of this type of receiver will wish to disagree with the findings of the bulletin in the class for receivers with less than five valves. The interest in the Type 2511 at the Philips stand this year gave a sufficient clue that it was a likely winner. In that it was the first all-mains-operated four-valve set, all-metal built, and constructed on mass-production lines, it rightly deserves a place among the winning sets. Its unique design, combined with remarkable performance, has earned the enthusiasm of the discriminating amateur to whom, this, the first technical description, may be of special interest.

Nothing of a technical nature is revealed externally, and the metal-bound cabinet with its bakelite panels and rounded corners will not offend in any surroundings, it being neither ornate nor ugly. Absence of complex controls is another of its good features, and while it is not disguised so as to lose its radio identity, the bewildering effect so often produced by a number of operating knobs is avoided. The finish is one which will not readily deteriorate, there being neither bright parts nor polished panels. There are but three controls, a single-geared tuning knob, a wave-change switch and a volume adjuster. Instead of the rotary controls appearing on the front panel as is so often the case, they are conveniently placed at opposite ends of the cabinet in order to provide convenient operation.

Technical knowledge is no aid to getting the most out of the set, as it is only necessary to rotate the single control tuning with one hand while the other hand maintains a critical regulation of volume. Test reveals that stations are to be found at every few degrees on the drum indicator. A transparent scale with lamp and hair line appears in the centre of the instrument behind a window on a narrow top bezel. The single lever switch which gives the two-wave ranges has, in addition to an "off" position, a setting that throws the gramophone pick-up into circuit. There is also a key which on one turn locks the lid and with a second turn locks the lever switch as well, so that the set cannot be turned on, while by means of an automatic-locking bar the lid cannot be raised except when the switch is turned to the "off" position.

On raising the lid little is revealed other than the fact that there are two screen-grid stages with $S_{4}4$ valves, an indirectly heated detector—the $C_{5}4$V-power pentode, the new $P_{4}M_{2}4$A with a working anode potential of 300 volts and a Philips full-wave rectifier type $250$. Beyond this everything is sealed, though a good deal of information concerning the interior apparatus was to be gleaned from the exhibition model in which the side panels had been removed.

The three tuning condensers being ganged on to a common shaft need compensating for small capacity differences in the associated inducances and this is probably carried out by three screws, the heads of which are exposed through the screening and their settings held by red sealing wax. These screws must adjust auxiliary condensers in parallel with the tuning units and in that they are used to bring the stray parallel capacities up to a given value it becomes necessary that the variable condensers follow a logarithmic law and a simple test with a wavemeter confirms the use of log scale condensers.

Three sets of tuning coils of the
An Echo of Olympia—

An anode, that employed the stage the combined one quality. is port glass individual screening links along type, capacity anode, which the eliminator appears to be combined, suggesting post-detector control. The instructional booklet, however, recommends the use of an external volume control when using the gramophone pick-up. This seems to make it clear that the volume control in the set precedes the detector. The component used for volume control is a wire-wound potentiometer giving a smooth and uniform regulation and is, no doubt, associated with one of the resistances used for grid biasing. Owing to the high anode voltage of the output valve an output transformer is fitted and by the use of two secondary windings high or low resistance loud speakers can be used. A tone-correcting condenser can be introduced and is combined with the two-pin loud speaker connector.

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**EXIDE W.Y.10**

**H.T. ACCUMULATOR.**

This is the latest addition to the Exide range of H.T. units, and made its first appearance on the occasion of the recent Radio Exhibition at Olympia. In designing this model, the Chloride Electrical Storage Co., Ltd., would appear to have appreciated the need for a reasonably priced unit, robust in construction and of sufficiently large capacity to cope successfully with the demands made on it by the average domestic receiver. In addition, it performs this function with the minimum of attention, and, where facilities are available for trickle charging, provides a trouble-free H.T. supply for a lengthy period.

The W.Y.10 is a 10-volt unit consisting of five cells built into a multi-compartment glass container, each, cell having a capacity of 7,000 milliampere hours. Assuming a normal discharge of 25 mA., a useful life of 280 working hours could be obtained on one charge. In general, the battery would be charged about once every fortnight or so, as this will keep it in better trim than less frequent attention.

Each cell is fitted with an ebonite lid, sealed in position, a feature which materially assists cleaning, and at the same time makes for more robust construction. Inter-cell leakage is minimised by extending the moulded partitions to the top of the glass container and carrying the lead bridge pieces over the tops of the sealing lids. The two end lugs, carrying the positive and negative terminals, are provided with projecting pieces which fit into slots cut in the ebonite lid, holding them rigidly in position and thus preventing undue strain on the lugs, and incidentally the plates, when the terminal heads are screwed down tight.

These terminal heads are non-interchangeable, being fitted with screw shanks of dissimilar size, and to assist in distinguishing them the positive is hexagonal in shape while the negative is round with a milled edge. Batteries are usually located in an out-of-the-way corner, not too well lighted, so that the advantage of being able to distinguish the positive from the negative without recourse to illumination will be appreciated.

Since the function of an accumulator depends on electro-chemical action, it will be realised that the most important feature is the plates.
An Echo of Olympia.—
Furthermore, the design of these will be governed by the nature of the work the cells are required to perform.

In the Exide cells the plates are made of antimonal lead cast in grid form with the active material applied in the form of paste. The active material only does the work, the lead grid being a retainer and conductor. Porous ribbed wood separators fill the space between the positive and negative plates, and so prevent short-circuiting. This type of assembly is adopted in the W.Y.10 model.

The well-merited popularity enjoyed by Exide batteries among wireless users is the outcome of forty years' experience in the manufacture of the lead type accumulator. Research work is continuously going on with a view to future improvements, and every new idea brought to the notice of the company is very carefully examined.

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"EKKO" ELIMINATOR
MODEL C.2A.

This unit is one of a series designed by Messrs. E. K. Cole, Ltd., to replace all batteries, including grid bias, and supply the receiver with power drawn from the electric mains. The model C.2A is for use on alternating current supplies of from 40 to 100 cycles periodicity, and can be obtained to suit all recognised standard voltages between 100 and 250. Since it is intended as a substitute for batteries, no alteration to the set is required.

The unit consumes 12 watts per hour, so that the running cost per 1,000 hours, assuming 6d. per unit as the price of electric current, would be approximately six shillings. Now, 1,000 hours represents, on an average of twenty-five working hours per week, a matter of forty weeks, so that running costs represent a very small fraction of the electricity account.

The model C.2A gives three H.T. voltages—one for the priming grid in screen-grid valves, a 90-volt supply for leaky grid detector valves, and 120-150 volts for the remaining stages in the receiver. A current of 20 mA. may be drawn from this tapping. Provision is made for low-tension current at 2, 4, or 6 volts, from 0.2 amp. up to 0.5 amp. In addition, grid bias from 1.5 volts to 12 volts, in five steps, is available.

Half-wave rectification, using a Westinghouse metal rectifier, is adopted for the H.T. supply, and a single choke and generous-sized condensers take charge of the smoothing. The detector voltage is fed through a series resistance, and a potentiometer arrangement, obtained by connecting two resistances in series, provides the voltage for the priming grid and the screen-grid H.F. valve. Grid bias is derived from a tapped resistance between the H.T. and the transformer.

For the L.T. supply a Westinghouse full-wave (bridge-type) metal rectifier is used. Two smoothing chokes of generous size and special large-capacity electrolytic condensers completely remove all ripple from the rectified A.C., and deliver to the L.T. terminals a steady current for the filaments of the valves. A variable rheostat controls the output, and a voltmeter gives visual indication of the voltage across the L.T. terminals.

The unit is enclosed in a stout sheet iron container with a brown crystalline finish. A small terminal is fitted for earthing the case, thus conforming to the recommendations of the I.E.E. as regards safety measures for domestic mains-operated devices.

A length of flex, terminating in a lamp adaptor, serves to connect the unit to the nearest convenient lamp-holder. According to the makers' instructions, the switches on the set should be left permanently in the on position. Switching on and off should be carried out by the mains switch on the unit, or the switch controlling the light point to which the unit is attached. By following this advice the condensers in the mains unit will not be left in a charged state, and it will be impossible to receive a shock, due to the retention of current in the large smoothing condensers, should, at any time, the wiring in the receiver require attention.

Wireless World

FERRANTI MOVING COIL LOUD SPEAKER.

Of the instruments which made their first appearance at Olympia the Ferranti loud speaker attracted its full share of attention. Here we have the final link in the endeavour made by the Ferranti Company to produce quality reception. Their careful study of circuit and transformer design in this connection gives to them the highest qualification for the production of a moving-coil loud speaker.

Models are available for both A.C. and D.C. field excitation, and in the former case the transformer and valve rectifier are carried in the loud speaker housing. As the valve used is a U8, a generous magnetising wattage is available which, combined with a small gap, produces a high flux density. A substantial copper plate screens the magnet winding from the moving coil as well as giving support to the centre pin. Instead of the field magnet taking the customary form of a hollow cylinder it is made of flat metal and is "U" shaped. Ampie cross section is obtained by this design with the added advantage that the heat produced in the magnet winding is carried away by the free circulation of air.

Eight segments of supple leather are assembled to give support to the cone, this being 6in. in diameter, a dimension which, it is to be noted, is slightly less than the customary one of 7in. or so. Centring is effectively carried out by a pierced card centred on the pole. A pressed metal cylinder supports the diaphragm, while a new departure in loud speaker construction generally is produced by metal stampings forming a housing enclosing field magnet and rectifier.

It is needless to add that by the simple process of aural test the performance of this new Ferranti product gives it a leading position among moving-coil loud speakers. It is fortunate that the popular vote should this year endorse the moving coil at a time when its general adoption is so rapidly growing.
GAMBRELL NOVOTONE.

In spite of the enormous advance in the quality of gramophone records produced by electrical processes few will deny that broadcasting at its best still keeps a fair margin of lead over the gramophone in the matter of quality. Limitations in loud speakers and amplifiers, of course, affect both systems of reproduction, but the necessity for restricting amplitude at low frequencies definitely places the gramophone record at a disadvantage. Most modern pick-ups show a rising characteristic from 250 cycles downwards, but the compensation is in most cases inadequate and the lower frequencies are not present in their proper proportion. Similarly, there is in many cases a lack of brilliance in the upper register.

In the "Novotone," designed for Messrs. Gambrell Radio, Ltd., by Dr. N. W. McLachlan, we have a device which adequately compensates for these deficiencies in recording, and in the characteristics of pick-ups, amplifiers and loud speakers. For obvious reasons the exact nature of the device is not divulged, but its function will be properly understood if we regard it as a step-up transformer with a rather special frequency characteristic. The curves indicate that there is a general raising of the level of the input from the pick-up, while there is a marked increase in the amplitude of notes below middle C and another increase to the higher frequencies reaching a maximum in the vicinity of 4,000 cycles.

The rate of increase in amplitude of the low notes with decreasing frequency has been carefully calculated in relation to recording deficiencies and other practical considerations, with the result that the low note compensation will be found to be sensible correct for most existing records, pick-ups and loud speakers. Record surface scratch, however, sets a limit to the useful increase in amplitude at high frequencies, and the degree of scratch varies with different records. Accordingly, provision has been made for effecting a compromise between high-note amplification and scratch. This is effected by connecting a 50-ohm rheostat ($R_1$, Fig. 1 (a)) across terminals SC and $P_U_1$, as the resistance is reduced in value, so the high note amplification, and hence scratch, is reduced. The effect of the resistance $R_1$ on the Novotone characteristic is clearly indicated in Fig. 2.

Many moving-coil loud speakers show a marked resonance in the region of 50-100 cycles. In these circumstances the increase in amplitude at low frequencies due to the Novotone would produce unpleasant results, if not actual damage, to the loud speaker. This difficulty is easily overcome by connecting a 0.001 mfd. condenser and a 1-megohm resistance between the Novotone and the grid and filament of the first amplifier as shown in Fig. 1 (c).

The effect on the characteristic is shown in Fig. 3 (A).

Where the Novotone is to be used in conjunction with existing amplifiers the general increase in voltage may result in overloading. A potentiometer arrangement must then be inserted as in Fig. 1 (b). It is important that the total resistance across terminals G and G.B. should be not less than 3 megohms. One resistance may conveniently be given a value of 2 megohms, and the other, $R_2$, be given any value from 1 megohm upwards, depending on the volume required. Curve B (Fig. 3) was taken with 1 megohm in the position $R_2$. The dotted line is curve 1 of Fig. 2 drawn for comparison to the same scale.

The Novotone was tested under working conditions with a four-pole change-over switch arranged to connect the pick-up direct to the amplifier for purposes of comparison. Apart from the general increase in volume, which is almost equivalent to adding a further valve, the effect of introducing the Novotone is most striking. On orchestral records it is like switching on the double basses, while the pedal and bass notes of the organ and piano are reproduced with a richness and volume closely approximating to the original. The effect of the scratch filter and the special output circuit for modifying the low note amplification are also clearly demonstrated by the change-over switch arrangement.

There can be no doubt that anyone who has heard the Novotone demonstrated in this way would from that time onwards cease to be satisfied with gramophone reproduction by ordinary methods.
HENDON'S HOOK-UPS.
The Hendon Borough Council has decided that new houses on the Clitterhouse Estate are to be provided with hooks fixed in the gutter boards for the suspension of wireless aerials. Prospective tenants will be informed that, in the interests of tidiness, aerials will be permitted only if the hooks are used.

AMERICA'S "FINEST PICK-UP" FROM HOLLAND.
For the first time in radio history a transmission from Holland was re-broadcast in the United States on October 26th. For forty-five minutes, beginning at 12 noon (E.S.T.) thirty stations associated with the National Broadcasting Company gave listeners a Dutch musical programme sent out from Huizen, PHI., operating on 16.86 metres, with a power of 40 kilowatts. The event was acclaimed as "the finest pick-up of a foreign programme ever accomplished in the United States."

WIRELESS ABSOLVED.
The fallacy that wireless affects the weather has been given the coup de grâce by the French Academy of Sciences, which has endorsed the statements of M. Sanson, meteorologist of the Seine-et-Oise Department, who says: "The development of wireless broadcasting has produced absolutely no effect upon our climate in the past 20 years."

THREAT TO INDIAN "PIRATES."
Radio "pirates" in India are shortly to have the shock of their lives, according to the Calcutta Statesman, which reports that the Post Office is about to initiate a campaign against the 10,000 persons in Calcutta alone who are known to be listening without licences. Hitherto, it is stated, the Post Office has been hampered by doubts about the exact legal position, but these have been entirely removed as a result of a case in the Alipore Court in which a "pirate" of high social standing has been fined 50 rupees, or in default, a month's imprisonment.

HIGH-POWER BROADCASTING.
It is understood that the Irish Free State Government will shortly invite tenders for the construction of a high-power broadcasting station with a service area covering the whole country. Although many recent contracts for electrical work in Ireland have gone to Swiss firms, it is understood that the authorities are exhibiting a preference for British plant.

OFF DUTY DELIGHTS.
"La Maison des Gardiens de la Paix," a new home for the Paris gendarmes, has been equipped with a broadcast receiver, head phones being available for each bed.

ESPERANTO.
The 22nd Universal Congress of Esperanto is to be held in Oxford during the first week of August, 1930. Methods will be considered for extending the use of Esperanto in broadcasting.

FRENCH PATENTS WARNING.
Bearing the title "For the Protection of the French National Market," a license has been issued by the Compagnie Générale de T.S.F. Paris, declaring that no licence has been accorded to any foreign firm permitting the importation of wireless apparatus employing the company's patents or those of the Société Française Radio Electrique (Radiola), La Radiotechnique, G.E.C., Marius Latour, Bethencourt de Bellesize, Marconi, Telefunken, AEG., Siemens Halste, and Western Electric.

Traders are consequently warned that any infringement will lead to prosecution.

G.E.C. v. MARCONI'S.
On Wednesday last, in the Chancery Division, Mr. Justice Eve gave judgment in favour of the General Electric Co. in cases brought by that company against Marconi's Wireless Telegraph Co. and Marconi's and the Marconi Oram Valve Co. respectively, on the question of whether the working agreement between the companies was coterminous with the ten years' lease of the G.E.C. valve factory at Hook Great, Sussex.

His Lordship said the agreement was indefinite and was unlimited as to time. There was not a word in the document to indicate that any of the obligations undertaken by the contracting parties outside those embodied in the lease were to subsist only so long as the lease was running. The applicant company was, therefore, entitled to a declaration accordingly. The costs must be paid by Marconi's.

NEW RADIO ERA FOR FRANCE.
Strong condemnation of State methods of landing broadcasting in France was contained in a speech delivered by the new Postmaster-General, M. Germain-Martín, a few days before he took office, and he was correspondent. Speaking as a private individual, M. Germain-Martín deplored the evils of Post Office monopolies, which have proved so detrimental to private radio and the wireless trade. It is hoped that under the new Postmaster-General's guidance the forthcoming radio bill regularising French broadcasting will shortly become law.

YOUR WIRELESS DIARY.
Every amateur must have wished at some time or another that he could carry a fund of wireless data "in his head." This being impossible in the majority of cases, the best substitute is a handy compendium of facts such as The Wireless World Diary and Note Book for 1930, published by The Wireless World and Messrs. Charles Letts and Company. The special features in the edition just published include: (1) Summary of regulations relating to amateur transmitting and receiving licences; (2) conversion tables (English measures to metric, etc.); (3) the broadcasting stations of Europe, together with the principal short-wave stations; (4) typical wireless receivers and eliminators, with fourteen different circuits; (5) inductance, wavelength and capacity values; and (6) valve data, giving characteristics of standard valves.

Copies of The Wireless World Diary can be obtained from leading booksellers and stationers, or from the publishers, Iliffe and Sons Ltd., Dorset House, Tudor Street, London, E.C.4. The price, with cloth cover, is 1s. (postage 1d. extra), or with leather cover, pencil and season ticket window, 2s 6d., postage 1d. extra.
Part VIII.
Power and Energy
in A.C. Circuits.
(Continued from page 583 of the previous issue.)

It will be remembered that, relating to alternating currents, the power absorbed by a simple resistance was found to be equal to the product of the R.M.S. values of the current and voltage, whereas for a pure inductance the average value of the power consumed was nil, no matter what the values of current and voltage might have been. In the former case the current and voltage were in phase, and in the latter 90° out of phase. It would seem reasonable to infer, then, that for a coil possessing both resistance and inductance, where the angle of lag of the current behind the voltage is between zero and 90°, the power absorbed will be somewhat less than the product of current and applied voltage.

Power and Angle of Lag.
This is actually the case, and so it is very important that we should know exactly how to determine the power in terms of the voltage, current, and angle of lag. Fig. 1 is a reproduction of Fig. 2 of the previous installment, where (a) represents a coil of inductance \( L \) henrys and resistance \( R \) ohms, and (b) represents the equivalent circuit as explained previously.

When a current is passed through the circuit, heat is generated in the resistance but no power is taken by the inductance. Thus the power taken by the coil (a) is exactly the same as the power taken by the resistance portion of the equivalent circuit (b), and can therefore be determined very easily. Let \( I \) amperes be the R.M.S. value of the current; then the average power in the resistance, and therefore in the whole circuit, is given by \( P = I^2 R = I \times IR \) watts. But we have already seen that for an inductive resistance the current is given by

\[
I = \frac{E}{Z},
\]

where \( E \) is the applied voltage and \( Z = \sqrt{R^2 + (2\pi L)^2} \) is the impedance. Thus the power equation may be expressed in the form

\[
P = \frac{E}{Z} \times IR,
\]
or

\[
P = \frac{LI}{Z} \times \frac{R}{Z} \text{ watts}.
\]

Power Factor of a Circuit.
This result shows that for an inductive coil the power is not given by merely multiplying the amps. and volts together; we must also multiply by the factor \( \frac{R}{Z} \) if we want the true power consumed by the coil. Now \( \frac{R}{Z} \), the ratio of resistance to impedance, is obviously less than 1, because \( Z \) is the combination of both the resistance and the reactance, and therefore the power in an inductive circuit is actually less than the product of amps. and volts. The product \( EI \) is only the apparent power, and the factor \( \frac{R}{Z} \) by which we have to multiply it to give the real power is called the power factor of the circuit. The apparent power \( EI \) is expressed in voltamperes, not watts; but the true power is in watts.

We can conclude, then, that for any circuit in which the current and voltage are out of phase the power consumed is less than their product and a power factor must be used.

For the particular type of circuit depicted by Fig. 1 the power factor is given by \( \frac{R}{Z} \), but there are other types of circuit having an angle of phase difference between the current and voltage waves, and therefore also having a power factor less than unity, but not given by \( \frac{R}{Z} \). So we must express the power factor in a general way which can be applied to any circuit.

If we refer to the impedance triangle for the circuit.
Wireless Theory Simplified.—

- Fig. 1, given in Fig. 2, we see that $R/Z$ is the cosine
of the angle of phase difference between the current and
the voltage, denoted by the angle $\phi$ of the triangle. So
for any circuit whatever, the power factor is the cosine
of the angle of phase difference, and the general
expression for the power in an A.C. circuit becomes
\[ P = EI \cos \phi \] watts.

The previous discussions on the two special circuits
containing resistance only and inductance only respecti-
vely enable us to visualise clearly what is happening
in the present circuit where both resistance and
inductance are present simultaneously. In the pure
resistance circuit the whole of the energy put in is con-
verted into heat and cannot be recovered, whereas in
the circuit possessing inductance only any energy put
in is stored in the magnetic field and the whole of it
is recovered when the field collapses. Obviously in
the combined circuit both of these effects will be present
and the average power must have a value lying some-
where between zero and the product of amps. and volts.

During the time that the current is building up from
zero to the maximum value some of the energy being
put into the circuit is converted into heat in the resis-
tance, the remainder going into the magnetic field
as stored energy. During the next quarter cycle, when
the current is falling again from the maximum value
to zero, energy is being withdrawn from the field in
the usual way, but heat is still being generated in the
resistance, so that only part of
the energy coming from the weakening field
is given back to the source of supply.

Nevertheless, we do get some of it back,
and this explains the reason why the true
power consumed being less than the
product of current and voltage. A cer-

tain amount of energy is given to the
circuit during the first quarter cycle of
current, but a portion of this is recovered
during the next quarter cycle, and so on.

Mechanical Illustration.

A frictionless crank and piston ar-
angement was cited for illustrating the
action of a coil having inductance only,
the whole of the energy used in accelerating the piston
over the first half stroke being given back to the crank
during the second half stroke as the piston was being
 retarded. This analogy can be extended to meet the
conditions existing in a circuit with both resistance and
inductance by taking friction into account.

Suppose that there is a considerable frictional re-
sistance to motion existing between the piston and the
cylinder wall. Over the first half stroke, as the piston
is gaining velocity, the crank pin has to exert a force
sufficiently great both to overcome the friction and to
accelerate the mass of the piston. The energy used in
overcoming the friction is converted into heat, raising
the temperature of the piston and cylinder, the remainder
being stored in the moving mass as energy of motion
or kinetic energy. During the second half stroke, when
the piston velocity is decreasing, the stored kinetic
energy is given up by the piston as before, but there is
still the frictional force to be overcome, with the
result that only part of the kinetic energy is recovered
and given back to the crank.

It will be seen that the analogy chosen to represent
the happenings in our inductive circuit is very com-
plete. Further consideration will show that even the
phase relationship existing between the alternating force
on the piston rod and the velocity of the piston is the
same as that between the current and the voltage in the
circuit. In future work we shall always liken inductance
to inertia or mass and electrical resistance to frictional
resistance. Further, it will be shown that capacity
can be likened to elasticity or spring action, and the
combination of these three will prove of great value in
illustrating the behaviour of oscillating circuits.

Numerical Examples.

An inductive coil is one of the most important circuit
components used in radio circuits, and therefore it will
be helpful to give at this juncture one or two numerical
examples on the calculation of current and power con-
sumed by an inductive coil when an E.M.F. of known
voltage and frequency is applied to it. In the majority
of cases a D.C. component of current will be present
as well as the A.C., but for the moment we shall assume
that we are dealing with pure alternating current.

Accordingly let us consider a coil whose resistance and
inductance are known to be 10 ohms and 0.5 henry
respectively, and that we require to find the current
and power consumed when 100 volts, R.M.S. value at a frequency of 50 cycles
per second is applied to its terminals. At 50 cycles the reactance is
\[ X = 2\pi fL = 2\pi \times 50 \times 0.1 = 31.4 \text{ ohms.} \]
The impedance of the coil is therefore
\[ Z = \sqrt{R^2 + X^2} = \sqrt{10^2 + 31.4^2} \]
In, therefore, we have
\[ I = \frac{E}{Z} = \frac{100}{32.95} = 3.04 \text{ amperes.} \]

For a simple series circuit of this kind
the power factor is
\[ \cos \phi = \frac{R}{Z} = \frac{10}{32.95} = 0.304. \]
The power consumed is therefore
\[ P = EI \times \text{power factor} = 100 \times 3.04 \times 0.304 = 92.5 \text{ watts.} \]
As there are no branches in the circuit and conse-
quently only one value of current to deal with we can
check this result by another method. This is done by
calculating the power in terms of current and resistance,
namely,
\[ P = I^2R = 3.04^2 \times 10 = 92.5 \text{ watts, as before.} \]

Inductive Coil in Series with a Resistance.

Very frequently a circuit consists of an inductive
coil possessing both resistance and inductance, connected
in series with a non-inductive resistance. Knowing the
voltage applied to the ends of the circuit, it is usually
necessary to determine the voltage across the coil itself.
Wireless Theory Simplified.—
A typical example is that of a choke connected in the
anode circuit of a valve.
In a previous example we considered this arrange-
ment, but on that occasion the whole circuit was supposed
to have negligible resistance. As a rule, however, in
practice the coil resistance cannot be neglected in this
way, and so our previous treatment of the circuit must
be extended to meet the new conditions.
Consider a circuit such as that shown in Fig. 3 (a)

\[ E = I + V \]

where a non-inductive resistance \( R \) is connected in
series with a coil or choke whose resistance is \( R \) ohms
and inductance \( L \) henrys. The total resistance of the cir-
cuit is \( (R + R_c) \) ohms and its reactance \( X = 2\pi fL \) ohms
where \( f \) is the frequency of the current in the circuit.
Thus for the complete circuit the impedance will be
\[ Z = \sqrt{(R + R_c)^2 + X^2} \] ohms, whereas for the coil alone
the impedance is \( Z_c = \sqrt{R_c^2 + X^2} \) ohms. If preferred, the
numerical values of \( Z \) and \( Z_c \) can be found from the impedance triangles of Fig. 3 (b), in which
case the diagram must be drawn to scale.
When a voltage \( E \) is applied to the ends of the circuit
a current of \( I = \frac{E}{Z} \) amperes will flow through it and
the voltage across the coil itself will be \( E_c = IR_c \).
Similarly the voltage across the resistance \( R \), will be
\( E = IR \).
From this it follows that the ratio of \( E \), to \( E_c \) is equal to the ratio of the external resistance
\( R \), to the coil impedance \( Z_c \).

But the total applied voltage \( E \) is not equal to the arithmetical sum of \( E \) and \( E_c \) because these latter voltages are not in phase with each other—\( E \) is in phase with the current as it is applied to a pure resistance, but \( E_c \) leads the current
by a considerable fraction of a cycle, as explained in Part VI.
A numerical example will prove this.
Suppose that in the circuit of Fig. 3 (a) \( R = 5000 \) ohms,
\( R = 10000 \) ohms and \( L = 10 \) henrys, and that
100 volts (R.M.S. value) at a frequency of 50 cycles
per second is applied to the ends of the circuit. Then
the resistance of the complete circuit will be 6000 ohms,
and its reactance \( X = 2\pi \times 50 \times 10 = 3142 \) ohms.
The impedance \( Z = \sqrt{6000^2 + 3142^2} = 6773 \) ohms, and
therefore the current will be \( I = \frac{E}{Z} = \frac{100}{6773} \) amp., or
14.76 milliamperes.

The impedance of the coil itself is
\[ Z_c = \sqrt{10000^2 + 3142^2} = 3295 \text{ ohms}, \]
and the voltage across it \( E_c = IR_c = 0.01476 \times 3295 =
48.64 \) volts. Similarly the voltage across \( R \), will be
\( E = IR = 0.01476 \times 5000 = 73.8 \) volts.

It should be noted that although we have only 100
volts applied to the ends of the circuit there are
73.8 volts across the resistance \( R \), and 48.64 volts across
the coil. If we add these together arithmetically we
get for their sum a value much greater than 100,
namely, 122.4. This can be proved experimentally
with a voltmeter. The reason is that \( E \) and \( E_c \) are
out of step, and it is their vector sum which gives the
total voltage across the ends of the circuit—the parallelo-
gram method must be used, as explained in Part IV.

(TO BE CONTINUED.)

A Popular Visitor.
Captain Derek McCulloch, of the B.B.C., paid a
surprise visit to the South Croydon and District
Radio Society at their meeting on October 29th, bringing
with him some special B.B.C. test
grapemophone records. The evening was devoted to
comparative tests of various pick-ups which
were connected in turn to the I.F. portion of the
Club set.
The Society offers a warm welcome to new
members.
Hon. Secretary, Mr. E. L. Cumber, 14, Camp-
den Road, South Croydon.

All About Valve Manufacture.
The recently formed Sheringham and District
Wireless Society is already showing signs of a
flourishing future, the meetings being largely
attended. On October 30th Mr. Carter, of the
Mullard Wireless Service Co., Ltd., lectured on
"The Radio Valve: What it Does and How it is
Made." With the aid of an excellent series of
ten lantern slides, members were able to
obtain an insight into the intricacies of valve
manufacture and operation. Applications for
membership will be gladly received by the Hon.
Secretary, Mr. C. R. Hunt, Church Street,
Sheringham.

Metal Rectifiers on the Film.
The new constructional film entitled "Metal
Rectifiers," prepared by the Westinghouse Brake
and Signal Co., Ltd., will be shown at a
meeting of the Bee Signal Radio Society on November
19th, at the Bee School, Beechcroft Road,
Balham, S.W.17. This film, which was recently
described in The Wireless World, demonstrates
very clearly the operation of various circuits
employing metal rectifiers. Non-members are
invited to attend the lecture, and those inter-
ested are asked to communicate without delay
with the Hon. Secretary, Mr. A. L. Osdee, 117,
Tramore Road, S.W.6. The lecture will begin
at 7.30 p.m.

Wireless in the Mediterranean.
"Wireless in the Mediterranean" was the
title of an entertaining lecture given by Captain
Leonard Plinge at the last meeting of the
Wembley Wireless Society. The lecturer illus-
trated his talk with a number of photographs
taken during his tour.
An attractive syllabus has been prepared
covering the winter months, and this will be
sent to enquirers on application to the Hon. Sec-
retary, Mr. H. E. Comben, 24, Park Lane,
Wimbledon.
The Social Side.
That the Muswell Hill and District Wireless
Society are as interested in the lighter side as
well as the technical aspects of radio was amply
proved by the success that attended their Radio
Dance and Whist Drive, held on November 21st.
Music was supplied by a grammophone pick-up
working through a large power amplifier, running
off a 400-volt transformer, an LSA valve
being used in the last stage, driving a moving-
eye speaker. The whole of the apparatus was
installed by members, and functioned excellently
during the whole period of the dance—some
eight hours. Over the portion of the whist
drive most of the card-players participated in the
dance, which lasted until Big Ben struck the
hour of midnight.
Hon. Secretary, Mr. C. J. Witt, 39, Colston
Road, London, N.10.

Modernising Club Equipment.
The record of an excellent year’s work was
presented at the Annual General Meeting of the
London Wireless Society on Wednesday, October
31st.
Mr. J. E. Evans reported that the Society’s
receiver had been modernised and equipped with
an up-to-date eliminator, and that his Com-
munity had undertaken to keep in repair the
headphones used for the Prince of Wales Hos-
pital.
For the coming season Mr. O’Connor was
selected Chairman and Mr. Bodenham was
selected Hon. Secretary. It was announced that
the Society’s Cup and Shield for the most inter-
esting lecture and demonstration given during
the past year had been awarded to Mr. F. E. R.
Nesbit.
New members will be welcomed at any meet-
ing of the Society, held at 28, Bruce Grove, N.17.
Hon. Secretary, Mr. Bodenham, 13, Bruce Grove,
Tottenham, N.17.

CLUB NEWS.

NOVEMBER 15th, 1929.

Fig. 3.—(a) Circuit consisting of a resistance \( R \), in series with an
inductive coil of resistance \( R \) and inductance \( L \). (b) The impe-
dances \( Z \) for the whole circuit and \( Z_c \) for the coil alone can be
obtained from the impedance triangles.
Broadcast Brevities

The Silent Twin.—Birmingham's Protest.—Centralisation.

The Second Transmitter.

"Hands off the poor man’s station!" exclaims a contributor to the Savoy Hill post-bag, decrying attacks on the Brookmans Park transmitter. No thoughts of the second transmitter disturb his rest, nor need they, for he has still a full month in which he may twiddle his cat-whisker without fear of interruption. Despite rumours, I am officially informed that No. 2 transmitter has not yet begun radiating, although the B.B.C. was strongly tempted to use it for a public experiment on Friday, November 1st.

A Near Thing.

The temptation came when complaints were made that the concluding broadcast of the Delius Festival would be limited to 5GB. The B.B.C. was anxious to please those who thirsted for Delius, but 2LO’s mixed programme of military band, Sir Oliver Lodge, and vaudeville was already printed and published.

"Come a brain wave. Inaugurate the second station with a surprise transmission of Delius!" said someone. Savoy Hill actually gave the idea a thought, but that was all.

B.B.C. as Pamphleteers.

The great pamphlet campaign is considered by Savoy Hill to be responsible for the relatively small number of complaints regarding the change-over from Oxford Street to Brookmans Park. Since the new station took over 29,000 pamphlets of advice have been distributed, in most cases with beneficial results. One old lady wrote saying that she and her maid, after studying the pamphlet, "got" Brookmans Park on a crystal set after two wireless experts had failed. A less fortunate correspondent in North Wales said: "Since you have moved to Langham Place I have been unable to pick up Toulouse."

A Painful Transition.

But for the fact that the B.B.C.'s task, like that of the tight-rope walker, is always fraught with peculiar difficulties, one might be tempted to say that the Corporation had arrived at a difficult stage in its career. The difficulties are certainly aggravated at the present moment, however, by the onset of the slow and necessary painful period of transition from the original scheme of programme distribution to the regional scheme.

As each locality is forced to yield up its individual niche, in the other, Savoy Hill undergoes a barrage of complaints from honest licensees to whom platitudes of "the greatest good for the greatest number" variety are like red rag to a bull.

Birmingham is Rousted.

The biggest outcry just now comes from Birmingham, which incidentally has suffered a definite loss in broadcasting prestige or grandeur the local station closed down in favour of 5GB. Birmingham was patient, however, until a few weeks ago, when the unkindest cut of all came in the form of the threatened disbandment of the Birmingham studio orchestra. It is true that many of the displaced musicians can be absorbed by the National Symphony Orchestra, but this is essentially a London combination, and Birmingham sees the transaction as another sacrifice on the altar of centralisation.

The "D.G." Goes North.

The seriousness of the situation can be gauged from the fact that Sir John Reith, Director-General of the B.B.C., attended a private conference at Birmingham last week to discuss matters with the Midland musicians. The meeting was held behind closed doors, and at the time of writing no disclosures have been made concerning future policy.

Dangers of Centralisation.

The case of Birmingham has been, or will be, repeated throughout the country as the tendency to centralisation becomes more apparent. The local aspirations of Aberdeen, for example, are served by a station director, an engineer or two, and a typist, the programme coming through the tap from Glasgow or London. Newcastle has just reduced its local staff. Glasgow's large orchestra is being transformed into an octette for use on odd occasions.

Provincial Interests at Stake.

Are the provinces justified in protesting? The majority of listeners will agree that they are, in the sense that if the provinces fail to look after their own interests, nobody else will. While the gradual change to the regional system is in progress the B.B.C. will be tempted on grounds of expediency to provide mass-production programmes; the danger to the provinces is that when the change is complete the B.B.C. will stick to the same methods. If the provinces are wise they will keep on clamouring.

Ulster in Trouble.

Strangely enough, while the cry in Great Britain is against centralisation, Northern Ireland is pleading for a little more. In the past fortnight Savoy Hill has received some bitter complaints from Belfast to the effect that the Ulster listener is left out in the cold.

It is alleged that 2BE works on a useless wavelength (242.3 metres); that half its radiation is wasted on the Irish Sea; and that the alternative programme from 5XX (when it is alternative) is unsuitable for Irish listeners.

B.B.C.'s Reply.

In reply, the B.B.C. regrets that a change of wavelength is impossible at the present moment owing to the international situation, and points out that 5XX gives a reasonably good service to Northern Ireland. Until Ulster's high-power station is erected in two or three years' time it looks as if listeners will have to make the best of a bad job.

"Effects" by Gramophone.

Sound effects will contribute prominently to the realism in a programme entitled "Intimate Snapshots," to be broadcast on November 22 from 50B. Lance Sieveking, the author, takes as the central idea the theory that for many people life is a series of dull and often meaningless repetitions. His examples prove it and afterwards show the contrary.

The atmosphere of a tube station and newspaper office will be reproduced by means of gramophone records prepared on the spot.
The Wireless Schneider Trophy

By D'Orsay Bell M.A.

In Quest of the Short-wave Record.

I t is high time that radio learned the uses of publicity. How many people know anything about that most exciting international contest which has been going on now for several years—the struggle to break the short-wave record—or, if you prefer it, the race for the highest radio frequency? How many? I repeat. The answer is in the interrogative, and would remain so but for the fortunate chance that The Wireless World has commissioned me to look into the matter.

The race, under the present rules, did not begin till some years after the revolution in wireless caused by the introduction of the three-electrode valve. Before this, a few desultory flights had been made, with prehistoric machines of the spark type, producing heavily damped waves with little power behind them. Then came the valve—but also the War: people were preoccupied, the early valves had high inter-electrode capacities, and the pursuit of the ultra-shorts was shelved for a time. But nothing is safe for long from the restless researcher. By ingenious wangling of the circuits someone induced an ordinary valve to give a wavelength far, far shorter than any it had dreamed of giving. That started it: at once, all over the world, earnest workers went one better; no sooner had an American proudly announced the production of a three-metre wave than an Englishman replied by generating a two-metre one; a little later a German would write reams to describe his researches leading to the production of a one-metre wave, and before the ink was dry a Japanese would brandish a 90-centimetre wave... And so began the race for the Wireless Schneider Trophy—so-called from the German word schneider, a cutter, because the idea is to cut off another centimetre or two.

In spite of lack of publicity, marvellous progress has been made, especially in the last year or so. As a general rule, the valves used are more of the receiving than the transmitting type, so that the power behind the waves is not very great—often only one or two watts; but the waves are genuine, undamped waves, real "C.W." suitable for telephony and other modern usages; and the smallness of the power is largely compensated for by the efficiency of radiation. A recent record—I dare not say "the present record," because by now someone has probably stood a valve on its head and got a millimetre or two shorter—is 3.5 centimetres. This, I think, goes to Poland (Potapenko up). It is rather a remarkable thought that we now have a complete range of wireless waves, from the giants—measured in miles—used in long-distance commercial work down to this midget of about 1\(^{3/4}\) in., all produced by the ubiquitous valve. Now just as you find stick-in-the-muds pompously demanding what is the good of these six-mile-a-minute aeroplanes and these four-mile-a-minute motor cars, "for all practical purposes, hrrmph?" so you find them condemning the time and trouble spent on these ultra-shorts as being wasted on matters of "purely academic interest." It is worth while looking to see if they are any nearer the mark now than they were about the aeroplanes and motors.

I have already indicated the extraordinary possibilities of waves of about 1 to 5 metres from a medical point of view, so I will not repeat myself. These same wavelengths seem very promising for communication of a certain kind—primarily, perhaps, for military purposes. With an input to the aerial of a tenth of a watt, signals have been obtained at loud speaker strength from an aeroplane twenty-two miles away; with one watt, telegraphy is possible from an aeroplane about eighty miles away. These ranges are nothing much compared with those obtained with ordinary "short" waves (400 miles with 2 watts to the aerial on a 50-metre wave, for instance), but the

The Wireless Schneider Trophy.—

"ultras" have particular properties of their own which are likely to add to their value enormously. In the first place, they give complete freedom from atmospherics and from fading (since the Heaviside layer is not mixed up in their propagation), and—and this is where the German workers get excited—their range can quite definitely be limited. Travelling, like light, in straight lines, a ray of ultras reaches the horizon (as seen from its transmitting aerial) and passes on into oblivion in space, not clinging to the ground nor being reflected back to earth by an officious Heaviside layer. Signals from a 1-watt transmitter may be quite strong at the horizon, but a little farther on they will almost have vanished—and even the use of fifty watts instead of the one will make them carry hardly any farther.

You see the possibilities of such waves for military purposes—where interception (with subsequent decoding) is such a bugbear? Can you not picture the indignant enemy, with a loop aerial at the end of a stick, vainly trying to stretch high enough to capture the waves passing derivatively over his head into the void? And the small size of the waves, too, makes them dirigible by quite reasonably small reflectors, so that they can be concentrated into a beam and sent in the required direction only. This becomes still easier as the wave gets shorter and shorter, and both Germans and French have had excellent results with waves of 20 to 40 centimetres, concentrated at the transmitter and collected at the receiver by parabolic metal mirrors. The Germans, in fact, have succeeded in telephoning on waves as short as 14 cms.—only over a mile or so, at present, but with ridiculously simple apparatus; and at the same special valve is used as transmitter and receiver this simple apparatus gives two-way telephony.

So you see these ultra-short waves are by no means just "highbrow" stunts. On the contrary, they are full of practical possibilities. At present they are in their infancy, and puny; but already the Americans are generating 4-metre waves with nearly a kilowatt behind them, using a big water-cooled valve; and no doubt very soon even the "centimetre" waves will have plenty of power. And nobody quite knows what will happen when we get "millimetre" waves—or less— with plenty of power behind them. Already Arkadiewa has produced waves less than a tenth of a millimetre long; that is to say, he has crossed well over the boundary line and invaded the country of the infrared heat radiation. The Schneider Trophy does not go to him—his waves do not comply with the rules; they are not true "C.W." but rather of the "whirr-crack" type, produced by a weird and special form of spark; unsuitable for telephony and with very little power behind them. All the same, they are real waves; they cannot be concentrated by quartz lenses and reflected by concave metal mirrors only 6 in. across.

Radiant Heat by Radio?

The whole subject teems with interesting undiscovered possibilities in all kinds of strange directions. Listen to this, for instance: a German researcher named Heinrich, playing about with short and ultra-short waves, glanced out of his window and saw a little crowd in the field outside, near his transmitting aerial. He soon saw that the crowd was watching a water-diviner, who was giving a demonstration of his art; he was also, Heinrich noticed, looking worried. But as Heinrich watched, the worried look vanished, and he went on quite happily with his demonstration; and Heinrich returned to his work. But as he again pressed the key, a sudden thought struck him, and he kept the key pressed and looked out of the window again. Sure enough, the diviner was looking worried again—more so than ever, for by this time he was nearer Heinrich’s aerial. For it turned out, quite definitely, that whenever Heinrich pressed his key the water-diviner’s hazel twig became seriously upset. So I will leave you now to face the very latest problems: (1) Can we transmit radiant heat from our wireless aerial? and (2) Is water-divining only another branch of radio?

TRADE NOTES.

High Street, Slough, Bucks. The telephone number is Slough 652.

The Hendon Lamp and Accessories Co., Ltd., 104, Southampton Row, London, W.C.1, would be pleased to receive from radio manufacturers, particularly those making portable sets and battery eliminators, detailed particulars of their products.

The General Electric Co., Ltd., "Magnet House," Kingsway, London, W.C.2, have recently opened a branch office at 3, Campbell Street, Leicester. Mr. W. J. Hodgkins, of the Birmingham branch, has been appointed manager. The telephone number is Central 5876, and the telegraphic address "Electricity."
Using the Pentode in Reflex Receivers.

EXCEPT for a few casual references, the writer has seen no mention of the fact that the pentode valve can well be used for purposes other than that for which it was originally designed. As a high-frequency amplifier, for example, the pentode will give, with the usual neutralised circuit arrangement, greater magnification than can be attained by any triode available. The heavy anode current drawn by the pentode renders its use for this purpose alone very uneconomical, but its ability both to amplify efficiently at high frequency and to handle power enough for working a loud speaker renders it the ideal valve for dual amplification in a simple reflex set. Those who have attempted to design a satisfactory reflex receiver will realise that in the pentode there is available, for the first time, a valve that can really "pull its weight" as dual amplifier.

Figure 1 shows a reflex circuit, employing a crystal detector, which has proved highly satisfactory in use. On the high-frequency side it is a quite conventional neutrodine, except that the secondary of the high-frequency transformer $T_1$ is tapped in order that the requisite step-down to the crystal may be obtained. The transformer $T_2$ may have a high ratio without detriment to quality, as the impedance of the crystal is quite low. Messrs. Ferranti were good enough to make up for the writer an experimental model of their AF5 transformer with a $15:1$ ratio and a 10 henry primary, and this has proved very satisfactory for the purpose. It is probable that they would supply this to order to anyone desirous of experimenting along the same lines.

From the secondary of $T_1$, the rectified signals are fed, through a radio choke, to the grid of the valve, the condenser $C_1$, serving to prevent a short-circuit of the low-frequency signals. Grid bias is provided through the transformer secondary and the radio-choke. Every crystal tried has been found satisfactory with the single exception of carborundum, which will not rectify efficiently the high voltages with which it has to deal in this set.

Overloading Troubles.

In common with all other reflex circuits, that of Figure 1 strongly resents overloading, which results, not in the mild distortion usual in "straight" sets, but in intermittent oscillation at low frequency lasting as long as the overloading persists. As soon as even the smallest degree of overloading is permitted, the loud speaker appears to reproduce all loud notes as toneless but most offensive grunts. It is absolutely essential, therefore, to limit the output from the valve to that which it can handle without any trace of the slight overloading that is usually permissible.

When a moving-coil speaker, which has a fairly low impedance to all audible frequencies, is in use, the pentode will accept far louder signals without overloading than when a speaker of moving armature type is chosen, for these offer a very high impedance to the upper range of speech frequencies. This alone would indicate that greater signal strength should be available before the "reflex grunt" makes its appearance if a moving-coil speaker is used, but there is still to be taken into account the enormously greater sensitivity of the moving-coil as compared with the moving iron. These two points together amply account for the observed fact that the reflex receiver shown produces a cheerful roar of first-class quality from any station within its range, provided that a moving-coil speaker is used, while with any other type of speaker signals have to be kept down to a miserable tinkle if good quality is to be maintained.

Eliminator for D.C. Mains.

A further development of the circuit is possible for those who are in possession of D.C. mains. With the aid of the eliminator shown in Figure 2 it is quite possible to dispense with both filament and anode batteries, lighting the filament of the valve gratis by putting it in series with the magnet of the moving-coil speaker. This must, of course, be chosen to pass, as a minimum, the current required by the pentode, and it is almost essential to employ, if only in setting up the eliminator, either a milliammeter at A or a voltmeter at V in conjunction with a variable resistance to ensure that the filament is...
CORRESPONDENCE.

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

**THE REGIONAL SCHEME.**

Sir,—With regard to the "regional scheme" it seems that the B.B.C. can only do one of two things:

1. Restrict their energies so that the listeners near their main stations are satisfied.
2. Continue their forward policy to the ultimate benefit of the majority.

In my opinion the first would be contrary to all laws of progress, while the second is the one which has put this country into such an enviable position as it now holds in the radio world. It is no use putting the brake on progress.

Eastwood, Notts.

L. W. GROVER.

Sir,—I disagree most strongly with your correspondent, Mr. Hobday, with regard to Continental programmes.

The sole reason why I invested in a screened-grid "three" was my inability to hear anything (worth wearing phones for) from the local station in the evenings, which is the only part of the day available for the average man. Week after week passes, and there is nothing but fifth-rate variety and jazz bands after 8 o'clock, a talk only of interest to a few people, or a scientific discourse so elementary as to be suitable for a kindergarten school.

No one can scan the programmes published by the B.B.C. in *World Radio* from such stations as Leipzig, Hilversum, Hamburg, Munich, Cologne, Turin, Toulouse, or Kalundborg, and say they are inferior to those printed in the *Radio Times*, passes my comprehension. Not only does the average orchestral concert contain better music, but it is better performed. Most of the great composers came from the "Continent," and the musicians of the Continent are best able to interpret their works.

Even the dance music from Germany or Denmark is played by ordinary orchestras, and is pleasant to listen to after the raucous blare, whine, and thump from 2LO, etc., etc.

If the Regional, or any other scheme, prevents me listening to foreign programmes, I shall turn my aerial into a saucepan-scourer and light my pipe with my licence. J. E. ROBERTS.

Stratham Hill, S.W.2.

Sir,—The correspondence you publish on the above subject prompts me to express another point of view.

I submit that (a) the regional scheme was never wanted, and (b) it is already out of date.

In regard to (a), if there had been any real demand for alternative programmes, the ridiculous system of sending out the same programme from 2LO and all the relay stations and 5XX, and to a large extent all the provincial main stations as well, would not have been allowed to continue, when 5XX could have been providing an alternative for the vast majority of listeners to all the other stations.

With regard to (b), it is obvious to the meanest intelligence that the ether is grossly overcrowded, and that sooner or later (and the sooner the better) there will have to be a drastic reduction in the number of wavelengths and stations in use in Europe. When that happens, since the only logical method of distributing wavelengths is more or less according to the area of the various countries (for the more sparse and scattered the population the more necessary is an efficient broadcasting service—it is a mere luxury for town dwellers, by comparison), this country will have to put up with three or four exclusive wavelengths, and then the B.B.C.'s twin transmitters will be useless.

In the present state of affairs really high quality reproduction is unattainable, since even if the 9-kilocycle heterodyne note of the adjacent broadcasting stations are suppressed, one still gets interference from the side bands of these stations. It might, in fact, improve matters a little if no broadcasting were allowed to transmit any side bands above 8,000 cycles.
They would be no loss, since they cannot be received, and at least they would not enroach on the fundamental band of the next station.

A. K. GORDON.

Crowborough, Sussex.

EMPIRE BROADCASTING.

Sir,—I have read with much interest the correspondence in your columns on the subject of Empire broadcasting, and the letter in your issue of September 11th, signed "Radiox," states a view on the point. As a Britisher, I appreciate the London programme more than any other, and I have formed a habit of rising at 2:30 a.m. to pick it up. Sometimes I find it repays the effort of early rising, but by no means always.

It would, therefore, be most helpful to those situated 7 hours east of Greenwich if SSW were to give at midnight a brief summary of the next evening's programme, and enable us to decide between sleep or listening.

I agree with "Radiox" that news items are badly wanted. The fifteen minutes' interval that takes the place of the news bulletin sends me back to bed disgusted on five nights each week. If the news bulletin does not affect the sales of newspapers at home, why should it affect the table service?

Bankok, Siam.

TYRO.

Sir,—I had been holding my hand to see what the opinions of other readers might be at the reopening of the SSW question before expressing any ideas of my own. However, the rest maintaining silence for the moment, I feel I must make some comment on your editorial of October 23rd.

On a recent voyage to and from Australia I took some trouble to gauge the effects of the reception of SSW and to make full notes on the reception of short-wave stations during the return voyage. The pivot of debate evidently no longer is whether or not there should be an Empire station, but rather whether there can be. You have suggested that any difficulty SSW may have in carrying out its responsibilities of broadcasting to the Empire is partly the fault of the engineers in charge of the station, and a correspondent suggests a wavelength change. (In passing I do not see how a listener in the Mediterranean, who is so very close to the splendid European medium-band transmissions, can demand a short-wave programme at all, or possibly criticise wavelength policy by results. Surely we can agree that SSW need not consider listeners this side of Port Said or the Canaries.)

The case to be made is that there are considerable parts of the Empire in which reception having a good entertainment value is possible. I hope we shall hear what the listeners in remote parts have to say; I am prepared to open the discussion by denying the possibility in all but a very few parts of the world. In regular broadcast stations that would satisfy non-technical listeners.

To go on throwing Eindhoven at the B.B.C. is vieuz jen. During September, 1929, Eindhoven seemed only to be working once a week. If correspondents want a new brick, it is the Berlin station Königswusterhausen, broadcasting only a very few kilocycles from the Eindhoven frequency and seeming to have more power, better quality, and a better radiation system than the Philips station.

Within SSW's first skip distance (this seems to be between 1,000 and 1,500 miles) the German station certainly was a revelation of what is possible near 32 metres; but we have agreed to discount short range reception. Between 2,000 and 5,000 miles, which of the two suffered the less from the high-speed fading that spoils reception was quite casual. Most of my observations seem to be in favour of SSW.

On most nights the log would run after this style for long-distance reception:

Tuesday, September 17th, 1939. 27° S.: 12° E.

SSW.—Signal strength good at 8 p.m. (local time), but high speed fading violent. Signal strength increased though a very low tone at 11 p.m., when XII and R7.

KDKA.—10.20 weak, but readable and steady. Fading only slight.

Königswusterhausen.—8.30-10, high speed fading. R8.

The qualifying clause "in all but a very few parts of the world" was meant to apply to the reception of SSW in the Far East along the China Coast. I am told that in those parts SSW cannot be received as satisfactorily on a local station but do you want dance bands before breakfast?

Hampstead, N.W.3.

M. A. SPENDER.

Sir,—On March 17th last I wrote to you re the information I had received from the B.B.C. on the subject of the suppression of the news bulletins. They explained that the news was not being broadcast because, rightly or wrongly, a letter was pointed out that 5GB is also an experimental station, yet the news is broadcast from it regularly. This letter you published.

In the number of World Radio for August 2nd, on page 156, in the centre column, occurs the following statement: We receive frequent enquiries as to why the news bulletin is not transmitted from SSW. All that can be said in this connection is that it is necessary to omit this item from SSW transmissions for reasons which are at present beyond the control of the B.B.C.

Obviously the explanation given in their letter to me dated February 22nd could not be considered satisfactory, and it is therefore not surprising that they should now have published something very different by way of explanation.

It is not pleasant to think that any such body as the B.B.C. could be guilty of want of good faith. Yet the facts as stated above can only tend to increase the suspicion and dissatisfaction felt by most overseas listeners in regard to everything connected with SSW since it came into being.

Moreover, the explanation alluded to in World Radio raises another point. The only control over the B.B.C. which is generally supposed to exist is that of the Government through the Postmaster-General. A question in the House ought to clear up the point of the objection of the Government to allowing the Colonies and Dominions to hear the news, and, if they have such an objection, on what grounds?

60° WEST.

B.B.C. TRANSMISSIONS.

Sir,—Surely it is time that criticisms as put forward by Mr. McCormack in your issue of October 23rd were brought to an end. As Mr. McCormack makes no reference, direct or indirect, to the removal of all sources of error in his set, it implies that all frequency distortion or attenuation occurs in the B.B.C. land lines and/or transmitters.

If your correspondent is capable of

(a) The complete elimination of side-band cutting in his own receiver whilst avoiding radio interference,

(b) Accurately distinguishing between side-band cutting in his receiver and attenuation of the higher frequencies in the land lines,

he is well on the way to a perfect set, and many readers would like to know how (a) is achieved.

If and when this perfect set be proved to exist, so much will then depend on the method of reproduction that for the moment further comment is superfluous. Suffice it to point out that further definite proof of the perfect reproducer will be required before such criticisms are fair. As you, Sir, are aware, the human ear is so adaptable to varying conditions as to be quite unreliable as evidence of perfection, and gives but evidence of the personal preference of its owner.

Until such time as this perfection be proved to exist, surely it is better to make the best use of existing radiations. The B.B.C. will gain nothing if the method of reproduction is not perfect, but would also probably claim that they were at least as good as any set reproducing them. If proof, and not judgment by ear, were furnished of really serious defects in transmission, the Chief Engineer would doubtless take steps to rectify his errors.

At a minor point: I live in the "A" service area of Brookmans Park, and therefore we cannot all have the Queen's Hall concerts as "first class," direct or "local." We must therefore accept the next best thing. But why complain in the same letter of the "second rate" on "fifth rate" land transmissions radiated from SNO when admitting there are available the "second rate" transmissions of 5XX1.

Yorkshire.

FAIR PLAY.

A 46.
**Valve Life.**

It seems to be quite common practice nowadays to heat the filament of an output valve with raw A.C. at the correct voltage; I am told that the life of valves supplied in this manner is considerably less than when battery is used. Can you confirm the accuracy of this statement, and also tell me if the falling-off, should it exist, is in any way serious? S. C. J.

It is regretted that we have no definite data on this matter, but it is to be assumed that the life of a valve fed with raw A.C. is somewhat shorter than with the alternative battery supply. We do not think that this effect is at all serious; indeed, any reduction in valve life is probably altogether insignificant.

---

**O.O.O**

**A Push-button Regional Receiver.**

I am thinking of using up some spare parts for constructing a simple domestic set for reception of the alternative programmes from Brookmans Park (when they begin). My two-H.F. set will be used on the outside aerial for distance reception, and it is proposed that the other receiver shall be connected and fed from an inside aerial. In order to have an ample margin of safety, it is proposed to use a single H.F. stage, from which no special attempt will be made to obtain maximum amplification. Will you please show me how a switching scheme for this stage may be arranged, in order that it will be possible to use pairs of semi-variable condensers tuned to the wavelength of the two transmissions? It seems that, after having once tuned the set, it should be possible to arrange matters so that either transmission can be received by manipulation of change-over switches, without any external control beyond, of course, that for the filament circuit.

T. F. S.

It should not be difficult to arrange a set on the lines you specify, particularly as no very great efficiency will be required at your distance from the regional transmitters. We suggest the arrangement shown in Fig. 1, in which S1, S2, and C4, C5, are, respectively, the condensers for tuning aerial-grid and H.F. transformer secondary circuits to the alternative wavelengths. These are thrown in circuit by means of the switches S1, S2; with a little care, these may be linked together mechanically and operated by a single knob.

As an additional refinement, it would be possible to arrange matters so that the filament circuit is "off" when the switch is in the central position.

In our diagram we have shown an anode bend detector, but the scheme would be applicable to a set in which grid detection is used, although any attempt to include reaction would tend to complicate matters.

---

**Omitting Decoupling Resistances.**

I have a Ferranti eliminator, which, as you will know, includes anode feed resistances for the various circuits; in these circumstances, would it be quite in order to omit the present decoupling resistances in the "1930 Everyman Four"? H. J. S.

In order to prevent the undesirable circulation of H.F. currents, we suggest that R4 and R5 should be retained. Otherwise your proposal is not open to criticism, although if you are attempting to obtain the very fullest magnification of which the receiver is capable, it might be desirable to leave a resistance of, at any rate, a few hundred ohms in the position at present occupied by R4 (in the detector anode circuit).

---

**An All-wave Frame Aerial.**

Have you ever described the construction of a frame aerial for both medium and long broadcasting wavebands? If so, will you please refer me to the back number in which the description appeared? W. J. M.

Full details for constructing an all-wave frame aerial were given in The Wireless World for July 27th, 1927.

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**Mounting an S.G. Valve.**

Do you consider it better to mount a screen-grid high-frequency valve in a position where it is unaffected by the field surrounding the coils, or to arrange it in such a way that the grid and plate sections of the valve are in the corresponding screening compartments of the set? B. P. A.

Where but one H.F. stage is used, this is not a matter of any great importance, even when one is aiming at an exceptionally high magnification; but in the design of receivers with two or more H.F. stages it is usual practice to screen the valves from the apparatus associated with the tuned circuits.
Wireless World

Record III Modifications.

Would it be possible to use a 6L6G valve in the output position of the Record III? I already have a valve of this type, and a power transformer with outputs of 4 volts, 6 volts, and 250 volts; the latter is for H.T. supply, of course, and the winding has a centre tapping.

If it is possible to use these components, will you please give me a circuit diagram of the modified filament and heater circuits?

F. McC.

There should be no difficulty in arranging matters so that your valve and transformer can be used. In Fig. 2 we give a suitable circuit arrangement; it will be noticed that a potentiometer and by-pass condensers are shunted across the low-tension output winding, which feeds the indirectly heated H.F. and detector valves.

An Unstable Portable.

I am sending you the circuit diagram of my recently constructed four-valve portable, which is giving a good deal of trouble through lack of stability. Can you suggest a likely source of the trouble, or recommend any additions that can be made?

J. R. B.

From the information you give about your set, it is extremely difficult to help you. One naturally expects to encounter a good deal of trouble in obtaining complete stability in a portable receiver unless a well-tried design is followed, as it is inevitable that there will be a good many stray couplings; these must be found and removed, or, at any rate, their "sense" must be altered so as to produce an anti-reaction rather than a reaction effect.

It is noted that your set includes complete decoupling of the various H.F. circuits, and apparently thorough screening where necessary. Of course, we cannot say if the joints of the screening box are sufficiently well made, and we would advise you in the first place to look to this point.

A common source of trouble in portable sets is interaction between the loud speaker leads and the built-in frame aerial; in spite of fairly elaborate "H.F. screening" precautions, a modicum of H.F. energy is often found in the former circuit.

We advise you to try the effect of connecting a by-pass condenser—of, say, 0.002 mfd.—between plate and anode of M. of the output valve, and also to connect an H.F. choke between the plate of this valve and the loud speaker.

Fig. 2.—A satisfactory modification of the Record III, allowing the use of a directly heated valve in the output position.

The Output Anode Circuit.

It is noticed that, although the majority of modern sets seem to have decoupling resistances and condensers in the anode circuits of H.F., L.F., and detector valves, no particular precautions seem to be observed in the case of the output valve. Would it not be an advantage to apply this method of preventing interaction in this case as well, particularly in view of the fact that the energy in this circuit is much greater than in any other, and presumably more likely to lend to trouble?

We would point out in the first place that it is seldom practicable to add a resistance capacity filter in an output anode circuit, because the current is generally so great that a resistance of the value necessary for adequate decoupling would bring about an excessive drop in voltage. In any case, it must be remembered that the decoupling arrangements customarily recommended nowadays are "two-way" devices; not only do they deflect H.F. or L.F. energy from a common source of anode current supply, but they also prevent the feed-back of energy from the output circuit to the anode circuits of which they form a part, and, what is more important, they consequently prevent the passing back of energy to the grid circuits.

It may be added that the anode circuit of the last valve is almost completely decoupled when a choke filter arrangement is used. The same holds good with a push-pull arrangement.

Long Waves for Long Range.

My advice has been asked regarding the choice of a four-valve set for use in Scotland in a district where I know from experience that Duweston S.XX transmissions provide the most consistently good signals.

It is observed that comparatively few commercial sets are designed for as good a performance on the long waves as on the medium band—probably because this is unnecessary in most districts. Can you refer me to any set likely to have a performance recommended for the long waves, where amplification is concerned, and which at the same time is easy to operate?

D. B. L.

Reception of long-wave signals is generally determined by the ratio of signal strength to atmospherics, and in any case it is, in a modern receiver, quite easy to get as much sensitivity as can ordinarily be usefully employed, although there are sometimes occasions where one can make use of a high degree of magnification. We suggest that you should consider the Pye Type 460 receiver, as this set includes long-wave circuits of unusually high efficiency.

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Approximate air line from London: 1,130 miles.

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Power: 40 kw.

Time: Eastern Continental (2 hours in advance of G.M.T.).

Relays programmes from Helsingfors (221 m.; 1,355 kc.; 0.9 kw.).

Standard Daily Transmissions.

G.M.T. 05.15 morning health exercises; 07.00 and 11.03 sacred service (Sundays only); 12.30 concert (Sundays only); 17.30 or 18.00 opera or concert (daily); 19.45 news in Finnish and Swedish. Occasionally on Saturdays at 21.00 dance music.

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A Pick-up of Distinction

The R.G.D. is something different.

The R.G.D. Magnetic Pick-up is designed after years of experiments and we believe it to be as perfect as possible. No record wear, perfect tracking, a scientific instrument, specially developed for moving coil speaker reproduction. Price £3 in bronze, £3-3-0 in oxidised silver.

Get Dubilier's Booklet—"A Bit about a Battery"—from your Radio dealer

The Radio Gramophone Development Co.,
St. Peters Place, Birmingham.

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

1930 EVERYMAN FOUR.
Coils per set £2 - 7 - 6
NEW KILOMAG FOUR.
Coils per set £2 - 5 - 0
WIRELESS WORLD KIT SET.
Coils per set £2 - 5 - 6
DECOUPLING RESISTANCES.
500 or 600 ohms .. 1s. 6d.
Fixed resistances wire wound
1,000-5,000 10,000 15,000 20,000 25,000 ohms
2/- 2/6 3/- 3/6 4/- each
FOREIGN LISTENERS FOUR.
B.B.C. Coils, per set of 3 £1 - 2 - 6
5XX Coils, per set of 3 £1 - 17 - 6
Coil Bases, per set of 3 £0 - 7 - 6

Write for illustrated lists:
WRIGHT & WEAIRE, LTD.,
140, HIGH ROAD, TOTTENHAM, N.17.

Weston sets the world's standard

Our Model 506 MIL-AMMETER Panel Mounting type should be placed in the High Tension Circuit of the valve to ensure correct operation and to check distortion.

Prices £1 : 15 : 0 — £2 : 15 : 0

Write now for your copy of “Radio Control,” the Weston FREE Booklet that explains the necessity for accurate electrical control of your Radio Receiver, and gives much helpful advice.

Address your post card to:

WESTON
STANDARD THE WORLD OVER

Pioneers since 1888
WESTON ELECTRICAL INSTRUMENT CO., LTD.,

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

Centralab

Heavy Duty Potentiometers

Centralab H.D. Potentiometers provide an accurate and smooth voltage control for eliminators and power circuits where a resistor capable of carrying a heavy current is required.

These new potentiometers are wire wound on asbestos and are assembled in a metal cup 1½" in diameter. They will dissipate up to 20 watts through the entire resistance without burning out. Supplied complete with bakelite arrow knob.

List Price, each:
- H.P. 000 — 20,000 ohms. 10/6
- H.P. 005 — 5,000... 10/6
- H.P. 008 — 8,000... 10/6
- H.P. 010 — 10,000... 10/6
- H.P. 015 — 15,000... 10/6
- H.P. 020 — 20,000... 10/6
- H.P. 025 — 25,000... 10/6
- H.P. 030 — 30,000... 10/6

Write for the Centralab Circuit Booklet — It's free.

Our new 68-page Audio manual and catalogue is now ready. It tells you all about Centralab Volume Controls, Power Rheostats and Potentiometers, and their use in radio sets and electrical phonographs. Send 6d. in stamps for postage.

The Rothermel Corporation Ltd.,
24, Maddox St., London, W.1.
Telephone: MAyfair 0578/9.

The Perfect Panel

TROLITAX is undoubtedly the panel for you. It is supplied in a variety of handsome finishes, including some entirely new wood finishes.

Trolitax possesses excellent insulating properties; it doesn't soften under heat, so that screws and terminals do not work loose when soldered.

Trolitax does not warp or sag, and its beautiful appearance enhances the finish of any set. Ask your dealer to show you samples.

TROLITAX

F. A. HUGHES & COMPANY, LIMITED
204/6 Great Portland St., London, W.1. Phone: Museum 8630 (1 lines).
Queensway House, 22, St. Mary's Passage, Manchester (Tel.: Manchester City 3359).
NOTICES.

The charge for advertisements in these columns is:

12 words or less, 9/- and 8d. for every additional word.

Each paragraph is charged separately and name and address must be stated.

STAIRS OFFERS for All Buildings are available to Trade Advertisers as follows on orders for consecutive advertisements. A contract is placed in advance, and in the absence of fresh order the entire sum is due within one month from the date of the previous issue: 13 consecutive insertions 6%; 28 consecutive insertions, 10%.

ADVERTISEMENTS for these columns are accepted up to FIRST POST on THURSDAY MORNING (previous to date of issue at the Head Office, 153 Fleet Street, London, E.C.4), to enable them to be inserted in the following issue unless otherwise instructed by the Proprietors. All advertisements in this section must be strictly prepared. The proprietors reserve the right to refuse to withdraw advertisements at their discretion.

Postal Orders and Cheques sent in payment for advertisements should be made payable to E & S. Ltd., and crossed "& Co." Notes being unaccepted if lost in transit should not be sent as advertisements.

All letters relating to advertisements should quote the number which is printed at the end of each advertisement, and the date on which it appeared.

The proprietors are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

NUMBERED ADDRESSES.

For the convenience of trade buyers, letters for Messrs. E & S. Ltd. may be addressed to numbers at "The Wireless World" Office. Please state whether this is desired, the sum of 6d. to defray the cost of registration and to cover postage on replies must be added to the advertising charge, which must include the words Box 479 to "The Wireless World." Only the number will appear in the advertisement. All replies to Box 479, E & S. Ltd., 57, Fleet Street, London, E.C.4, Readers who reply to Box 479 advertisements are warned against sending remittances through the post except in registered envelopes, in all such cases the use of the Deposit System is recommended, and the reason, the box should be clearly marked "Deposit Department.

DEPOSIT SYSTEM.

Readers who hesitate to send money to unknown persons may deal in perfect safety by availing themselves of our enthusiastic offer of Deposit System. They may be deposited with "The Wireless World," both parties are advised of its receipt.

The time for collection is three days, commencing from receipt of goods, after which period, if business does not return to goods, they must be returned to sender. If necessary, the buyer instructs us to return such goods at its cost and we, in turn, return them by the same means but in the event of no sale, and subject to these being returned to the Buyer in perfect condition, each party carries one way. The seller takes the risk of loss or damage in transit, for which we take no responsibility. For transactions up to £5.00 or thereabouts, we charge £1.00 per quarter, and from £5.00 upwards, the commission is £2.00 per quarter, no minimum.

SALE OF HOUSE.

The sale includes all that is necessary for the continued use of the property as a Wireless House, and it is understood that the entire proceeds of the sale will be applied to the payment of the debt.

The sale is now open for inspection, and any interested parties are invited to make an offer.

No tender will be accepted unless it is accompanied by a deposit of £100, which will be deducted from the purchase price.

The property is available for inspection at any convenient time, and those interested are requested to communicate with the agent, whose address is given below.

The sale is subject to the conditions of the lease, and the successful bidder will be required to pay the balance of the purchase price immediately upon the conclusion of the sale.

For further particulars, please apply to the agent, who will be pleased to give all necessary information.

The property is situated in a highly desirable residential area, and is in excellent condition, both inside and out.

The sale is now open for inspection, and any interested parties are invited to make an offer.

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The sale is subject to the conditions of the lease, and the successful bidder will be required to pay the balance of the purchase price immediately upon the conclusion of the sale.

For further particulars, please apply to the agent, who will be pleased to give all necessary information.
Be Proud of your Set!

You have always wanted your Set to be better than others. Here is your chance.

Fit a Resistor Panel — it will beautify your Set. Your friends will praise its appearance. Resistor Panels are distinctive and superior panels. They have everlasting strength. Ask your Wireless Dealer to show you a Resistor Panel or write direct.

Fit a Resistor Panel

AMERICAN HARD RUBBER CO. (Britain) LTD.,
13a, Fore Street, E.C.2.

ECLIPSES ALL MAINS SET

Radio Experts unanimously agree that the new "Miracle" 3-valve All-Mains Set is far ahead of anything yet offered to the public. Amazing volume of tone while comparison with other makes ensures a far bigger selection of stations.

SOLD AT FACTORY PRICES, with or without Grand Model Cabinet, Conic or Horn-type Loudspeaker, for £1 deposit. Nothing more to pay for one month. Balance by easy monthly payments.

Special offer of Screened Grid Sets.

£2
ELECTRIC PICK-UP

to all who write now for Free Art Lists illustrating Miracle Sets and order within 2 days.

WORLD'S WIRELESS STORES,
Wallington, Surrey.

THE WIRELESS WORLD

For Every User of a Camera!

Every camera owner can get more pleasure out of photography and better results by reading "The Amateur Photographer" regularly.

The "A.P." caters for all photographers, including beginners and advanced workers and contains Lessons for Beginners; Free Criticism of Readers' Prints; Answers to Queries; Regular Competitions and a weekly Art Supplement of particular interest to pictorial workers.

THE AMATEUR PHOTOGRAPHER & CINEMATOGRAPHER

The Journal of Every One with a Camera.

Every Wednesday 3d.

From "The Amateur Photographer."

For Every User of a Camera!

Every camera owner can get more pleasure out of photography and better results by reading "The Amateur Photographer" regularly.

The "A.P." caters for all photographers, including beginners and advanced workers and contains Lessons for Beginners; Free Criticism of Readers' Prints; Answers to Queries; Regular Competitions and a weekly Art Supplement of particular interest to pictorial workers.

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The AMATEUR PHOTOGRAPHER & CINEMATOGRAPHER

The Journal of Every One with a Camera.

Every Wednesday 3d.

From "The Amateur Photographer."
THE PILOT RESISTOGRAD

5/-

A variable resistance for all uses especially adapted to handling output voltages in eliminator circuits. It has a jumpsless range from 40 ohms to 10 megohms and handles 20 watts.

THIS RESISTANCE IS ABSOLUTELY FREE FROM PACKING AND IS NON-INDUCTIVE.

Also all linemen supplied by The Pilot Radio and Tube Corporation of New York, the largest manufacturers of Wireless parts in the world.

Write for catalogue to:

THOMAS A. ROWLEY, LTD.,
59, SKINNER LANE, BIRMINGHAM.

Small Goods for Great Britain and Ireland.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
A New Whiteley Boneham Loud Speaker

This is the new model which proved so popular at Olympia. The Mellow Tone and Full Volume of this Speaker is things to marvel at. It brings out the low and the high notes to exceptional advantage without overloading. The case is beautifully made and finished in mottled bakelite. At 42/- this new Whiteley Boneham Speaker is one of the big things in present-day speaker value. 

Ask to hear it at your Dealer's.

WHITELEY BONEHAM & CO. LTD., Nottingam Road, Mansfield, Notts.

THE WIRELESS WORLD
November 13th, 1920

CABINETS.

ARCHAFT Cabinet; Britain's best value; lowest prices consistent with highest quality; illustrated catalogue free, from original manufacturers, 44-45 craft Co., 546, Cherry Orchard Rd., Croydon. (Phone: Croydon 1961.)

ARCHAFT C. M. — New products in solid oak and mahogany, from 15/- to 71/-.—Arch. C. M. Ltd., 25-27, 10th St., London, N.1. (Phone: 1335.)

DIBSNA'S — TABLE model in solid oak and mahogany, from 15/- to 71/-.

DIBSNA'S — Cabinets, fitted with Radium or Radium substitutes. (Phone: 1335.)

DIBSNA'S — Pedestal model, with separate battery compartments; from 56/- to 12/-.

DIBSNA'S — Cabinets made to Customer's Own Design.

DIBSNA'S — Write for new 16-page art catalogue — F. Diby, 9, The Oval, Hackney Rd., E.2. Phone: Bishopsgate 6458. (Phone: 1335.)

ARCHAFT Radio Cabinets are Britain's Best Value.

ARCHAFT Radio Cabinets are Britain's Best Value.

KAYS' Cabinets, the greatest range of pedestal cabinets in the kingdom; original creations designed at prices 50% lower than elsewhere; quotations for special cabinet; delivery in short notice guaranteed; moving coil, portable, baffled, stereo, microphone, electronic, automatic, etc., wholesale prices free. — Kays, Wireless Cabinet Manufacturers, Mount Pleasant Rd., London, E.3. Phone: Waterloo 1620.

ARCHAFT Radio Cabinets are Britain's Best Value.

SUPPLIERS of "Wireless World" — New Cabinet for 1930. Four, the new kilowatt, "Wireless World" Record Three. Only original supplier of "Wireless World" cabinets, and "Wireless World" kit sets, each compartment sealed and electrically tested with brush gages, 2 polished copper screens for G.U. valves, complete with oak base, exquisite Inlay Finish; top prices given for any type of copper screening boxes or screens on application. — Rigby and Wellwood, Sheet Metal Workers, Milverton Rd., Rocklands.

FINESST American Types, astonishing value, special offer on cabinets, hinged lid, baseboard, highly polished, take 6½ x 8¼ in., sample, price 6/6; trade discounts for quantities. — Mag-Radio, 112 Warton Lane, Birmingham.

LOUD SPEAKERS — Cabinets, extraordinary offer, oak cabinets, hinged lid front, highly polished, 11½ in. square, 8d. each. oaks, moulded, take ordinary units; sample, price 2/6; trade discounts for quantities. — Mag-Radio, 112 Warton Lane, Birmingham.

11/ — Polished teak cabinet, 21 in. x 9 in., as new. — 105, Harrow Road, London, W.4. (Phone: 1335.)

COILS, TRANSFORMERS, ETC.

600 OHMS Decoupling Resistances for New Kilowatt Point, foreign listeners four, and all "Wireless World" circuits, hand made and tested in our own workshops, improved models wound with Calistiana wire, 1½ inch, post free. — Graves Bros., St. Mary's Place, Shrewsbury.

600 OHMS Decoupling Resistances for New Kilowatt Point, foreign listeners four, and all "Wireless World" circuits, hand made and tested in our own workshops, improved models wound with Calistiana wire, 1½ inch, post free. — Graves Bros., St. Mary's Place, Shrewsbury.

RADIOGRAPH, Ltd. — W.W. coils, Record III, 44/—; new Kilowatt four, 40/-; S.G. regional, 37/6; foreign listeners four, 40/-; Europa portable, 37/6; Europa III, 18/6; S.G. multi-valve portable, 22/6; new Euromax four, 40/6. — Radio Graph, Ltd., 40, Great Titchfield St., London, W.1.

RADIOGRAPH, Ltd. — 2½ in. x 8 in. — Redmills deep ribbed or Bocal tube, 6d. each; 8½ in., 6d. each; 12½ in., 1½ in. extra. — Radio Graph, Ltd., 40, Great Titchfield St., London, W.1.

RADIOGRAPH, Ltd. — W.W. cabinets, 4 compartments, 36/6; 2 compartments, 25/6; cracker, 61/6; oak, 41/6; oak finish — Street Station Rd., Handsworth, Birmingham.

A.G. Co. Special Units — Titan units, 15/-; Europa portable, £1/1, 5 circuits, 2 medium and four, 17½ in. deep grid type, £2/17/6; Fat Deciduous Three transformer, 16½; aerial coil, 16½; Foreign Listeners Fours, medium £3/17/6, long £4/17/6; kilowatt, £2/17/6; de-coupling resistances, £1/11/6; 1000 ohms, 1½. — Write for coil and Resistors component list to Alpco Co and Component Co., Howker St., Sheffield.

MENTION OF "THE WIRELESS WORLD" WHEN WRITING TO ADVERTISERS WILL ASSURE PROMPT ATTENTION.

Mention of "The Wireless World" when writing to advertisers will assure prompt attention.
"ANOTHER HELSENS, PLEASE"

DESPITE the results of the last Election, it is safe to say that we Brits are a Conservative crowd.

When we have found a good thing, something we can trust, something that never lets us down, we stick to it. I do not need a new H.T. Battery at the moment, my present Helsen has only been in use for three months, but when I do, I shall automatically ask my Dealer for "Another Helseen, please." And if you like to say that to loudly is in a matter of sentiment, I can only reply that it is a sentiment that would never let history if I had not proved Helseen to be such a matchless battery, and I am only one of thousands who think the same.

PRICES

Standard Capacity.

"Wisy" 9 volt Grid Bias Type £2-5
"Wira" 90 volt H.T. Type, 10/-
"Wisz" 90 volt H.T. Type, 18/-
"Wisz" 108 volt H.T. Type 20/-

Treble Capacity.

"Koia" 65 volt H.T. Type, 30/-
"Koia" 65 volt H.T. Type, 35/-

Your Dealer Sells Them.

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

For the benefit of the thousands of FADA Receiver owners in Great Britain we have organized a FADA Service Department. Your enquiry will have the personal attention of experts with unique experience of FADA sets; and ample testing and repair facilities are available too. Not only FADA receivers, but any other types can be efficiently dealt with. Ask us about our "All-in" Annual Service, which relieves you of all further trouble.

WATCH THIS COLUMN FOR NEWS OF
The New FADA RADIO-GRAMOPHONE,
All-electric — wireless, gramophone, motor and dynamic speaker, all worked from the house-current. Price £75.

Send Stamped Addressed Envelope for November Sale List.

Telephone City 0191.

FADA Public Address and Broadcasting Microphones

The ideal instruments for addressing an audience through Loudspeaker (with Valve Amplifier or L.F. Stage of Wireless Set), and for relaying Speech and Musical Entertainment to any distance.

Powerful Loudspeaker Reproduction with perfect Purity.

Highly durable, sensitive, yet guaranteed entirely free from distortion or microphone noises, absolutely ideal background; far superior to ordinary Microphone Transmitters; for use with Valve Amplifier or Valve Set (through Bridge of Gramophone Pick-up) is desired at Operators Meetings in towns, Theatres, or Concert Halls. Operates from 2 Volt tapping of L.V. Accumulator; through Microphone Transformer. Current consumption one-tenth Ampere. Provided with detachable Sound Collector, handle, book for suspension, and a 9 ft. silk connecting cord, as illustrated.

Pedestal Type, in...-

These Microphones are rendered Directional by attaching the Sound Collector and Pedestal Type, Microphone Transformer, special design to obtain best results from sensitive Microphones when connected to high-resistance transformers. Could not be used without Amplifier; best Transformers made for clear speech with volume, modulation speech and music transmission. Public Address Microphones, etc., by request.

[Ad for other products]

LOUD-SPEAKERS. — Contd.

Bakers SELHURST RADIO are the pioneer manufacturers of Moving Coil Speakers

The New 36 page booklet, "Sound Advice," is yours for the asking. If you are looking for a Baker's Moving Coil Speaker, and you will not be disappointed.

Baker's send you our Free 36 page booklet, "Sound Advice," a postcard will do.

Baker's are of the Highest Grade Throughout, and of proved efficiency.

You want an "ELECTRADIX" radio tester to get exact results.

The DIX-ONEMETER is the highest grade possible. Used in Admiralty, G.P.O. and the "Varsities." Price: "DIX-ONEMETER" in cases, ready 10 microamps per div., with 6 Multipliers. £4 10s.

A WONDERFUL STOCK OF RADIO AND SCIENTIFIC APPARATUS.

Send your inquiries for Moving Coil Speakers, Mains Sets, Chokes, Gramophone Microphones, Recorders, Heliac, Special Apparatus for Transmission and Testing, Dynamic and Motors, all sizes, Bridges, Galvos, Switch and Control Gear of every description in stock.

Now ready, New Edition of 72 page Illustrated Catalogue 9d.

Send Stamped Addressed Envelope for November Sale List.

Telephone City 0191.

TURN THE WORLD YOUR WAY WITH
POLAR CONDENSERS

As used in the new "BROWNE'S S.G. THREE."


ELECTRICAL CABINETS

Complete with Base for 1930 Everyman Four, New Kilogram Four, and W. W. Record III. Jacobean finish.


RIGBY & WOOLFENDEN, SHEET METAL MAFABROD WROUGHTS, MILNROW RD., ROCHDALE.

Regional Station - Eliminator

Doubles the Slectivity of your Set.

Cuts out your Local, Powerful Station and brings in Distance, Weak and Foreign Stations.

Fitted in 30 seconds. No Alterations to Your Set.

Come and Hear It. Showroom open till 8 p.m.

Descriptive Leaflet Post Free.

I.D.S. LTD. 4, Golden Square, Piccadilly, W.1.

Telephone: Gerrard 2137.

Priced £10/6

Post Free.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
Loud-speakers.—Contd.

Birmingham.

"WIRELESS WORLD" Moving Coil, set of parts, £2; leather mounted cone for red unit, 3/6. —W. L. Newell, 26, Peel Rd., Peckham, S.E.15. [7116]

AMPLION Lion Chassis L14; £3;10/-; parts —Baker, 64, Haverstock Rd., Knowle, Bristol. [7135]

CELESTION, G12, oak, perfect condition, £8; pair D.E.S.s, 5/- each; D.E.S. 4/-, "Wireless," 95, Longchamp Road, Battersea.- [8729]

STERLING Audivox H1 Horn Loud-speaker, in excellent condition; 30/- —Write Box 3912, c/o "T.R.

FADA Loud-speaker, similar to large Kenco exceptional bars for type; £3;10/-; Brown, Langchurch Rd., Dorking. [7792]

AMPLION Horn; cost £5/16/; sell £2; excellent condition.—Hallsallie Rd., Golders Green. [8520]

AMPLION Lion Loud-speaker, type L1-41, in Amplion oak cabinet; bargain, £5—12, Southern Rd., East Finchley. [7170]

TRANSMITTERS.

CHEKBROS. Cheltenham transmitters and choice of descriptions, special transformers for transmitting and modulation; choice a specialty; enquiries.—Chester Bros., 224, Dalston Lane, London, E.8. [5240]

TRANSMITTER or Amplifier, American L50 (U.X. 250); £2—£3, Rockville, Knaresborough. [7124]

WIRE.

WIRE of Every Size and Kind from The Beaver Eng. Co. 4, Upper Grosvenor Rd., Handsworth, Birmingham. [3987]

COMPONENTS, ETC., FOR SALE.

SLIGHTLY Used Pick-up, Celestion, 50/-; Phillips, 50/-; 500/; 250/; 150/; 120/; 50/; 40/; 20/; 10/; 5/; 3/; 2/; 1/-; 1/; ½d.—Radio Stores Ltd., 41, High St., Basingstoke. [6764]


AMPLIFIER Valve.—If you require power you cannot do better than one of these:—


Otto, 100, 15,000, 20,000, 25,000, and 50,000 ohms, 5 variable tappings: 2/- each.—R. L. Scott, 10, Chiswick High St. [7175]

CHOICES (£1) —Choice coils, excellent for smoothing, any size, 3d. each; special heavy duty choices for 100 and 200 watts at £6/8/- and £8/6/- respectively.—any article or newspaper against cc.—H. L. Higgins, Radio Engineer, Clapham-on-Sen. [5050]

BELLING-LED Panel Fittings are designed to give an expert finish to any home-constructed set; catalogue post free.—Belling and Ltd., Queens Works, Ponders End, Middlesex. [10018]

58/-6/- 150-volt H.T. accumulators, compact, portable, months; advertised.—Pearson, 29, Midland Rd., Winton, Bournemouth. [7170]

THE RADIO EXCHANGE, Trevile St., Plymouth.—Your old set, loud-speaker or accessories, taken in part exchange for new.

£1,000 Worth of Radio Bargains: send stamp for 200 pages, fully illustrated catalogue; components, sets, loud-speakers, etc.—Trevine, 29, Tavistock Rd., Peckham, S.E.15. [7116]

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

We SPECIALISE in the supply of all Good Quality Radio Sets, Components and Accessories on Easy Terms. We will give you efficient service. No references required. Send your list of requirements and a quotation will be sent by return.

London Radio Supply Company
11, OAT LANE, NOBLE STREET, LONDON, E.C.3
NATIONAL 1927

RADIO-GRAMOPHONE CABINETS

Beautifully finished in highly polished OAK. Spacious compartment for speaker and batteries. Overall size 36" x 24" x 19". Special price to "W.W." readers.

£4.19.6
Delivered free in England and Wales. Scotland 2/6 extra.

RADIO-GRAMOPHONE MANUFACTURING CO.
(In Voluntary Liquidation)._Parts offered for sale by

THE WIRELESS WORLD

Components, Etc., for Sale.—Contd.

PERFORMANCE Remarkably Good, says "Wireless World" laboratory tests, on testing Aircooled H.T. choke; obtainable by post, 2/-, if desired.

VARLEY Pick-up and Auto Arm, £2/2, or separately: Formica 0.75; 1 1/4; 1.50; 2.50; 3.00; 5.00. Motor, 2.50; 3.00; 5.00; 8.00. New, at 10/- each; B.I. 20; 20/6. (See also). 12/-.

Herberts XPEIUMENTS.—Ail and test equipment, 6/-; and 8/-; 35/-; 5/-; and 7/-; 21/-; Mullard grid leak, 2/6, 5 and 2 meg, all by

600 OHMS Decoupling Resistances; see adv. under Colla.—Groves Brothers (Manufacturers).

Radio-Gramophone Cabinets

(1927)

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

"I HAVE received so many replies to my advertisement in "The Wireless World," which appeared under a Box Number that I am sending herewith stamps to the value of 6d. as further payment towards your postage expenses. Thanking you for the quick despatch of all replies."

R. W. CAPEWELL,
32, Chapel Terrace, Trent Vale, Stokey-on-Trent.

How to sell a Portable!

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

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

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

TWELVE Months' Guarantee Accompanies all our Repairs: any make of L.F., transformer, telephone, or loud-sounder repair, and despatched within 48 hours; 4/- post free; don't discard if burnt out.—Leeds Wireless Repair Service, 214, High St., Colliers Wood, S.W.18.

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

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


WANTED.

WANTED, good L.F. transformers, 6/- each, to order.—Apply New Marconi power transformer G, 600 volts, 4,000,000 microamps output, 2 Marconi heavy duty chokes, 2, 1,000 cells, 600 new Westinghouse rectifiers, RS-19, mains transformer, 50,1-, 2,000,000 microamps output, 1,000 new trial transformer.—Harnan, 11, Highbury Grove, Highbury.

EXPERIMENTER'S SURPLUS.—Modern components, M.C. style, list forwarded—High End, Roxwell, Hoylake, Cheshire.

SALE.—Ferranti A.F.S. now; beat each offer; secure.—St. John, Hanwell, W.7.

ADVERTISEMENTS.

REPAIRS.

T W E L V E Months' Guarantee Accompanies all our Repairs: any make of L.F., transformer, telephone, or loud-sounder repair, and despatched within 48 hours; 4/- post free; don't discard if burnt out.—Leeds Wireless Repair Service.

K IN G S T O N - O N - THAMES.—2/- per bobbin loud-sounder: phonograph transformers, 4/- guaranteed.—Minter, 156, Condover Road.

R EPAIRS Returned Post Free, and to ensure satisfaction send remittance after approval of same.—Leeds Wireless Repair Service.

T U R N S P E A K E R S, headsets, re wound to any voltage, £1; 4/—, spare parts; 6/-, Todd, 23, Boston Place, Green Rd., Leeds.

G U A R A N T E D, repair by experts; loud-sounders, etc., headsets, speaker, pick-ups, any type, rewound, remagnetised, and adjusted, post free, 4/-, transformers from 4/-—Howell, 42, Pothering Road, Enfield, Middlesex.

W A N T E D.


WANTED, L.T. changer, A.C., Ormond 55/1 dial, and set later L.F. phones; cheap for urgent cases.—Holmes garage, Adlington, Lancs.

WANTED, cheap second-hand case for portable; parlor set.—Elstead, 26, Dudley Rd., Hastings.


WANTED, coils, switches, chokes, screen and fixed condensers for McMichaels Three, and Clissold Four.—Thames Terrier, 34, Bakerstone Lane, Islington.

WANTED, complete, or part, various, also with condition.—R.F. III. 325, London, N.7.

M O V I N G Coil Galvanometer, calibrated resistances, Wheatstone bridge, ex-Government study switches, home, etc.—Evelyn Lanes, Putney, Greater London.

WANTED, complete, or part, various, also with condition.—R.F. III. 325, London, N.7.

B. B. A. case, Ammonium Lin.—Blackburn E. 52, Griffin St., Derby.

A G E N C I E S.

A G E N T WANTED. H.F. Accumulators, 60, 35, 20, 10 volt 5/- each; good Homer.—Fawcett, 28, Midland Rd., Donsouthern.

R. G. G RE AT R E X and Co., 184, Regent St., Lon don.—Phone 42, London, 8406.—Wanted 100 cells (known as Atlas Battery Eliminators), are distributors of a fine British portable; 16 stations, £16/6. [6754]

A G E N T WANTED, space time, wireless experience, to deal with friends; would accept any term.—H. L. Printz, 53, Camden Rd., Holloway, London.

A G E N T Wanted by Well-known German Wireless Manufacturer, preferably to work on his own account.—Apply Etsa Radio, Berlin, Spandaustrasse, 31.

E X C H A N G E.

Y O U R Old Apparatus Taken in Part Payment for Latest Type; see our ad in column Receivers for Lane.—Scientific Development Co., 51, Fitzvoyce, Preston.

B U S I N E S S E S & PROPERTIES FOR SALE, TO BE LET OR WANTED.

R E T A I L. Business, electrical and wireless, etc., established 7 years; price £1,200, n.v., stock valuation; premises included: 1500 sq. ft., electrical plant, furniture, etc., 2 valuable patents and goodwill; ex-Government agencies; busy business; situated main railway into important town; open to strictest investigation. W.O.R.'s need apply to Box 3780, W.11. 


S I T U A T I O N S V A C A N T.


S I T U A T I O N S V A C A N T.

Not yards, but miles ahead of all rivals

EPOCH
NEW MODEL 99 P.M.
MOVING COIL SPEAKER
makes its bow to the most critical of listeners
and scientists.
Reproduction to absolute Perfection.

No accumulator, no mains, no suspension, no adjustment.
7 days' free trial.
Send for new catalogue W.S.2: 16 pages of real information and no salesman’s talk.

EPOCH RADIO MANUFACTURING CO. Ltd.
3, Farringdon Avenue • E.C.4
Phones: CENTRAL 1911/2

Situations Vacant.—Contd.

YOUNG Man (aged 21-25), Required for High Class Repair Work on Small Electrical and Wireless Apparatus.—Apply, stating age, experiences, and salary required, to The Empires Co., Ltd., Employment Department, Hayes, Middlesex. [7080]

SPLENDID Opportunity for a Smart Young Man, thoroughly experienced in retail sale, must furnish full references, very attractive prospects of advancement to a man with ability; letters only.—Leopold Radio Supplies, 98, High St., S.E.8. [7096]

LEADING Manufacturer Requires Capable Radio Lecturer, must have sound theoretical qualifications and practical knowledge of latest broadcast receiving apparatus, offers sales service experience an advantage.—Write, giving full particulars, age, salary required, etc., to Box 3862, c/o The Wireless World. [7118]

RADIO Engineer for Works Manufacturing High Frequency Receivers and Components, thorough knowledge of electrical work, in and out of trade, responsible, and capable of effective work.—Box 3865, c/o The Wireless World. [7128]

WIRELESS Operators Required by Leading Shipping Company: operators with about 2 years’ sea service preferred.—Write, giving full particulars of education, technical training, and practical experience, Box 3861, c/o The Wireless World. [7183]

SITUATIONS WANTED.

WORKS Manager of Well Known Radio Camper Desires Change, 13 years’ practical experience all branches of radio trade, fully conversant with English and American production systems.—Box 3979, c/o The Wireless World. [7101]

RADIO Engineer, 14 years’ experience, seeks situation, will maintain an interest in all new developments.—Box 442, Bella, Fleet St., E.C.4. [7117]

MARINE Wireless Operator, age 30, previously commercial traveler, experienced modern practice, broadcast reception, power amplification, installation of receivers, and familiar radio components on British market, is adaptable, trustworthy, and can provide security to anyone who will utilize his services.—Box 3866, c/o The Wireless World. [7160]

I MPORTANT responsible position required by highly qualified radio engineer and manager (28), considerable experience in designing publicity, salesmen, know-how high power amplifiers, uses to work for high pressure, ability to control output of stage, age 33, energetic.—Box 3867, c/o The Wireless World. [7125]

LATE Partner Well Known Radio Manufacturing Co., Penks Change, 14 years’ practical radio experience, sound knowledge high power amplifiers, uses to works management of every detail, application for position of Manager, age 33, energetic.—Box 3868, c/o The Wireless World. [7161]

MEMBER of Leading Radio and Electrical Manufacturers Desires Change, preferably design or experimental work, desirable sound production goods, technical ability, all radio receiver circuits, microphones and public address amplifiers, also repairs.—Box 3869, c/o The Wireless World. [7158]

BOOKS, INSTRUCTION, ETC.

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

STEP by Step Wireless: a complete course of the theory of electricity in relation to the practical design of wireless apparatus, eliminators, circuits, etc., with extracts from designer’s notebook, giving up-to-date practical applications, bound weekly, ready for first 4 weeks.—Clifford Presland, A.M.I.E.E., R.A., Dept. W.W., Hampton-on-Thames. [0196]


LOUD-SPEAKERS, by C. M. E. Balb.—A practical handbook for wireless listeners on the selection, construction and performance of loud-speakers, with notes on the detection and remoulding of faults; net of book-sellers or Pitman’s, Parker St., Kingsway, London, W.C.2. [7069]

Wonderful Response!

A recent advertiser in "The Wireless World" writes—

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

We supply super capacitors Dry Cells and all parts for building your own dry battery at home.
This is the best and cheapest form of T.T. you can afford.
Super capacitors Dry Cells such as 20 milliampe, 28 per doz.
Send 1/- stamp for booklet, "How to Build a Dry Battery at Home."

THE LETTON BATTERY CO., 265, Church Rd., Leyton, E.11,

REPAIRS
Any make of L.F. Transformer, Loudspeakers or headphones repaired and dispatched within 48 HOURS. TWELVE GUARANTEE with each repair. 1/- Post Pd.
Terms to Trade.

PARISH OF STEPNEY.
RADIO & ELECTRICAL ENGINEERS
and WIRELESS APPARATUS MANUFACTURERS.
The Guardians of the Poor of the Parish of Stepney are required to receive tenders for the installation of Wireless Receiving Equipment and Apparatus at each of their three Hospitals, viz., St. Michael's, Mile End, and Stepney.

Mile End Hospital, Barkston Road, Mile End, E.8.
St. George's-In-The-East Hospital, Raine Street, Old Gravel Lane, E.4.
St. Peter's (Whitechapel) Hospital, Vallance Road, E.1.
The tender must reach this office by 1.00 p.m. on Thursday, 5th December, 1929.
By Order,
S. McCLELLAND,
Clerk to the Guardians.

DUTY TERMINALS
AND OTHER WIRELESS ACCESSORIES
J. J. EASTICK & SON.
ELEEX HOSI. 6TH ROAD, LONDON, E.C.

USE ELELEX (TM) TRELBE
DUTY TERMINALS
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J. J. EASTICK & SON.
ELEEX HOSI. 6TH ROAD, LONDON, E.C.

“Build your own Dry Batteries.”
A New Wireless Hobby.

We supply super capacitors Dry Cells and all parts for building your own dry battery at home.
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Super capacitors Dry Cells such as 20 milliampe, 28 per doz.
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Super capacitors Dry Cells such as 20 milliampe, 28 per doz.
Send 1/- stamp for booklet, "How to Build a Dry Battery at Home."

THE LETTON BATTERY CO., 265, Church Rd., Leyton, E.11,
Superior A.C. POWER TRANSFORMERS and CHOKES for the MAINS from 35' each for ALL INPUTS and OUTPUTS.

WILLIAM BAYLISS LTD., Sheepcote Street, BIRMINGHAM.
Telephone: Mid. 7409.
Telegrams: "Drawbench, B'ham."

HYDRA FOR ORGOLA
The Bakelite-cased HYDRA non-inductively wound will prove the most satisfactory condenser in the Orgola circuit, because it is non-inductively wound; other makes are inductively wound.

PRICES:
25 mfd. - - 1/9
5 mfd. - - 1/10
1 mfd. - - 2/-
2 mfd. - - 2/9

LOUIS HOLZMAN, 37, Newman Street, London, W.1
TELEPHONE - - - - - MUSEUM 2642

THE BEST PANELS—
Trelleborgs GUARANTEED SHINE EBONITE
25% REDUCTION ON RETAIL PRICES

NOW THE CHEAPEST!

TRELLEBORG EBONITE WORKS LTD.
UNION PLACE, WELLS STREET, LONDON, W.1.

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Whether five
or five hundred are listening
They hear the programme
clearly . . . easily

Last night . . . a few couples dancing in
a drawing-room, to the lilt of a waltz from a
famous band. To-night . . . a big audience
hearing speeches broadcast from a political
meeting. And yet on both occasions they listen
to the same loud speaker!

No wonder this new Marconiphone Moving
Coil Speaker is so popular!

Its tone! So very true, so perfectly modulated
. . . Such amazing range! Listen to it
and you hear music exactly as it is played
. . . voices with all the expression of life!

All the volume you can want—yet so sensitive!

The one-piece diaphragm brings out the true
value of every note . . . highly accurate centring
of the moving coil makes it so sensitive that
nothing is missed . . . This speaker blends
them all smoothly—flawlessly.

Moving Coil Units for home construction
from £4.10.0. Cabinet Models for working
from 6-volt accumulator—£7; from D.C.
mains—£7.10.0; from A.C. mains—
£12.12.0 (including Rectifier Unit
and Valve).

Marconiphone
Moving coil speakers

The First and Greatest Name in Wireless
BEAM AND THE REGIONAL SCHEME

Because of the increase in power from Brookman's Park, the new 2LO, it is more important than ever to purchase a loudspeaker which will handle great volume without rattle or distortion.

"BEAM" SPEAKERS are constructed to give the finest possible reproduction on either weak or strong reception. The model illustrated is marvellous value, of excellent appearance, and harmonizes with all home surroundings.

"BEAM" H.T. BATTERIES are silent yet energetic workers. The elements of which they are built ensure steady flow of current without background noises.

All "Beam" products are obtainable from your dealer or direct.

Beam Ltd.
35, Farringdon Road,
London, E.C.1

Telephone: Holborn 7049.

Why take your accumulator to a charging station now the winter is here?

Be up-to-date

Charge your Accumulator at Home

at Less than 1d.

TEKADE

TRICKLE CHARGERS FOR A.C. MAINS.

100—130 v. or 200—250 v. for charging 2 and 4 v. accumulators.

Price 29/6

No valves, no breakable parts, noiseless and safe!

Ask your dealer or write for full particulars to

Dr. Nesper Ltd.,
Colindale Avenue,

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

Mullard
MASTER • RADIO

Advert—THE MULLARD WIRELESS SERVICE CO. LTD., Mullard House, Charing Cross Road, London, W.C.2

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Cut out local interference with a LEW COS WAVETRAP

Glazite coloured connecting wire in 10 ft. lengths
Price 6d. per coil.

The Lewcos Wavetrap should be fitted to all sets where interference from local stations is experienced. If you cannot cut out the new Brookmans Park station—fit a Lewcos Wavetrap. To ensure efficient working on all wavebands there are four wavelength ranges; see you get the right one suited for your set.

LEW COS RADIO PRODUCTS FOR BETTER RECEPTION

LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, CHURCH ROAD, LEYTON, LONDON, E.10.


WESTINGHOUSE

METAL RECTIFIER

STYLE H.T. 3

FOR HIGH TENSION

D.C. OUTPUT 120 V., 20 M.A.

Price 12/-

Full details and circuits for this unit, and our other types, are given in our 32-page booklet "The All Metal Way—1930." If you are interested in A.C. mains units, you should have a copy.

Send a 2d. stamp with your name and address.

Made in England by:

The WESTINGHOUSE BRAKE & SAXBY SIGNAL Co. Ltd.
32, York Road, King's Cross, London, N.1

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

appreciates music that he himself has played to thousands.

No greater testimony for Telsen Transformers could be found than the artistic sense of a Musician who writes to us of the wonderful balance of tone these Transformers give throughout the entire musical scale—which has now made it possible for him to hear as he once played to thousands. Try one in your set—and have music in all its reality!

RADIO'S CHOICE!
—AND A MUSICIAN'S TOO!

TELSHEN ELECTRIC CO. LTD., MILLER STREET, BIRMINGHAM.
PHILIPS
RECTIFYING VALVES

for:
—Reliable H.T. Supply
—Dependability
—Long Life
—High Efficiency

An output easily varied and smoothed.
The only rectifier that has stood the test of all—TIME.

Representative types:
Type 506. Full wave type. Filament voltage 4 volts.
Filament current 1 Amp. Anode volts -2 x 300 volts.
R.M.S. max. Rectified current 75 m.A. Price 20/.-
Type 505. Half wave type. Filament voltage 4 volts.
Filament current approx. 1 Amp. Anode volts R.M.S.
400 volts max. Max. value Rect. Current 60 m.A.
Price 15/-.
Type 373. Half wave type. Filament voltage 4 volts.
Filament current 1 Amp. Anode voltage 200 volts.
R.M.S. max. Rectified current 40 m.A. Price 15/-.

Philips make rectifying valves for voltages up to 4,000 and currents up to 40 amps.

PHILIPS
for Radio

Branches and Service Departments at—
Birmingham  Glasgow  Bristol  Liverpool
Nottingham  Cardiff  Leeds  Manchester
Newcastle-on-Tyne  Belfast  Dublin  Plymouth
Advert. PHILIPS RADIO, PHILIPS HOUSE, 145, CHARING CROSS ROAD, LONDON, W.C.2.

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Eliminate That Buzz & Hum

To ensure pure, clear, silent, power use.

Ever Ready, Britain's Best Batteries

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Radio's Supreme Power

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

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

66 V. from 7/6
99 V. .. 11/6
Super Capacity for Multi-Valve Sets

99 V. 32/6

The

Grosvenor Battery

BRITISH MANUFACTURE

GROSVENOR BATTERY CO., LTD., 2-3, White St., MOORGATE, LONDON, E.C.2. Phone: Met. 6566

Superior A.C. POWER TRANSFORMERS

and CHOKES for the MAINS from 35’- each
for ALL INPUTS and OUTPUTS.

Special Audio-Frequency Chokes and Transformers, and Smoothing Chokes for all purposes.

WILLIAM BAYLISS LTD., Sheepcote Street, BIRMINGHAM.
Telephone: Mid. 1409.
Telegrams: "Drawbench, B'harm."

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
November 20th, 1929.

THE WIRELESS WORLD

Advertisements.

IF LONDON ISN'T GIVING DANCE MUSIC—VIENNA IS.

The McMichael Super Range Four places you outside the usual restrictions of programme choice. Tuning is so simple that it is easy to obtain any selected station, whilst the selectivity is such that stations obtained come through without any interference.

It is a receiver that you can take anywhere certain of an exceptionally wide range of stations with a loud speaker reception of power and quality, whether indoors or outdoors.

A McMichael triumph obtaining the utmost result from the latest and best valves and components. In its handsome furniture hide suit case it is a pleasure to eye and ear.

The McMichael Super Range Portable FOUR

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

Call at your local dealer's and ask for a demonstration of this unique portable.

CASH PRICE

22 GNS.

(Inc. all Equipment and Royalties.)

Or if desired it can be purchased by means of our special 'Deferred Payments on Hire Purchase Terms" system. £5 down and 10 monthly payments of £2 1.

The McMichael Super Range Four (Table Model)

Contains the same circuit as the McMichael Super Range Portable Four, but is made as a table model in handsome Walnut. It is mounted on a turntable, and has a most efficient frame aerial fitted inside the Cabinet. The use of additional aerial and earth can be used to add to the normal and very remarkable range.

Cash Price,

26 Gns.

Including all Equipment and Royalties.

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YOURS FOR 10/- DOWN

THE SECRET OF PERFECT RECEPTION

Maximum results from any Set depend upon consistently powerful and smooth High Tension current. Dry Batteries cannot possibly be efficient, as they deteriorate in strength from the moment you connect them to the Set, and modern Super-Power Valves literally eat H.T. Current, the result being the Batteries are exhausted in a very short space of time. On using H.T. Batteries the cost must be anything from £50/- to £6 per annum, for a three or multi-valve set. Compare this with the cost of an "ATLAS" Eliminator. The first cost is practically the last, as the current consumed, even on a multi-valve Set, would not exceed £2 per week, and the Eliminator is practically everlasting.

MODEL A.G.16.

For A.C. Mains is suitable for any Set from one to five valves and specially caters for Sets using Screen Grid, Detector and Pentode Valves. It is also ideal for use with any Portable Set when used in the home. Provides two Fixed Tappings of 120 and 150 volts respectively and one Variable 3100 volts. Output 150 volts at 25 m/A. If you are on D.C. Mains our D.G.16 Model is what you require.

DARIO Milled Base for Easier Handling.

FOUR VOLTS

Universal 25 amp... 5.6
Resistor 25 amp... 5.6
Super H.F. 75 amp... 7.6
Super Power 15 amp... 7.6
Hyper Power 3 amp... 9.6
Pentode 3 amp... 18.6

From your Drake or direct.

DARIO VALVES

Best way to all Stations

IMPEX ELECTRICAL, LTD., DEPT. C.
538, HIGH ROAD, LEYTONSTONE, LONDON, E.11

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The name Ormond is a surety that not only the parts seen but in all those hidden details, however small, there is the same perfection of construction and design as shown in the beautifully finished exterior.

The new Ormond Loud-speaker is no exception to the rule. Its exterior design is original and most attractive, whilst the finish is perfect.

The handsome Oak or Mahogany cabinet is fitted with the famous Ormond 4 Pole Adjustable Unit and specially designed "wonder" cone with the result that the tone and volume is of exceptional excellence. "Blare" is absent and the reproduction, whilst powerful, is very mellow.
Pick-ups and the NOVOTONE

Every user of an electrical pick-up should immediately write for the "Novotone" Booklet.

The Novotone Tone Compensator invented by Dr. N. W. McLachlan not only compensates for the inherent losses in pick-ups but also for the even greater losses in recording.

Read this extract from "The Wireless World," August 21st, 1929, Page 177:

"In ordinary records it is necessary to restrict the amplitude of notes below about 250 cycles in order that the vibrations may be contained within the standard pitch of the groove."

THE NOVOTONE COMPENSATOR

Turns losses into gains.

Puts in bass without boom.

Improves reproduction over the whole musical scale.

Gives realism from records.

Write now for the 8-Page explanatory Booklet "W.N."

See the Diagram Illustrating the effect of the Gambrell Novotone on electrically reproduced records.

GAMBRELL RADIO LTD.,

6, Buckingham Street, Strand, London, W.C.2.

Telephone: Temple Bar 3313."
VARLEY ALL-ELECTRIC RECEIVERS

We can tell you—of the Varley all-electric receivers—that each is remarkably selective; that reproduction is excellent; that they will operate a moving coil speaker—that they are free from mains hum; that they are equipped with gramophone attachment and have many other outstanding features.

We can tell you that the VARLEY model shown here has been tested in 12 different parts of the country, and that in each, 10 to 20 different stations were received; that Brookman's Park can be cut out at seven miles from that station.

Far rather that you should hear it, see it, test it yourself. Then you, too, will acknowledge these points. You will appreciate its attractive design and appearance—its VARLEY quality. Your dealer will demonstrate it to you.

VARLEY Upright Electric Radio Gramophones.
A.C. Model - 39 Guineas.
D.C. Model - 39 Guineas.
Marconi Royalty extra each 25f.

VARLEY All-Electric Console Radio Gramophones.
A.C. Model - 65 Guineas.
D.C. Model - 65 Guineas.
Marconi Royalty extra each 40f.

Advertisements for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
### M.P.A. COMPONENTS

#### BEST IN RADIO!

**MADE TO A STANDARD THAT SETS A STANDARD!**

### M.P.A. ELIMINATORS

Wired research and experience are behind these new components. Every Eliminator is tested to over 1,000 volts A.C. for breakdown, and complies in every way with I.E.E. regulations.

**UNIVERSAL MODEL A.C.** For input voltages from 200-450 volts. Supplies H.T. in 2 Tappings from 200/50 volts, output at 200 volts 50 mA. L.T. (A.C. 1 to 3 volts), Grid bias in 20 one-volt steps. Price £12. 10. 0.

**GENERAL PURPOSE MODEL A.C.** For input voltages from 300-500 volts. Supplies H.T. in 2 Tappings from 300/70 volts, output at 300 volts 50 mA L.T. for ordinary (U.C.) valves variable 2/6 volts, and Grid Bias, 20 one-volt steps. Price £16. 16. 0.

**POWER MODEL A.C.** For Public Address Systems and Power Amplifiers. For input voltages from 200-450 volts. Supplies H.T. 500 volts and 600 volts at 600 volts. Output at 600 volts 100 mA. Attached to output 45 mA L.T. (A.C.) valves in 4 volt steps and Grid Bias in 20 500-volt steps and one variable supply to 400 volts. Price £23. 0. 0.

Power Smoothing Choke (Type SM 500) EXCEPTIONAL EFFICIENCY! FIRST-CLASS WORKMANSHIP! Carrying capacity 500 milliamperes, suitable for smoothing in power amplifiers. Tested to over 1,000 volts for breakdown. Complied in all respects with I.E.E. regulations. Price 60/-.

### M.P.A. CHOKEU

L.F. Maximum inductance at full load. No increase in temperature. Comply with I.E.E. Regulations. Tested to over 1,000 volts A.C. for breakdown.

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<td>20 Henrys</td>
<td>120 mA</td>
</tr>
<tr>
<td>50 Henrys</td>
<td>50 mA</td>
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<tr>
<td>100 Henrys</td>
<td>55 mA</td>
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<tr>
<td><strong>B</strong> Series</td>
<td></td>
</tr>
<tr>
<td>30 Henrys</td>
<td>28 mA</td>
</tr>
<tr>
<td>60 Henrys</td>
<td>12 mA</td>
</tr>
</tbody>
</table>

### M.P.A. MAINS TRANSFORMERS

High Efficiency with first-class workmanship. Tested to over 1,000 volts A.C. per 1000 volts. Comply with I.E.E. Regulations to exact specifications. All secondary connections are made to the correct secondary circuit for each transformer.

<table>
<thead>
<tr>
<th><strong>Model</strong></th>
<th><strong>Price</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>AMT 50—Primary tapped for all A.C. voltages.</td>
<td>£10. 0. 0.</td>
</tr>
<tr>
<td>AMT 100—Primary tapped for all A.C. voltages.</td>
<td>£15. 10. 0.</td>
</tr>
<tr>
<td>AMT 200—Primary tapped for all A.C. voltages.</td>
<td>£25. 0. 0.</td>
</tr>
</tbody>
</table>

### M.P.A. CHANGE OVER SWITCHES

SILVER-GOLD ALLOY CONTACTS. HIGH CLASS PRECISION WORKMANSHIP. Rotary cam switches of very low capacity. Positive lock in each position. High quality.

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th><strong>Description</strong></th>
<th><strong>Price</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>3-pole 2-way switch with additional adjustable pair of contacts.</td>
<td>£8. 0. 0.</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>3-pole 2-way switch.</td>
<td>£9. 0. 0.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>3-pole 2-way switch.</td>
<td>£6. 0. 0.</td>
</tr>
</tbody>
</table>

### M.P.A. POTENTIAL DIVIDER


**M.P.A. products above £5 can be purchased on easy deferred terms. Ask your dealer to-day.**

**M.P.A. Wireless. Ltd., Dept. 2, Radio Works, High Road, Chiswick, W.4.**

### A guaranteed L.F. TRANSFORMER

For 15/- you can buy a guaranteed transformer of first-class design—a transformer that is used in some of the finest Cinema and public address equipments in the world. The Windings are so designed that screening is quite unnecessary and breakdown impossible under normal conditions. The core is of ample cross sectional area and has a very high saturation point. Put one in your set and note the improvement in quality.

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SEND FOR FULL PARTICULARS

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DROY BATTERIES
PERTRIX LIMITED. BRITANNIA HOUSE SHAFTESBURY AVENUE, LONDON W.C.2. FACTORY - BRITANNIA WORKS, REDDITCH, WORCS.

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40 WATT Model
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Power Supply Units our Speciality.

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

M-L MAGNETO SYND. Ltd., Radio Dept.,
Telephone: 5001.

COVENTRY.

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THE BEST LOUD SPEAKER.

The golden tone of the new model is imparted by the wonderful tuned gongs. Amazing purity and volume.

COME AND HEAR IT!
Demonstrations Daily.

7 Days' Approval against cash.

The DONOTONE (Regd.) LOUD SPEAKER
(Dept. C),
TELEPHONE: HOLBORN 0233.

From 5 Gns.

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Great 20-passenger Air Liners rely on Marconi Valves for navigation messages


Imperial Airways' machines use Marconi Valves. Croydon Control Tower uses them. For their reliability. For their long range. Your radio set would be better for them. Give you greater volume, clearer tone, longer service. Cost not a penny more. Fit any set.

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The first and greatest name in wireless

Write for an interesting valve catalogue to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.8
DUBILIER
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DURABILITY

DUBILIER
MANSBRIDGE
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PAPER CONDENSERS

0.1 to 1 each 2/- 1/3 to 0.5 each 2 3/4
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Prices of higher values on application.

MICA CONDENSER
Type 620

0000 to 0009 ... 2/6
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Intermediate Capacities at proportionate prices.

You cannot afford to use any but the best Condenser in an eliminator circuit.

HELSBY CONDENSERS

are made and guaranteed by a firm with 30 years' experience in condenser making, from small telephone and radio condensers to Power Condensers weighing upwards of 2 tons.

Guaranteed working voltages:

Type M — 150 volts D.C.
Type 3A — 450 volts D.C.
Type 4A — 600 volts D.C.

All Helsby Condensers are vacuum dried and impregnated with a special non-hygroscopic material which renders them moisture proof.

If unobtainable from your dealer, write to us giving his name and address.

BRITISH INSULATED CABLES LTD
PRESCOT - LANCs.
Makers of PRESCOT and HELSBY cables

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
A NEW Loud Speaker principle—
gives amazing results!

THE instant success of the new Brown Duplex Loud Speakers which give such amazingly clear reproduction, is entirely due to the new Brown "Vee" Reed combined with the extraordinary Brown Duplex Diaphragm. Only in Brown Duplex Loud Speakers are these revolutionary features to be found. They are the patented invention of Mr. S. G. Brown, F.R.S., who is known throughout the world as the maker of the first Wireless Loud Speaker.

The Brown Receiver, illustrated here, is highly recommended for use with any of the Brown Duplex Loud Speakers. It is made in two models—for A.C. or D.C. mains* or battery operation—and gives truly wonderful results. Anyone can operate it, and get as many as 41 home and foreign stations in an hour. No coil changing is necessary—the Brown Dual-wave Coils cover all wavelengths. No better combination than the Brown Receiver and a Duplex Loud Speaker can be bought at any price. Ask your dealer to let you hear for yourself.

In case of D.C. Mains where humming is prevalent, a special Smoothing Filter can be provided.

FREE!

Write for FREE illustrated Folders, to Dept. 'D', S. G. BROWN Ltd., Weston Avenue, North Acton, London, W.3.
WHAT MORE COULD YOU WANT
IN A GOOD WIRELESS BATTERY?
The TUDOR battery has everything a good wireless battery ought to have—charge indicators, for convenience and safety—thick plates and wood separators, for long life and robustness—non-corrosive terminals with vaseline chambers—clear glass containers—big ebonite filling plugs—and now an all-metal carrier! Yet with all these advantages Tudor batteries cost only very slightly more. Ask your local dealer to show you one and examine these detail refinements, including the ingenious indicators which tell you how much current you have left and when recharging becomes necessary.

<table>
<thead>
<tr>
<th>10 Volt HIGH TENSION UNITS.</th>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 H.T. 1</td>
<td>2,750 Milliamps</td>
<td>6/9</td>
</tr>
<tr>
<td>5 H.T. 2</td>
<td>5,500</td>
<td>10/-</td>
</tr>
<tr>
<td>5 H.T. 4</td>
<td>12,500</td>
<td>17/6</td>
</tr>
</tbody>
</table>

COUPON.
Please send me full particulars of Tudor Wireless Accumulators.
Name
Address
Tudor Accumulator Co., Ltd.
1, Norfolk Street, Strand, W.C.2.

“Inundated with Letters and Enquiries!”
The Result of advertising in “The Wireless World.”

“The Wireless World,”
Dorset House,
Tudor Street, E.C.4.

6th November, 1929

Dear Sirs,

As you are aware, on the 9th of October we inserted a full-page advertisement in your paper describing our L.F. Coupler, which was followed a week later by a similar advertisement giving a wiring diagram showing the incorporation of the same in a combined Radio-Gramophone.

It has occurred to us that it may be of interest to you to know that we have since been simply inundated with letters and enquiries from all over the Country. It is no exaggeration to say that our whole activities have been concentrated upon dealing with the ceaseless procession of callers and letters sent to us since the advertisements appeared. Even at this date, we have a number of enquiries on hand which require attention.

We feel we cannot speak too highly of this achievement, and commend your paper as a valuable medium for obtaining the interest of the Wireless public.

Yours faithfully,
GRAMO-RADIO AMPLIFIERS, LTD.,
(Signed) GORDON R. WARD, Managing Director.

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

A GOOD Filament WITH
"TENACIOUS COATING"
Reproduction from an untouched microphotograph showing the coating typical of all OSRAM VALVES. Notice the absolute evenness of the coating. There are no gaps, the coating clings, so that the full benefit of the coating is maintained. The secret is the startling discovery of the scientific process of "TENACIOUS COATING."

WRITE for booklet "OSRAM WIRELESS GUIDE" (1929 edition) giving full particulars of the full range of OSRAM VALVES with the "TENACIOUS COATING." Also helpful wireless information of importance to every listener. Sent post free.

A BAD Filament WITHOUT
"TENACIOUS COATING"
This reproduction shows part of the filament of a badly coated valve before use, showing a serious gap in the coating. A gap such as this starts the valve off in its life with a poor performance. The valve then prematurely fails.

Osram Valves with the
"TENACIOUS COATING"
MADE IN ENGLAND SOLD BY ALL WIRELESS DEALERS.
Only Five Weeks and Christmas:

Have you realised that within the next two weeks you will be called upon to make a decision as to what music you will have for Christmas? Whether it is for your Club or your Home, you will require some instrument to entertain your friends, and why not make it a Radiogramophone and be up-to-date?

The R.G.D. Radiogramophone.

An entirely new six-valve instrument giving the highest possible quality for both radio and record, with ample volume, incorporating the latest design of moving coil speaker, operates entirely from electric mains, A.C. any voltage, or D.C. 200 volts or over.

£75 in Oak. £80 Mahogany.

Place your order now to ensure delivery, to avoid disappointment.

Literature on application to
The Radiogramophone Development
St. Peter's Place, Co.
Broad Street,
BIRMINGHAM.
PHILIPS BATTERY ELIMINATORS
H.T. UNITS

Type 3002
Offers 6 optional anode voltages. Output approximately 22mA at 150 volts.
£5-10-0

Type 3005
For D.C. Mains.
£3-17-6

Type 3009
Offers 4 optional anode voltages, one fixed and two adjustable grid bias voltages. Output approximately 22mA at 150 volts.
£5-15-0

PHILIPS BATTERY ELIMINATORS
H.T. UNITS

PHILIPS RADIO, 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.
STANDARDS

G.M.T. and T.C.C.

G.M.T. stands for Greenwich Mean Time and is the standard by which we gauge the varying times throughout the world.

T.C.C. means Telegraph Condenser Company and stands for the makers of the condenser which has long been recognised as the standard for all condensers.

As Greenwich gives us standard time, so does the T.C.C. factory at Acton give us the standard condenser.

Be certain of "Greenwich Accuracy" in your condensers by using only "the condenser in the green case"—T.C.C.

The condenser illustrated above is a .0003 mfd. Flat Type Mica Condenser. Price 1/3d. Other values in this type from .0001 to .01 mfd. Prices 1/3d. to 2/6d.

The REES-MACE GNOME SCREENED GRID FOUR VALVE PORTABLE

The smallest efficient portable in the world, the Rees-Mace "Gnome" is light enough to be carried without being burdensome. It gives razor-edge selectivity and a choice of 20 to 30 broadcasting programmes with vital, full-fledged tone, cutting out Brookman's Park completely and with ease. Nothing has been sacrificed to give such compactness—standard batteries and valves are used.

Price 19 GUINEAS

The REES-MACE TOURIST SEVEN

A seven-valve superheterodyne in a suitcase, ensuring extreme selectivity and very great range. Four or seven valves can be used as required. In brown or blue hide. Price 39 Guineas

Write for full details of all Rees-Mace Models.

REES-MACE MANUFACTURING CO. LTD.
39A, Welbeck Street, London, W.1
(Phone: Mayfair 3758.)

AND AT PARIS, THE HAGUE AND NEW YORK

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THE LATEST SCIENTIFIC DEVELOPMENT IN L·F·TRANSFORMERS is the new HI-FU LIX GECOPHONE L·F·TRANSFORMER

A perfect amplification curve from 50 to 6,000 cycles

WITH THE BIGGEST STAGE GAIN CONSISTENT WITH HIGH QUALITY REPRODUCTION

THE TRANSFORMER USED BY LEADING PORTABLE MANUFACTURERS

PRICE 20¢


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FAST AND SLOW MOTION CONTROL for Tuning and Reaction.

You will find a wonderful difference in the way you can pull in stations which are separated by only a metre or two, when you employ "Polar" Fast and Slow motion condensers.

Polar Condensers make just that difference in selectivity that adds a few more stations to your list of those "worth hearing"; and they also improve the quality of reception by giving you "dead on" tuning.

FOR TUNING
Place the Polar "IDeAL" behind your panel.

FOR REACTION
Place the Polar "Q.J." behind your panel.

Obtainable from all Dealers. New Polar Catalogue Free on request.

POLAR "Q.J."
-00025 - - 10/6
-00015 - - 10/3
-0001 - - 10/-

Supplied with Knob and Dial to match the "Ideal," if desired. No extra cost.

WINGROVE & ROGERS LTD.
188-189, STRAND, LONDON, W.C.2.

THE "PIXIE"

This wonderful 5-Valve Receiver is the latest challenge to the Portable World. It is the smallest and lightest 5-Valve Receiver ever marketed, and has the same beautiful finish that characterised the "Metropolis" Set which received such unstinted admiration at the Olympia and Manchester Radio Shows.

The circuit employs the first time the new Patented (No. 303256) system of Screened Reaction, which allows excellent selectivity to be obtained with only one tuning dial. Handsome Lebakite Panel and Loudspeaker Grille, unspillable Accumulator and 10 volt H.T. Battery. The case is covered in dark red morocco grained leather cloth. Send for full particulars.

PRICE 14 GNS.
or 50/- down and 25/- per month.

EMPIRE ELECTRIC CO.,
10, FITZROY SQUARE,
Telephone: MUSEUM 1098.
LONDON, W.1.

THE "METROPOLIS"

This famous Receiver is the only Superhet Portable in the world. The circuit employs five valves, two screened grids, two triodes and a pentode, and is the most selective set it is possible to make. It is consequently ideal for those living near a High Power Station. The range is enormous, and the Celestion Speaker gives a beautiful mellow tone.

The set is contained in a handsome real leather case, 13 x 12 x 8 ins., and its complete weight is only 22 lbs.

"Metropolis" brings the whole world to your home and is an unending source of entertainment. Let us give you a demonstration in your house of its wonderful capabilities.

Send for full particulars.

PRICE 30 GNS.
or £6 down and 50/- per month.

Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention. 816
MAZDA P.625

EFFICIENCY & ECONOMY

TYPE P 625A

MAZDA P625a.
Type P625 A is a super-power valve, and is capable of giving a high power output without distortion. It has been designed for operating cone and moving-coil type loud speakers. The volume obtained with this valve when used in the final L.F. stage is sufficient for most purposes, whilst the quality of reproduction over the whole of the musical range is bound to please all lovers of good music. Those who desire a large volume of sound and better quality of reproduction should fit the valve in the final stage of their receivers.

PRICE 15/-

MAZDA RADIO VALVES

THE EDISON SWAN ELECTRIC CO. LTD.
Head Office Ediswan Radio Division and West-End Showrooms:
1a, NEWMAN STREET, OXFORD STREET, W.1.
Phone: Museum 9801.
SHOWROOMS IN ALL THE PRINCIPAL TOWNS.

If a record's worth playing it's worth playing well!

Use the MORE-MUSIC LESS-WEAR PICK-UP

A record is made electrically—unless it is reproduced electrically a great deal of its beauty may be lost. Use a B.T.H. pick-up with your radio set and hear record music as you've never heard it before.

Pick-up and Tone Arm—Price 45/- complete.

THE EDISON SWAN ELECTRIC CO. LTD.
Head Office Ediswan Radio Division and West-End Showrooms:
1a, NEWMAN STREET, OXFORD STREET, W.1
Phone: Museum 9801.
SHOWROOMS IN ALL THE PRINCIPAL TOWNS
IN THE WIRELESS STATION ON THE CLIFF RECEIVING THE ANXIOUS CALL FROM THE DRIVEN SHIP STANDS THE EXIDE BATTERY

REMEMBER YOU CAN HAVE THIS SELF-SAME BATTERY IN YOUR OWN SET. THIS PRE-EMINENT PARAGON BATTERY OF THE WORLD

Exide

THE LONG LIFE BATTERY

Obtainable from Exide Service Agents and all reputable dealers. Exide Service Agents give service on every make of battery.

EXIDE BATTERIES
(London Sales & Service Depot) 217-239, Shaftesbury Ave., W.C.2

THE reason for the enormous popularity of the Watmel Balanced Armature Unit is that it is so sensitive. At the same time it has a response curve that is remarkably even over the entire range of musical frequencies. Both these qualities are the result of the same feature of design. The armature is suspended between four pole pieces of a powerful permanent magnet. When the signals magnetise the Armature there are at any moment four distinct forces at work tending to turn the Armature about its axis. Because there are these four forces at work simultaneously, the Watmel Unit responds readily even to weak signals, and this saves your battery current. Also, because electric forces rather than springs are relied upon to compensate the Armature movement, there is an almost entire absence of "peak" response, and consequently outstanding purity over all frequencies. You cannot get a finer Speaker Unit, whatever you pay for it.

We shall be glad to send you on request our Folder No. 101, showing you how to make up a very fine Loud Speaker from a Kit of parts, also Folder and blue print for building up a modern 3-Valve Set.

WatMel

WATMEL WIRELESS CO. LTD., Imperial Works, High St., Edgware, Mx.
Telephone: Edware 0323.
All who prefer quality in cigarettes
Say Player's Please

5 for 3d. 10 for 6d.
20 for 11½d.

REAL UTILITY
CONVENIENCE AND EFFICIENCY
Ferranti Anode Feed Units are designed to provide ideal conditions for feeding the valves. Occupying a minimum of space on the baseboard, one neat component takes the place of the many that were previously necessary. Gives results equal to those obtained when a separate battery is used for each valve.

Obtainable in two types, as illustrated. Write for full particulars and folder Wb 415.

FERRANTI ANODE FEED UNITS
FERRANTI LTD. HOLLINWOOD LANCASHIRE
Build the **BULLPHONE**

Screened Grid and Straight "3" Sets for perfect reproduction

Send direct for free Circuits.

**The BULLPHONE**

L.F. POWER TRANSFORMER

10'6

Guaranteed never to burn out.

**BULLPHONE**

4 Pole, Duplex Reed Adjustable Tone CONE UNIT

15' -

Adjustable CONE CHASSIS

Suitable for any Cone Unit,

Per 3' - Pair.

Obtainable from your Local Dealer or direct from

**BULLPHONE LTD.**

38, HOLLYWELL LANE, LONDON, E.C.2

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**The STAR TURN**

Pick out the brightest spot in the programme and then—listen with a Pentovox Three.

Here is realism, vivid and clear. Keen selectivity to cut out everything but the station you want. Rich and mellow reproduction. Ample volume without distortion. Yet the Pentovox Three is most moderately priced. Easy monthly payments if you wish.

**TEN POUNDS**

Including Valves and Royalties

**JUNIOR CONE REPRODUCER**

Brings the best out of any set and costs only 35' -

**SENIOR CONE REPRODUCER**

£5 0 0

**MOVING COIL LOUD SPEAKERS**

A.C. £13 10 0

D.C. £11 0 0

Ask your Wireless Dealer about the comprehensive Bowyer-Lowe range of Sets and Components, or write for illustrated literature.

**BOWYER-LOWE**

In association with Recordophones Ltd.

London Showrooms:
ASTOR HOUSE, ALDWYCH, W.C.2

Head Office and Works:
RADIO WORKS, LETCHWORTH, HERTS.

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Mention of "The Wireless World," when writing to advertisers, will ensure prompt attention.
The latest & best in H.T. Accumulators

This entirely new range of C.A.V. H.T. Accumulators has many unique features to commend them to all radio users. They are supplied in separate 10-volt blocks and assembled 30-volt units, the latter comprising three 10-volt blocks air spaced from each other and assembled in a carrying tray. All-moulded acid proof material so popularly used for car batteries, is employed for the cell containers and trays, the polished surface giving an attractive appearance.

M 103
10 VOLT 6/3 MILL. UNIT AMP. HRS.
Also supplied in 2,900 & 10,200 Millamp Hrs.

Specify the C.A.V. Jelly Acid Battery—The Perfect L.T. for all Portables.

WRITE FOR CATALOGUE TS.

Advertisement for "The Wireless World" are only accepted from firms we believe to be thoroughly reliable.
Braced to a girder-like rigidity—locked top and bottom the elements in the NEW Cossor Screened Grid Valve are immovable—they are proof against even the hardest blow. The Cossor system of Interlocked Construction ensures a degree of strength never before attained in any valve—it ensures that the Cossor Screened Grid Valve will retain its amazing sensitivity and efficiency throughout its exceptionally long life. Use the NEW Cossor Screened Grid in your Receiver—no other valve has Interlocked Construction.

The NEW

Cossor

Screened Grid Valve
GUIDE TO RECEIVERS.

In this issue we publish our fourth annual Buyers' Guide to Receiving Sets of To-day. This annual feature is not only becoming of the utmost value to would-be purchasers of complete sets, but it has the additional advantage that the publication of this information puts our readers au fait with the present tendency in design and indicates very clearly the types of receivers on which manufacturers are concentrating.

It is noticeable from the figures which this year's Buyers' Guide to Sets provides that the popularity of mains-operated receivers is increasing, whilst another point of interest is that the popularity of portable sets amongst manufacturers has about reached its zenith. By this we do not mean that the portable set is by any means a thing of the past, but that manufacturers, rather than develop new portables on the lines of those previously marketed, are designing sets which are self-contained except in so far as they require to be connected to the electric supply mains for operation. The new receiver has the advantage over permanently installed sets that it can be moved from one room to another, and is independent of an aerial.

The sets of to-day serve once more to emphasise the fact that receivers are designed to suit the valves which the valve manufacturers develop, and it would appear that at present, at any rate, it is the valve manufacturers and not the manufacturers of sets who set the pace and control the evolution of the wireless receiver.

TELIVISION: A STATEMENT OVERDUE.

The wireless picture transmissions which the B.B.C. have been conducting over an agreed period of twelve months have now come to an end and, according to our information, the B.B.C. has decided not to continue them because, in their opinion, there is not sufficient evidence of public interest.

Whilst it may be difficult to find a good reason for quarrelling with this point of view, yet we feel strongly that a blunder has been permitted somewhere because to us it seems unfair that a section of the public, however small, should have been induced to invest in the purchase of picture-receiving apparatus only to find, after a comparatively short run, the transmissions which could be picked up in this country on the instrument discontinued. We should, of course, be told that all purchasers of the apparatus were advised that the transmissions conducted by the B.B.C. were only experimental and their continuance could not be guaranteed, but how many people, we wonder, would have been prepared for such a decision as has now been made.

In the broadcasting of television experiments by the B.B.C. such as is now proceeding, we have another instance of questionable policy, but we feel that we should exonerate the B.B.C. from responsibility for both these enterprises, because if our information is correct, they were thrust upon them by the Post Office, because the Post Office was not prepared to grant independent experimental facilities to those concerns which were commercially interested in picture transmission and in television. How long, we wonder, will the B.B.C. television broadcasts continue? Is it not time that we had from some authority a general report and a statement of the number of persons who "look in" to these transmissions? The Television Society, which was formed some time back with the object of furthering the development of the technical side of the subject, might, we think, quite reasonably be regarded as a suitable body to form a committee to investigate the matter, provided this committee was chosen from amongst unbiased and unprejudiced persons.
GREAT progress has been made over the past year than during any other similar period since broadcasting began. Periodically we say that radio receiver design is settling down, that the rate of progress is becoming slower and that there is shortage of new ideas. Then comes perhaps a small contribution to a temporarily standardised practice and a number of changes quickly follow. By way of example, we might quote the effect of the screen-grid valve, which when first introduced made but slow headway in spite of a manufacturing prejudice against the then adopted practice of using the neutralised triode. This journal did much to draw attention to that all-important property of the screen valve, the amount of residual capacity left after the introduction of the screening electrode and its effect upon amplification. It was shown numerically that a far greater degree of amplification could be obtained with the improved types of S.G. valves than by the alternative process of the neutralised triode. Confidence thus gained in the use of the S.G. valve has brought about its almost universal adoption. A moment's thought will reveal that this minor development has proved a starting-off point for a host of modifications in receiver design. Thus one S.G. stage effectively replaces two inefficiently-coupled triodes; two stable H.F. stages of enormous overall amplification is a new introduction, while complete screening, accompanied by all-metal construction throughout, is the recent trend. In fact, to the screen-grid valve can be attributed a drastic change in the appearance, general construction and operation of wireless sets and the performance expected of them. So absorbed are designers in carrying into effect these technical improvements that there is yet little evidence of the new conditions in the ether, occasioned by the regional scheme, having made their mark upon the build of our sets.

Three out of every twenty sets are fitted with anode bend detectors. A slight upward trend in the use of this form of detection is to be noted.

Three Hundred Sets Analysed.

In the following few pages are summarised the general details of design of the receiving sets obtainable to-day. As in other years, percentages have been determined from specifications as they are and not from the knowledge that many of the types will soon be passing to be replaced by more up-to-date models possessing details that would modify the figures. Our census is taken at a time of change, but, nevertheless, the upward and downward tendencies revealed can be accepted as a reliable guide, their significance being actually of greater
Receiving Sets of To-day.—

importance than is indicated. Data has been compiled, as far as is possible, in respect of some 300 sets, with the aid of information courteously furnished by the manufacturers, gleaned from trade lists, and in

Last year reaction was used in eighteen sets out of every twenty. Now reaction is only to be found in fifteen out of every twenty. The use of the capacity method of obtaining reaction is almost universal.

many cases actual scrutiny of the apparatus. Incidentally, the total number of sets is less this year than last, due to the withdrawal of obsolete types, many of which were superheterodynes, a reduction in the range of models, and, it is interesting to note, a slight falling-off in the number of set manufacturers.

We will consider the receivers, item by item, from aerial to loud speaker. While it was confidently believed that as a result of the improving performance and rapid growth of the portable, combined with better and easier H.F. amplification, that the outdoor elevated aerial would disappear, there is, in fact, a slight percentage decrease in sets using entirely frame aerial. Regional conditions with generous signal strength over densely populated areas may modify this trend, and the decline in the use of the frame is probably due to the fall in the number of portables, with which it roughly numerically corresponds. It is probable, however, that the sensitivity-selectivity product for an outdoor aerial is better than for a frame when using a well-designed set embodying both filter and H.F. amplification. Among open aerial sets it is a growing practice to fit a small fixed capacity condenser in the aerial lead. This arrangement permits the use of a single-coil aerial inductance in place of a transformer so that long- and short-waveband switching is simplified and some degree of selectivity achieved, together with an increase of signal voltage at the grid of the first valve. The reduction of aerial capacity provided by the series condenser simplifies ganging.

Whereas a year ago switching for long and short wavelengths was carried out by a variety of methods, it has now become general practice to merely short-circuit a loading coil. Portions of both primary and secondary windings are short-circuited in the case of H.F. transformers, and no longer is the somewhat difficult arrangement of series-parallel switching favoured. No single example has been noted of the use of specially designed low-loss coils, and even in the newer sets fitted with tuned screen-grid stages the inductances are mostly of a type introducing appreciable H.F. resistance. Such resistance is perhaps of small account in view of the other losses present, and these are generally of no greater value than is just required to give stability.

In a few of the up-to-date multi-valve sets, including screen-grid stages, the interstage screening is fairly thorough, but its completeness is obviously determined as a result of experiment, and takes into account convenience of manufacture.

Associated with the H.F. stages, one notes the bold bid made in the recently introduced sets to provide
Receiving Sets of To-day,—
single dial tuning control demanding the ganged working of two or more tuning condensers. Some degree of flatness of tuning, combined with the precise matching of coils and condenser scales before assembly, would seem to be the system by which successful ganging is achieved. Trimming condensers, connected across the tuning condensers, are to be found in several sets, but their purpose can be merely that of bringing the stray parallel capacity up to a required minimum value being that on which the plate shape of the logarithmic scales were calculated. These trimmers do not compensate for lack of uniformity in the condensers themselves or differences in coils; they merely correct for circuit capacity differences. If, however, the coils are precisely matched and no provision is made for "slip ganging," logarithmic scales are not required, it merely being necessary to match the capacities, including stray capacity at all settings of the condensers. Ganging the condensers gives an apparent sharpness of tuning not possessed by the individual stages, but it is possible that the production of a flat-topped resonance has been the aim in some of the sets in order to maintain a sufficient degree of selectivity without cutting down the sidebands, a necessary requirement for quality reception. Filters have not yet found their way into receivers of this class.

Aperiodic H.F. amplifiers are still to be found, but only in the older surviving portables. It cannot be denied that sets embodying two aperiodic stages have entirely satisfactory range-getting properties, but the amplification is essentially the result of a happy state of reaction control which this arrangement affords. The decline in the use of two aperiodic stages is marked, and is due partly to a preference for the single S.G. tuned amplifier and also to a decline on a percentage basis in the number of portables.

This latter observation is indicative of trend towards the replacing of the battery-operated portable by the all-mains set. Portables have appealed because they are self-contained, a feature so much sought after that it has dominated all other considerations of maintenance or performance. This feature is shared by the mains-operated receiver, and is combined with freedom from battery troubles and expense, while permitting of the use of valves of high performance and unrestricted as regards anode potentials and current. Thus there is an obvious prediction which an indication already confirms.

**Fewer Sets with Reaction.**

From the figures showing forms of detection one cannot overlook an increase in the use of anode bend detection, even though the advance is only small. Better H.F. amplifiers are largely responsible for the change, while the increased production of quality sets using perhaps a resistance-coupled L.F. stage has partly contributed. Regional conditions may further help the figure for anode-bend detection to advance, though the leaky grid method has many points in its favour, and will not fall back to any marked extent.

A slight decline in the manufacture of both two- and three-valve sets is evident by an increase in the number of receivers of four valves. There are contributory clauses which have combined to account for this change.

Reaction is to be found in 75 per cent. of the sets. This high figure is accounted for by the fact that it is provided in all two- and three-valve portable sets. Here, again, can be seen the modifying effect of better H.F. amplification, in that this year's analysis reveals a very definite downward tendency in the use of reaction. It is, moreover, safe to forecast a rapid decline in the use of reaction under regional scheme conditions.

Little or no novelty has found its way into the L.F. amplifier, neither have the figures representing the types of intervalve couplings greatly changed. Increases in the use of anode bend detection and the production of expensive radio-gramophones might suggest a rise in favour of resistance coupling. On the other hand, the pentode valve has reduced the number of L.F. stages, while the input coupling is invariably a transformer. Although large sets are on the increase push-pull amplifiers have not grown in numbers. Parallel-connected output valves are included in the specifications of generous output amplifiers, and there are several examples of the use of pentodes in this way.
A modern receiver dissected to reveal present-day practice.
Receiving Sets of To-day.—
After more than a year of popular interest in the electrical reproduction of gramophone records we find but a small increase in the percentage number of sets in which provision is made for the use of a gramophone pick-up. The figure given increases mainly to the newly created radio-gramophones. Omission of the provision for use of a gramophone pick-up does, however, undoubtedly mar the selling potentialities of sets.

Mains-operated sets are but few in number, yet their rapid growth indicates that they will become as popular as the portable which they are the tendency to replace. Their circuit systems have been dealt with in the preceding analysis. Unlike the portable, where the design is a random process of trial and error, and where all the established theoretical considerations are seemingly contravened, the mains set rigidly embodies in every detail all the best and most advanced principles. Sets for D.C. supply represent a small portion only of the total number of mains sets, and there is no evidence that the manufacturers intend to give much attention to this class of receiver. The requirements of the listener with D.C. supply are met by using a battery set with L.T. accumulator and D.C. eliminator and cells for grid biasing. Both indirectly and directly heated A.C. valves are to be found in the A.C. sets, one of the reasons given for the use of the directly heated valves being the easy conversion to battery working. Grid biasing is obtained in the majority of A.C. sets by a voltage dropped across a resistance carrying the anode current, the circuit becoming complicated by the earthing of the spindles of the tuning condensers. It is due to grid biasing problems that directly heated (battery) valves are used in the output stages of the A.C. models, a separate winding being provided for the purpose on the mains transformer. There is a wider range of battery than indirectly heated valves suitable for the output and these valves operate without hum when heated with A.C.

There is an appreciable increase in the inclusion of generous output stages, this having come about by the need for good quality and large undistorted A.C. output with loud speakers of the moving-coil type.

Sets of to-day are less like an assembly of well-known components than in preceding years. If progress were to become less rapid, then the enthusiast would soon find himself in the position of being able to procure a set as good, and probably cheaper, than he could build. Marked changes are, however, taking place now as hitherto, centring chiefly around the application of valve development. A fact that must not be overlooked is that every set is, with perhaps one exception, British built. While this position is, of course, mainly due to the foresight of the manufacturers in the matter of the administration of patents, it could not have been maintained with inferior gear.

Visiting a Power Station.
Condenser manufacturer was dealt with in an interesting way by Mr. Haywood, of the Duddell Co., in a lecture before the Alma (Hornsey) Radio Society at a recent meeting. On October 25th members paid a visit to the local power station, which is being entirely rebuilt. Under the guidance of the engineers the party obtained a clear insight into the latest practice in electrical power distribution. Attractive items in the early future include a visit to the local telephone exchange and a lecture by a representative of the Mullard Company.
Hon. Secretary, Mr. A. J. Hopkins, 41, Tufalgar Rd., W. 11.

A Mystery Debate.
The Incorporated Radio Society of Great Britain announces that the proceedings at the meeting will be held at the Institution of Electrical Engineers, Savoy Place, W.C.1, at 6.30 p.m.

From Battery to Mains.
All Main Receivers are of special interest at the present time, was the subject of a lecture given before the London Wireless Society on November 6th by the Society's Technical Officer, Mr. J. Burns. Additional interest was given to this lecture because Mr. Burns treated his subject from the point of view of the listeners. Three weeks previously the society had listened to a lecture on the same subject by a representative of a firm producing these all-electric receivers commercially, using equipment for two years with this class of equipment. At the conclusion of his talk, the lecturer was able to draw upon a useful fund of practical experience which proved very interesting. Many members who are now making a change from battery to mains heard him.
Hon. Secretary, Mr. W. Rodenmold, 19, Bruce Grove, N.17.

The "Hit and Miss" Method.
The story of how it was considered wonderful to plug a bell across the width of a room by wire is well known. A. E. W. Myles, in delivering the Presidential address on "The Progress of Radio" at the meeting of the Radio Ex-

FORTHCOMING EVENTS.

WEDNESDAY, NOVEMBER 20th.
day and District Radio Society.—At 8 p.m., at 15, Royal Crescent, Leck.—Speaker, Major.-
Society.—At 8 p.m., at Tollington Park, Thurs-—Speaker, Major.-
Queen's Park Radio Society.—At 7 p.m., at the Oldfield, Hendon, Hendon Road, Paddington. Speaker by W. J. Jones.

THURSDAY, NOVEMBER 21st.
three and District Radio Society.—Visit to—At the Parochial Hall, Brookfield Road, Edginton, with Harry E. Wilson.

FRIDAY, NOVEMBER 22nd.
Radio Society.—At 8 p.m., at Mount House Hall, George Street, Reading. Speaker, A. M. Morgan. (Measures, S. G. Brooks, Ltd.)

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CLUB NEWS.

WINDSOR, NOVEMBER 28th.
"Radio and District Society. — At 8 p.m., at 15, Royal Crescent, Leek.-Speaker, Major.-
Society. — At 8 p.m., at Tollington Park, Thurs-—Speaker, Major.-
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In a Valve Factory.
Secrets of valve manufacture were disclosed by Mr. Clarke, of the Mullard Wireless Service Co., at a meeting of the Bath and District Radio Society on November 1st. The interest aroused by this constructive lecture was increased by the unlimited discussion which followed.
Meetings are held every Tuesday and Friday at 8 p.m. at the Bath, Green's, No. 11, Bath gardens, at the Australian Men's Evening Insti-ute, Lutheaven, Balmoral, W.S.11. Hon. Secretary, Mr. H. E. Riddell, 27, Stormont Road, W.S.11.

The "Hit and Miss" Method.

The story of how it was considered wonderful to plug a bell across the width of a room by wire is well known. A. E. W. Myles, in delivering the Presidential address on "The Progress of Radio" at the meeting of the Radio Ex-
When the learner at Heston Aerodrome is up in the air alone, relying for the first time on his own skill and coolheadness, he is sometimes faced with a sudden yearning for human society. He places a new valuation on the services of his former companion, the instructor.

For many flying hours before he ventures out solo he is kept on leading strings. The machine used is of the Moth or Avian class of light aeroplane, the instructor occupying the front seat and the pupil the rear seat usually occupied by the pilot. Conversation between the two is carried out by means of a voice pipe system which consists of two speaking tubes, one from pilot to pupil, and the other from pupil to pilot, with a suitable by-pass connection at a point in its length whereby pilot or pupil can hear his own speech without impairing the hearing of the other. After the pupil has done the required amount of dual training and he is considered sufficiently far advanced to fly by himself he is allowed to take up the machine on his own, and it is at this point that wireless equipment is particularly useful. All previous instruction having been given by means of the voice pipe, the psychological effect on the pupil can be appreciated if, when on his solo flight, he is still enabled to receive necessary instructions in the familiar 'voice of his instructor should he show signs of nervousness or lack of control of the machine. Aerial tuition at Heston is now being carried out with the aid of the G.A.6 light aircraft receiver, manufactured by Messrs. Alfred Graham. By means of the voice pipe attachment the output speech from this receiver is applied to the part of the voice pipe containing the by-pass tube, thus enabling the pupil to listen to the wireless reports or instructions without having to wear headphones.

The receiver operates from small aerials fixed between wing tips and tail in such a way that folding of the wings is not interfered with. Current is supplied from a small container holding the H.T. battery and an unspillable accumulator, connection to the set being made through armoured cable.

In the case of a fully qualified pilot this receiver is
Flying Lessons by Wireless.—
particularly useful for receiving meteorological reports. The voice pipe arrangement enables both pilot and passenger to converse together and also to hear wireless reports.

The total weight of the complete outfit is about 18 lb., and the aerial system does not detract from the manoeuvrability or aerobic performances of the machine.

With regard to the ground station used in conjunction with this receiver that fitted at Heston is the 1 kW. intermediate air-port transmitter manufactured by Messrs. Alfred Graham and Co., Ltd. This outfit consists of a transmitter working on 764 metres, the wavelength which has been sanctioned by the Air Ministry for light aircraft training and meteorological transmissions. The transmitter provides either C.W., I.C.W. or phone, telephony being normally used for communication with the machine.

The transmitter is situated in the control tower of the aerodrome, and when A.C. mains are available the entire outfit is run direct from the supply; thus there is no running machinery and no noise. As Heston Aerodrome is at present on a D.C. supply it has been necessary to use a rotary converter. The auxiliary apparatus in addition to the main transmitter consists of a receiver covering all wavelengths from 200-2000 metres, a heterodyne oscillator for use in the reception of C.W., and a speech amplifier unit which provides the modulation voltage from a standard Amplion microphone.

The aerial system consists of twin lengths of phosphor-bronze wire at a height of about 55 feet, one end being supported on a steel lattice spar and the other on a mast on top of the control tower.

With this arrangement it is possible to take a microphone on the roof of the control tower, from where a view of the entire aerodrome may be obtained and instruction be given for all positions of the machine. It is also possible to obtain a view of other machines taking off and landing, so that any necessary warnings may be given.

As an example of the value of the aircraft receiver for meteorological purposes, the experience of a flying visitor to the recent Newcastle-on-Tyne Air Pageant is worth quoting.

On the Sunday morning after the pageant it was desired to start the return journey to Heston Aerodrome, but the weather at Newcastle was impossible owing to a thick fog, rain and drifting smoke. While waiting, however, to see if the weather would clear Croydon was tuned-in on the receiver while sending a message to a machine on the cross-Channel service, indicating that although weather round Newcastle was bad, at a few miles to the south there was little or no fog, with quite good flying conditions. Backed up by this news the pilot took off from Newcastle, and made a perfectly good return journey to Heston.

Swiss Amateur Union.
A section of the International Amateur Radio Union has now been formed in Switzerland, under the presidency of M. H. Degler (HB9D), of the Radio Club of Zurich. The Hon. secretary is M. W. Schneebberger (HB9C), whose station is at Flurereuttes 20, Lausanne, and the traffic manager is M. Wurst (HB9E), also of Lausanne. Address communications to the U.S.K.A., Postfach, Zurich.

R.S.G.B. Calibration Service.
Readers are reminded that calibration signals are transmitted on the second and fourth Sundays of each month, from Mr. G. W. Thomas' station, G5YK, at Cambridge, beginning at 10.00 G.M.T., with the call "RSGB H5SBR DR G5YK." followed by a two-minute dash on 7050 kc. (42.55 metres). At 10.05 G.M.T. the call is repeated and is followed by a similar long dash on 7250 kc. (41.39 metres). The calibration transmission is preceded at 09.55 by the letter X, in Morse, and a telephonic announcement that the service is about to begin, followed by a further announcement of the actual measured frequency of the two transmissions.

TRANSMITTERS' NOTES
Reports Welcomed.
Mr. J. J. Armstrong, 109, Rupert Street, Bolton, Lancs,transmits on 169 metres, his station G5XN, at midnight on Saturdays and 11 p.m. on Sundays, and on 42 and 21 metres between 8 p.m. and 10 p.m. during the week. Mr. Armstrong will be glad if anyone hearing these signals will kindly send him reports.

New Zealand Stations.
The following list supplements and corrections that published in the "Radio Amateur Call Book" for September :-

Auckland District.
ZLAA S. G. Waite, 34, Marlborough St., Dominion Rd., Auckland.
ZLAA G. J. Spraw, 14, Stanley St., Hamilton.
ZLAF J. J. Lynch, Napier.
ZLAFK K. H. Hooper, 38, Rosneta Road, Hamilton.
ZLAFI A. F. Wood, F.W. Station, Waikato.
Wellington District.
ZLAX R. V. Roberts, 39, Scarborough Terrace, Wellington.
ZLAXD S. E. Brown, 32, Owen St., Wellington.
ZLAXE H. H. Boyle, Gumtree Steamship Co., Ltd., G.P.O. Box 186, Wellington.

ZL1BC J. T. Perry, 80, Tiber St., Wellington.
Cantebury District, Wellington.
ZL1BD C. R. Taylor, 226, Papamoa Rd., Christchurch.
ZL1BDf 1. H. Backhouse, Jrn., 38, Office Rd., Merivale.
ZL1CD T. W. Smith, 58, Derby St., St. Albans.
ZL1AA0 J. Stone, 34, Grove St., Duseid.
ZL1BM V. G. Whitman, Pyewong Point Light-house, Otahuhu.

New Call-Signs and Changes of Address.
G15BD W. S. Davison, 42, Eginton St., Portrush, Co. Antrim. (Change of address).
G6TY J. Fyson, 41, The Broadway, Woodford Green, Essex. (Change of address).

France.
FREX J. Denosil, 20, rue des Bouches, Cambrai.
FRFP P. Hore, 17, rue Jean-Jacques, Boulogne.
FPEF E. Petin, 172, Boul. Fessele, Paris 17. (Change of address).
FSLN M. Ross, Villa Portale, 4, Diean. (Change of address).

Samoa.
PK4BO J. H. A. van Buijten, c/o. Adn. de Doll.
Mij. Median.

Madagascar.
FBSHEL (Tananarive) is cancelled.

--- End ---
VEST POCKET WIRELESS.
From Detroit comes the report that a pocket wireless set has been tested and found practicable for regular use by the police. The set contains two valves, measures six inches by four inches, and is narrow enough to fit into a vest pocket. The aerial consists of a network of 175 ft. of fine wire sewn into the back of the vest.

Tests are stated to have given clearly audible signals at a distance of seven miles from the Detroit police transmitter, KOP.

DISCRIMINATING CRIMINALS.
Thieves who stole £80 worth of wireless goods from a Manchester shop last week had the choice of a wide range of sets, but selected only the latest models.

ESTEDDFOD WIRELESS.
A reader writes to correct the statement in a recent issue that the wireless competition at next year's National Eisteddfod will be the first in the history of this event. A prize of £50,000 was offered for a home-constructed wireless receiver in the Eisteddfod of 1925, though unfortunately there was only one entry!

THE MONOPHONE.
Maj.-Gen. G. O. Squier, late of the U.S. Army, and famous for his inventions connected with "wired wireless," has won a decision at the U.S. Patent Office giving him priority in the invention of the "monophone." Using the ordinary telephone system, but not interfering with its normal functioning, the "monophone" provides subscribers with broadcast programmes on a frequency band "entirely above and out of the way of the band used by wired radio on power lines for broadcasting service."

Gen. Squier's claim is so broad that it is held to cover even "talking movies" in the house through a completely screened circuit with zero noise level, due to the lead sheathing of the telephone cable.

ANOTHER HEAVIside LAYER?
A woman applicant at Willesden Police Court recently complained that her neighbour's aerial was of the wrong wavelength, upsetting her washing and making it as black as soot.

THE WIRELESS LEAGUE.
Members of the Wireless League are cordially invited to attend the Annual General Meeting which will be held at the Royal Automobile Club, Pall Mall, S.W., on Friday, December 6th, at 3 o'clock. Sir Arthur Stanley will be in the chair.

BEAM BROADCAST TO CANADA.
The Marconi-Mathieu multiplex beam service from Bodmin, operating at 16-575 metres, was used for relaying the broadcast of the Cenotaph service on Armistice Day to listeners in Canada, who heard the transmission from the broadcasting stations of the Canadian National Railways. On a previous occasion, when the beam station relayed the Thanksgiving Service in Westminster Abbey, Canadian listeners reported that the quality was equal to that of a first-class local broadcast.

A BOOK OF VALVES.
To the student of modern valve design one of the most interesting publications of the moment is the new Osram Valve Catalogue issued by the General Electric Co. Ltd., Magnet House, Kingsway, W.C.2. In seventy-nine pages the whole range of Osram receiving valves is dealt with, each valve being illustrated and described. Characteristic curves and full working data are given in each case.

ONE UNDER THE EIGHT.
There are 21,629,107 radio receiving sets in the world, according to the precise estimate of the Electrical Equipment Division of the U.S. Department of Commerce. The authors of this delicate computation state that there is one receiving set for every 124 persons in the United States, one for every 53 in Europe, and one for every 86 in the world.

CLUB SECRETARIES, PLEASE NOTE.
For the benefit of radio societies and schools, the Marconiphone Company has prepared three interesting lectures, each illustrated by lantern slides, which are suitable for delivery by a society member. The subjects dealt with are: (a) Screen-grid valves and circuits; (b) A.C. valves and circuits; and (c) public speech and music amplifiers.

Particulars can be obtained from the Marconiphone Co. Ltd, Department I.D., 210-212, Tottenham Court Road, London, W.I.

FLYING LESSONS BY WIRELESS. The transmitter installed at Heston Aerodrome by Messrs. Alfred Graham for use in instructing solo fliers. The above photograph taken in the control tower, shows the transmitter on the right. The smaller panel on the left contains the receiver, heterodyne unit and speech amplifier.
### BUYERS’ GUIDE, 1929-30.


<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Name of Set</th>
<th>Valves and Couplings</th>
<th>Current Supply</th>
<th>Price</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Adley Radio, Ltd., 90, Mortimer Street, London, W.1</td>
<td>Adley One (P)</td>
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<td>PS</td>
<td>15</td>
<td>Inclusive, Frame aerial incorporated, 17 lb.</td>
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<td>Three (P)</td>
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<td>Oak or mah. Lacquer (2.10s. extra, 15 lb.)</td>
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<td>Four (P)</td>
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<td>Inclusive mah. or walnut. 17 lb.</td>
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<td>16 x 12 x 5 in., 57 lb.</td>
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<td>16 x 15 x 8 in., 58 lb.</td>
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<td>A.C. Mains Radio-Grano (AG).</td>
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<td>Suitcase 5 (P)</td>
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<td>Screened Grid 4 (P)</td>
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<td>Transportable 3 (P)</td>
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<td>Battery Driven Radio-Grano (AG).</td>
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<td>C. C. Bowyer-Lowe, 55a, High Street, Bedford.</td>
<td>Two Valve Mains “A.C.”</td>
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<td>Null Secundus Rover, S.G.4 (P)</td>
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<td>Null Secundus Universal Four (P)</td>
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<td>Null Secundus All Mains Three (P)</td>
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<td>Radiogramophone (RG.)</td>
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<td>Mains Three</td>
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<td>S.G.3 Receiver</td>
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<td>Duovalve Pedestal</td>
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<td>Portable V. (P)</td>
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<td>Pentavox Three</td>
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<td>Vos Populi (P)</td>
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<td>Four (P)</td>
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<td>5-valve Receiver</td>
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<td>“Rover” Super Screened 4 Transportable (P)</td>
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<td>“Kever” 3-valve Self-contained.</td>
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<td>Screened Grid 3</td>
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<td>Pentode Model (P)</td>
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<td>All Mains S.G. Transportable (P).</td>
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<td>ABBREVIATIONS:</td>
<td><strong>RC</strong> = Radio Gramophone.</td>
<td><strong>P</strong> = Portable.</td>
<td><strong>V</strong> = Valves.</td>
<td><strong>S</strong> = Screen Grid.</td>
<td><strong>T</strong> = Tuned Grid.</td>
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<tr>
<td><strong>TA</strong> = Tuned Anode.</td>
<td><strong>TG</strong> = Tuned Grid.</td>
<td><strong>TT</strong> = Tuned Transformer.</td>
<td><strong>AC</strong> = Aperiodic.</td>
<td><strong>RG</strong> = Resistance.</td>
<td><strong>Tr</strong> = Transformer.</td>
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<td>Manufacture</td>
<td>Name of Set</td>
<td>Valves and Couplings</td>
<td>Current Supply</td>
<td>Price</td>
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<td><strong>Edison Bell, Ltd., 62, Grafton Road, London, S.E.15</strong></td>
<td>All Mains Radio-Gram (RG)</td>
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<td>All Electric Receiver</td>
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<td>Stil (P)</td>
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<td>S.G. Three</td>
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<td>Eleven Mains</td>
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<td>Eleven Mains Portable (P)</td>
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<td>Table Grand</td>
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<td>Electricphone &quot;Waterloo&quot;</td>
<td>- - - - *SG TA *TR RC - *T Tr - D D PP</td>
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<td>&quot;Waterloo&quot;</td>
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<td>&quot;Regina&quot;</td>
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<td>&quot;Rex&quot;</td>
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<td>&quot;Ascot&quot;</td>
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<td>Corner Cabinet Radio-Gram (RG)</td>
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<td>A.C. 31</td>
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<td>Pegasus Scout (P)</td>
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<td>Radiogramophone (RG)</td>
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<td>All Electric Two</td>
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<td>Three</td>
<td>- - - - - *SG TT *TR RC - *T Tr - D B GP</td>
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<td>Transportable (P)</td>
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<td>Four</td>
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<td><strong>Empire Electric Co., 10, Pitney Square, London, W.1.</strong></td>
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<td><strong>Falk, Osmann &amp; Co., Ltd., 83/85, Farringdon Road, London, E.C.</strong></td>
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<td><strong>Jonathan Fallowfield, Ltd. 61,2, Newman Street, London, W.1.</strong></td>
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<td><strong>Ferranti Ltd., Hollowood, Lanse. A. C. Franklyn, Pedestal Works, Camden Terrace, Leeds.</strong></td>
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<td><strong>Gambrell Radio, Ltd., Buckingham House, Buckingham Street, London, W.C.</strong></td>
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<td><strong>Buyers' Guide, 1929-30.</strong></td>
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<td>Brand</td>
<td>Model</td>
<td>Mains Valves</td>
<td>Transformer</td>
<td>Speaker</td>
<td>Price</td>
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<td>Lotus S.G.P.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£12.50</td>
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<td>Gent &amp; Co., Ltd., Pataday Works, Leicester.</td>
<td>Three-valve</td>
<td>Portable</td>
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<td>Collings &amp; Ayres, 11 The Broadway, Bedford.</td>
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<td>Gould, Harper &amp; Co., 7 Tons Road, Peck.</td>
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<td>Graham Amplus, Ltd., St. Andrew's Works, Slough.</td>
<td>All Mains</td>
<td>Portable</td>
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<td>J. G. Graves, Ltd., Westville, Durham Road, Sheffield.</td>
<td>All Mains</td>
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<td>A. W. Grafton &amp; Co., Ltd., Old Factory, Bales Hill, Redditch.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£50.00</td>
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<td>Halcyon Wireless Co., Ltd., 313/319 Regent Street, London, W.I.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
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<tr>
<td>Hirtle Bros., 3 Ballet Road, Lower Edmonton, London.</td>
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<td>Portable</td>
<td>2-valve</td>
<td>£60.00</td>
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<tr>
<td>Harmonie, Ltd., Great Portland Street, London, W.I.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£65.00</td>
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<tr>
<td>Hart Collins, Ltd., 34a, Desborough Street, London, S.W.1.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£70.00</td>
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<tr>
<td>E. R. Harveyson, Hatherton Terrace, Hoxton Lane, W.1.</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£75.00</td>
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### Neutrosouic

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<tr>
<th>Model</th>
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<th>Transformer</th>
<th>Speaker</th>
<th>Price</th>
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<tbody>
<tr>
<td>De Luxe S.G.4 (P)</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
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<td>Harrie Radio-Granophone</td>
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<td>2-valve</td>
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<td>Harmony (P)</td>
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<td>&quot;PASSPORT' Mains Trans-</td>
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<td>&quot;FABOON&quot; S.G. de Luxe (P)</td>
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<td>&quot;PASSPORT&quot; 4-valve S.G.</td>
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<td>&quot;Monarch&quot; (P)</td>
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<td>Pedestal Radio-Granophone</td>
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<td>Type S.</td>
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<td>&quot;CABINET&quot; (P)</td>
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### Neutrosonic

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<th>Model</th>
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<th>Speaker</th>
<th>Price</th>
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<td>Short Wave Coherent Grid Receiver</td>
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<td>Short Wave Neutromusic Receiver</td>
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<td>Portable</td>
<td>2-valve</td>
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<td>A/C Cabinet Model (RG).</td>
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<td>Neutrosonic de Luxe Radio-Granophone (RG).</td>
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<td>Neutrosonic Seven Transportable Model (P).</td>
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<td>2-valve</td>
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<td>Universal Receiver (C).</td>
<td>All Mains</td>
<td>Portable</td>
<td>2-valve</td>
<td>£170.00</td>
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### Summary

- **Radio Gramophone:** Lotus S.G.P. All Mains, Portable, £12.50.
- **Radio Gramophone:** Collings & Ayres, 11 The Broadway, Bedford, All Mains, Portable, £30.00.
- **Radio Gramophone:** Gould, Harper & Co., 7 Tons Road, Peck, All Mains, Portable, £35.00.
- **Radio Gramophone:** Graham Amplus, Ltd., St. Andrew's Works, Slough, All Mains, Portable, £40.00.
- **Radio Gramophone:** J. G. Graves, Ltd., Westville, Durham Road, Sheffield, All Mains, Portable, £45.00.
- **Radio Gramophone:** A. W. Grafton & Co., Ltd., Old Factory, Bales Hill, Redditch, All Mains, Portable, £50.00.
- **Radio Gramophone:** Halcyon Wireless Co., Ltd., 313/319 Regent Street, London, W.I., All Mains, Portable, £55.00.
- **Radio Gramophone:** Hirtle Bros., 3 Ballet Road, Lower Edmonton, London, All Mains, Portable, £60.00.
- **Radio Gramophone:** Harmonie, Ltd., Great Portland Street, London, W.I., All Mains, Portable, £65.00.
- **Radio Gramophone:** Hart Collins, Ltd., 34a, Desborough Street, London, S.W.1., All Mains, Portable, £70.00.
- **Radio Gramophone:** E. R. Harveyson, Hatherton Terrace, Hoxton Lane, W.1., All Mains, Portable, £75.00.

- **Radio Gramophone:** De Luxe S.G.4 (P), All Mains, Portable, £80.00.
- **Radio Gramophone:** Harrie Radio-Granophone, All Mains, Portable, £85.00.
- **Radio Gramophone:** Harmony (P), All Mains, Portable, £90.00.
- **Radio Gramophone:** "PASSPORT' Mains Trans-portable (P), Portable, £95.00.
- **Radio Gramophone:** "FABOON" S.G. de Luxe (P), All Mains, Portable, £100.00.
- **Radio Gramophone:** "PASSPORT" 4-valve S.G. (P), All Mains, Portable, £105.00.
- **Radio Gramophone:** "PASSPORT" 4-valve S.G. (P), All Mains, Portable, £110.00.
- **Radio Gramophone:** "Monarch" (P), All Mains, Portable, £115.00.

- **Radio Gramophone:** Short Wave Coherent Grid Receiver, All Mains, Portable, £135.00.
- **Radio Gramophone:** Short Wave Neutromusic Receiver, All Mains, Portable, £140.00.
- **Radio Gramophone:** A/C Cabinet Model (RG), All Mains, Portable, £145.00.
- **Radio Gramophone:** A/C/G Table Model, All Mains, Portable, £150.00.
- **Radio Gramophone:** Neutrosonic de Luxe Radio-Granophone (RG), All Mains, Portable, £155.00.
- **Radio Gramophone:** Neutrosonic De Luxe Table Model, All Mains, Portable, £160.00.
- **Radio Gramophone:** Neutrosonic Seven Transportable Model (P), All Mains, Portable, £165.00.
- **Radio Gramophone:** Universal Receiver (C), All Mains, Portable, £170.00.

**ABBR EVATIONS**

- RG = Radio Gramophone
- P = Portable
- SG = Screen Grid
- TA = Tuned Anode
- TG = Tuned Grid
- Tr = Transformer
- Direct. = Direct
- D = Direct
- T = Triode
- F = Pentode
- * = Directly or Indirectly Heated Mains Valves
- Coupling: Loud Speaker Feed
- F = Filter
- Tr = Transformer
- Current Supply: B = Battery
- AC = Main Supply

**Incorporated Gramophone Pick-up Arrangements**: If = Pick-up.

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**ABBREVIATIONS:**
- **RG** = Radio Gramophone.
- **F** = Portable.
- **P** = Valve.
- **SG** = Screen Grid.
- **TG** = Transformer Grid.
- **TG** = Transformer Grid.
- **TR** = Transformer.
- **SL** = Speaker.
- **D** = Directly Heated Mains.
- **IND** = Indirectly Heated Mains.
- **PP** = Pick-up Provision.
- **GP** = Grid Provision.
- **PP** = Provision for Pick-up.

*Note: The table continues with similar entries.*
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Abbreviations:
- **RG** = Radio Gramophone
- **P** = Portable
- **SG** = Screen Grid
- **LG** = Led Grid
- **Ch** = Choke
- **Tr** = Triode
- **AC** = Alternating Current
- **DC** = Direct Current
- **PP** = Provision for Pick-up

Coiling:
- **T** = Tuned
- **A** = Aperiodic
- **R** = Resistance
- **T** = Transformer
- **B** = Battery
- **L** = Leaky Grid
- **F** = Filter
- **Ch** = Choke
- **PP** = Provision for Pick-up

Additional notes:
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The Relationship Between the Mechanical and Electrical Systems.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

The coil-driven loud speaker is a mechanical device propelled by electric currents. It can be divided into two basic systems (1) a purely mechanical system, (2) a purely electrical system. The mechanical system causes sound to be radiated, whilst the electrical system supplies the energy necessary for this to be accomplished. By virtue of this relationship there is a definite connecting link between the mechanical and electrical systems. The object of this article is to indicate the interaction of the two systems and to give a diagram by means of which the combined performance can be visualized by aid of an equivalent electrical circuit.¹

Taking the mechanical circuit, we have the arrangement of Fig. 1, which is equivalent to a mass $m$ attached to a weak spring $S$, as shown in Fig. 2. The mass, whose effective value is $m$, corresponds to the diaphragm, whilst the spring corresponds to the diaphragm support. This is assumed to be elastic, and allows the diaphragm a fair amount of axial motion with but little constraint. Under this condition the natural axial frequency of the diaphragm (when the coil circuit is open) will be from 5 to 15 cycles per second. When the diaphragm vibrates there is a certain amount of resistance offered by the air, due to the generation of sound waves. Also, there is a loss in the diaphragm. These resistance effects impose a certain amount of damping on the mass $m$, i.e., it is not absolutely free to move with the spring.

The electrical circuit is illustrated in Fig. 3. The coil is situated in a strong radial magnetic field. When the coil is fixed in position so that it cannot move, the electrical circuit is the simple form shown in Fig. 4, where the coil merely has an inductance $L_o$ and resistance $R_o$ combined.

¹ For complete theory see Philosophical Magazine, Supplemental Number, June, 1929.

energy or power (whichever we like to consider) is derived primarily from the electrical circuit. Electrical power is the product of e.m.f. and in phase current. If, therefore, the coil current is $i$ and the corresponding back e.m.f. (in phase with $i$) induced due to the motion of the coil is $e$, the power radiated as sound is $ei$. It should be observed that the current and e.m.f. are in phase, i.e., their maximum values occur simultaneously. This value $e$ is one component of the back e.m.f., but there is another and a larger component which does no useful work. It merely reduces the value of the current at low frequencies, which is unfortunate.

If the coil were stationary there would be no induced back e.m.f., so that the simple arrangement of Fig. 4 does not represent the actual state of affairs. We have to incorporate in our electrical circuit something which accounts for the back e.m.f. The analysis leading to the final result is...
The Moving-coil Speaker and its Equivalent Circuit.

Beyond the scope of this journal, but we are not precluded from discussing the result. In Fig. 5 we have an electrical circuit which behaves in the same manner as the moving coil of Fig. 4. Suppose we select a certain frequency, say 500 cycles, then by properly choosing $C_m$ and $R_m$ the current in the system will be identical with that through the moving coil at 500 cycles. $R_m$ is the electrical resistance corresponding with the mechanical resistance to the motion of the diaphragm. The power loss in $R_m = i^2 R_m$, and this is the energy radiated as sound. The condenser $C_m$ may appear extremely peculiar, but it is merely an electrical device which has the same effect in reducing the current at low frequencies as the back e.m.f. due to the motion of the coil.

Moreover, in Fig. 5 we have an electrical circuit in which the mechanical and electrical systems of the coil drive are represented. By its aid we can study exactly what will happen at various frequencies without considering the mechanical aspect of the problem at all.

There is a variation in the components $R_m C_m$ according to the frequency, but we need not enter into such details here. The action of the coil in motion can also be represented by the equivalent circuit of Fig. 6. In this case the condenser $C_m$ and resistance $R_m$ are in parallel and have different values from $R_m$ and $C_m$.

Hitherto we have considered cases where the frequency of the coil current is well removed from the natural frequency of the diaphragm on its support, viz., 15 cycles. When the frequency approaches 15 cycles it is clear that the amplitude of motion increases, due to mechanical resonance. This condition is not represented in Fig. 5, so that an additional electrical quantity is required to give the complete equivalent circuit.

In Fig. 5 it was essential to introduce a condenser $C_m$ to represent the effect of the back e.m.f. due to the motion of the coil. We now have to represent the elastic effect of the surround, for $C_m$ reduces the low-frequency currents, and therefore the axial movement of the diaphragm is also reduced. But the elasticity of the surround increases the amplitude of motion near 15 cycles, so that it gives the effect of an increase in current. Now we know that an inductance tends to neutralise the effect of a condenser. Moreover, we require an inductance to complete the equivalent electrical circuit for frequencies in the neighbourhood of 15 cycles. This has been added to Fig. 5, with the result exhibited in Fig. 7. Clearly the effect of the inductance $L_m$ is to counteract the influence of the condenser $C_m$, so that the amplitude of motion is increased. Another method of representing the complete circuit is illustrated in Fig. 8. The inductance $L_m$, capacity $C_m$ and motional or radiation resistance $R_m$ are now in parallel. The resonance frequency of the surround is identical with that of $L_m C_m$.

The value of $C_m = m/C^2$ where $m$ is the effective mass of the diaphragm. This includes the added mass due to the sound waves caused by the motion. $C$ is the product of the total length of wire on the coil and the strength of the radial field. $L_m = C^2 / k$ where $k$ is the force required to move the diaphragm through an axial distance of 1 cm. against the supporting material.

In this discussion the diaphragm has been assumed to move as a whole at all frequencies. We know this does not hold in practice, so that modifications will be required to cope with frequencies above about 200 cycles (depends upon size of diaphragm). These equivalent diagrams are extremely useful in studying the principle of the coil-driven loud speaker, since the complete outfit is reduced to an electrical circuit.

The values of $L_m$, $C_m$, $R_m$, etc., will depend upon the size of the diaphragm, the mass of the coil, the number of turns on the coil, the strength of the magnetic field and the flexibility of the support. If the reader knows these factors for his own loud speaker he will be able to set down numerically its equivalent circuit. Of course, when resonances occur there will be a variation in the equivalent circuit. However, enough information has been given to introduce the subject to the reader who desires to have a deeper insight into the action of his loud speaker.

Incidentally, it is of interest to observe that Fig. 8 covers the case of a reed driving a rigid disc.

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1. See Philosophical Magazine, loc. cit.
2. In Figs. 5 to 8 the equivalent circuit is shown with open ends. In practice, of course, the circuit is completed through something else. When transformer coupling is used, the secondary of the transformer is connected to the ends of the equivalent circuit. On the other hand, when a high-resistance coil is used, the circuit is completed through the valve and choke-condenser combination.
“ARBE” LOUD SPEAKER.

This is a cabinet-cone instrument fitted in a case of generous size and pleasing finish. It is acoustically open at both back and front, a feature which attributes to the good performance exhibited on test. The movement is an Ormond four-pole unit with adjustment, and this drives a 12in. cone.

Specially prepared material, somewhat resembling buckram in appearance, is used for the diaphragm. The periphery of the cone rests lightly against pads of felt; the driving mechanism being partially relieved of the cone’s weight by holding this, at two points, by rubber clamps.

That the bass is emphasised unduly. However, this is an aural illusion not substantiated by test.

The instrument is sensitive to weak inputs and can be driven at ample volume for average-sized rooms with a medium-size power output valve. The D.C. resistance of the windings on the unit is 2,000 ohms.

This loud speaker is available in either an oak case or a mahogany cabinet; the prices being £3 10s. and £3 15s. respectively. The makers are The “Arbe” Radio Manufacturing Co., 25, Meredith Street, St. John’s Street, London, E.C.1.

BELLING-LEE SAFETY CONNECTORS.

Messrs. Belling-Lee, Ltd., Queensway Works, Ponder’s End, Middlesex, have for long specialised in the manufacture of insulated terminals particularly suitable for use where high anode potentials are employed. The latest addition to their wide range of connectors is a plug and socket having all “live” metal parts protruding from the panel adequately protected by insulating material.

The construction of these insulated H.T. plugs and sockets is shown clearly in the accompanying drawings. The socket is fixed to the panel, or terminal strip, and the completely insulated plug terminates the flex lead. Soldered connections are dispensed with and provision is made to grip the outer covering of braided silk, or cotton, thereby giving a tidy appearance to the leads. The price of the plug and socket is 9d., or they can be purchased separately, the panel portion costing 4d. and the flex connector 6d.

ELLISON H.T. ELIMINATOR.

This model has been designed for use on 200-volt 50-cycle supply mains, and gives two output voltages. That marked H.T. +1 is adjusted to suit the requirements of most detector valves, and H.T. +2 is intended to supply the remaining valves in the set. A series resistance

Details of the Belling-Lee insulated H.T. plug and socket.


absorbs the excess voltage at the detector tapping, so that it is a simple matter to change this for one of different value, should this be necessary in any particular case.

Full-wave rectification is adopted, using a Marconi or Osram U.5 valve. At the time of test the mains voltage was 210, and this gave 5.5 volts across the valve's
Wireless World

We have had samples sent to us for examination, and find that the coils comply with the specification given, and we believe they will be found satisfactory in every respect.

The workmanship is of a high order. Spacing of coils and sections are correct. A slight deviation has been made from the published description, this being the shortening of the spacers carrying the primary winding on the medium-wave H.F. transformer. Since this is a constructional detail of no particular importance, it will not affect the efficiency of the coils. We can confidently recommend them to all prospective constructors of this receiver.

slightly better characteristic than the A.F.5, when used with a suitable valve, and, of course, the amplification is very much greater. Needless to say, it should be preceded by a leaky-grid detector valve, as the primary impedance is hardly of sufficient magnitude to enable the best to be obtained with anode bend detection.

The amplification afforded by a combination of grid detector, A.F.6, and a super-power output valve, with a good mutual conductance, will compare favorably with that generally associated with a pentode output stage.

The makers are Messrs. Ferranti, Ltd., Hollinwood, Lancashire, and the price is £30.

"STORK" LOUD SPEAKER UNIT.
The "Stork" loud speaker unit is a product of the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, and is in the same movement as fitted to their cabinet loud speakers of the same name. It is now being offered as a separate unit for home construction at the attractive price of one guinea. It is for use with cone diaphragms. The movement is of the single-acting reed type, with the armature fixed at one end. An adjusting screw is fitted to regulate the clearance between the armature and the laminated pole-pieces.

Ferranti A.F.6 transformer. It has a step-up ratio of 1:7.

A NEW FERRANTI TRANSFORMER.
There is evidence to show that the present trend in design of receivers favours an increase in the number of H.F. amplifying stages with a reduction in the L.F. amplification.


A practical test was made, using a good cone diaphragm and a suitable baffle. On the whole the response was very good indeed: the frequency range, with normal electrical inputs, being from about 150 cycles to 5,000 cycles. There were some minor resonances—probably feed resonances, since this is fairly rigid—between 5,000 and 3,000 cycles, but these were not unduly marked. Otherwise the response was fairly constant over the audible band covered, but there was a noticeable falling off below 200 cycles.

The measured D.C. resistance of the windings was found to be 420 ohms. It is possible to connect the loudspeaker direct to the last valve, even though a super-power type is fitted, without serious voltage drop. A choke-condenser filter, or transformer, output arrangement would be preferable, if this can be fitted conveniently.

Set of "Bercif" coils for the 1930 Eveyman Four receiver made by Simmonds Bros.

1930 EVERYMAN FOUR COILS.
These constructors contemplating building the 1930 Eveyman Four receiver may be interested to learn that a set of coils for this receiver has recently been placed on the market by Messrs. Simmonds Bros., Shireland Road, Smethwick, Staffs. These are offered at 57s. the set.
Wireless Theory: Simplified

Part IX.

Condensers and Capacity.

(Continued from page 542 of previous issue.)

WE now come to the third and last "constant" of the electric circuit, namely, capacity. As the name implies, the capacity of any part of a circuit is the extent to which a "charge" or quantity of electricity can be stored or accumulated in that part. It is the capacity for storing electricity in a stationary (electrostatic) state under a given electrical pressure or voltage. In just the same way the capacity of a compressed-air cylinder could be expressed as the amount of air it would hold under a given pressure. That component of the electric circuit which is designed expressly for the purpose of producing this effect of capacity is called a condenser.

In order to understand clearly the effects of capacity, especially in an A.C. circuit, it is necessary to know exactly what capacity is and how it arises.

It was pointed out in Part I (September 25th issue) that a current of electricity could be looked upon as a stream of electrons passing from atom to atom along a conductor, the stream being continuous so that electrons were not accumulated at any point in the circuit. Under the heading of capacity, however, we encounter entirely new conditions, namely, where electrons are transferred from one part of a conducting system to some other part of the same system in which there is no complete or closed circuit for a continuous stream of electrons to flow round.

Direction of Flow of Electrons.

But before proceeding farther a word is necessary regarding the direction of flow of electrons moving round a circuit carrying a current. It was explained in Part I that a free electron is a minute negatively charged "particle" which can be moved by the action of an electromotive force. The central positive charge of each atom of matter is not mobile in this way and cannot be separated from the atom of which it forms the nucleus. Thus a current of electricity is a stream of electrons moving in the opposite direction to that normally chosen to indicate the direction of flow of current. This fact is plainly illustrated by the action of an ordinary valve, where the current in the plate circuit is always taken as flowing from the positive terminal of the H.T. supply to the plate and thence through the vacuum to the filament. But we actually know that the electrons representing the current are given off or omitted by the hot filament and are collected by the plate and so move the other way round the circuit.

In the early days of electricity, before the discovery of the electron, it was thought that both kinds of electricity moved round the circuit in opposite directions and the choice of the positive direction was quite an arbitrary one. In the light of the electron theory the choice has turned out to be very unfortunate, and the reader should bear in mind that when a current flowing through a circuit has its direction indicated by an arrow the actual direction of motion of the electrons representing that current is opposite to that indicated by the arrow. For most purposes this distinction is not necessary, but it is for our present purpose of considerable help in elucidating problems of capacity.

The Nature of Capacity.

Suppose that two flat metal plates A and B of equal size are placed parallel to each other, but not touching, as shown in the upper part of Fig. 1, and that they are electrically insulated from each other, the medium between them being air. Between A and B is connected a circuit consisting of a battery E, a resistance R and a switch S. In the figure the negative pole of the battery is shown connected to plate A.

Providing the switch S has not been closed no potential difference or voltage will exist between the plates (they could be momentarily joined together with a piece of wire to ensure this). This means that each plate carries an equal number of free electrons. If the plates are at zero potential with respect to earth the negative electrons on each are present in just sufficient numbers to neutralise completely the positive charges at the centres of the atoms and leave the plates as a whole electrically neutral. Now consider what happens
Wireless Theory Simplified.—

when the switch S is suddenly closed. The battery will immediately try to drive a current round the circuit, but owing to the gap between the plates no continuous current will be able to flow. Nevertheless, the tendency is for the battery to drive electrons round the circuit in a clockwise direction, and so, on closing the switch, electrons will immediately be drawn off from plate B, passed through the battery, and piled up on plate A. As soon as any electrons are taken from plate B those left are insufficient to neutralise completely the positive charges at the centres of the atoms, and so plate B acquires a positive potential. The extra negative electrons which are driven on to plate A will give the latter a negative potential, as there will then be more than sufficient to neutralise the positive nuclei of the atoms.

The initial rate at which the electrons are taken from B and put on to A by the action of the battery will depend on the E.M.F. of the battery and the resistance R of the circuit, because the stream of electrons flowing from B to A constitutes an electric current. But once this current has started the potential of B is becoming more positive and that of A more negative, that is to say, a potential difference is building up between A and B in such a direction as to oppose the action of the battery. Thus as time progresses, after closing the switch, the current, or rate of transfer of electrons, becomes rapidly less and ceases altogether when the potential difference between the plates has reached a value equal to the E.M.F. of the battery. Under these conditions plate A is charged exactly to the same potential as the negative pole of the battery, and B to that of the positive pole. We see, then, that the current obtained is only a momentary or transitory one which passes from plate A to plate B according to the usual notation although the electrons are moved from B to A.

An Analogy.

Before discussing the magnitude and time of duration of the charging current it will be helpful to consider a suitable mechanical analogy. The electric circuit of Fig. 1 can be represented by the cylinder and pipe arrangement shown in Fig. 2. An airtight cylinder C is divided into two equal compartments A and B by a diaphragm D. Compartment A is connected by means of a pipe to the output side of a fan pump P of the type used in ordinary vacuum cleaners, compartment B being connected to the input or vacuum side. The whole system is assumed to contain air at the normal atmospheric pressure when the pump is stationary, so that each compartment holds an equal weight of air, which corresponds to the electrons in the electric circuit.

One of the pipes has a constriction R representing the resistance of the electric circuit.

If the fan pump is suddenly started it will immediately begin to draw air from compartment B and transfer it to A. The result is that the pressure in B begins to fall and that in A to rise, just as in the electric circuit the potential or electrical pressures of the plates were changed. In the same way the current of air through the pipe diminishes as the pressure difference between compartments A and B rises and will cease altogether when the difference of pressures in the two compartments is exactly equal to the pressure exerted by the pump. A continuous stream of air cannot flow on account of the dividing diaphragm in the cylinder corresponding to the gap between the plates of the electric circuit.

As regards the air system it is quite obvious that energy is required to change the pressure levels of the compartments of the cylinder as described, and that energy is stored in the cylinder. If the motor driving the pump is switched off the air will immediately commence to rush back from A to B and so tend to drive the fan in the reverse direction. The amount of energy stored will depend on the capacity of the cylinder and the difference in pressure between the two compartments.

Electric Field.

Now, in exactly the same way, energy must be stored somewhere in the electric circuit of Fig. 1 when the electrical pressure between the plates A and B is raised, because during the time that the plates are being charged the battery is driving a current against an opposing pressure quite apart from that due to the resistance of the circuit. This energy is stored in the space between the plates. The ether there has been subjected to a sort of strain and is trying to recover—it makes practically no difference whether there is air or a vacuum between the plates.

The space where the ether is strained in this way is called an electric or electrostatic field, and its presence can be very easily detected experimentally. If a small light body such as a pith ball, suspended on a silk thread, is charged positively and then dangled between the plates it is definitely attracted towards the negative plate A and repelled from the positive plate B, showing that there are lines of force stretching from one plate to the other. These lines of force are quite different from those of magnetism; they are produced by electrons at rest, whereas the magnetic lines were produced by electrons in motion, that is, by an electric current.

The electrostatic strain set up in the ether by the charges on A and B is a sort of elastic one tending to return the potentials of the plates to their original common level. If we disconnect the plates from the
Wireless Theory Simplified.—

battery and then join them to the terminals of a sensitive galvanometer the latter will give a momentary deflection indicating that the excess negative electrons on plate A have rushed back and made good the deficiency on B. Our simple condenser has been discharged and the energy which it possessed dissipated in the resistance of the circuit connecting A to B. The switching arrangement for the experiment is shown in Fig. 3.

Definition of Capacity.

When the switch is closed the initial value of the charging current will be \( I = \frac{E}{R} \) amperes, because at the start there is no back pressure exerted by the condenser. But as the voltage across the condenser builds up it throughout the charging period. This could be done theoretically by reducing the variable resistance \( R \) in Fig. 3 at a uniform rate from the initial value to zero during the charging period. Under these conditions the voltage across the condenser would rise at a uniform rate, as shown in Fig. 4 (b).

Suppose, then, that with a steady charging current \( I \) amperes the potential difference between the condenser plates reaches a value of \( E \) volts in a time of \( t \) seconds. Now, the product of the current \( I \) and the time \( t \) is the quantity of electricity transferred from one plate of the condenser to the other. From this the \textit{capacity} can be defined as the quantity of electricity or "charge" required to change the potential difference between the plates by one unit of E.M.F.

Practical Units of Capacity.

When the charging current \( I \) is in amperes and \( t \) is in seconds the quantity of electricity or "charge" is expressed in \textit{coulombs}. The capacity in the practical system of units is expressed in \textit{farads}. A condenser is said to have a capacity of one farad if the potential difference between the plates is raised by one volt when a quantity of electricity equal to one coulomb is put into it, or when a charging current of one ampere flowing for one second changes the potential difference between the plates by one volt.

Thus if a current of \( I \) amperes flowing for \( t \) seconds raises the potential difference between the plates from zero to \( E \) volts the capacity of the condenser will be

\[ C = \frac{It}{E} = \frac{Q}{E} \text{ farads} \]

where \( Q \) stands for the charge in coulombs or ampere-seconds.

The farad is a very large unit indeed. If a condenser of one farad capacity were charged to one volt, on being discharged through a resistance it would give out one ampere for one second or the equivalent. If charged to 180 volts it would be capable of giving out the equivalent of one ampere for three minutes! It would require an enormous condenser to give such a performance. Thus in general practice the capacity of a condenser is expressed in \textit{microfarads} (mfd.), meaning millionths of a farad. But when making calculations relating to condensers farads must be used in all the ordinary formulæ; to convert from microfarads to farads we must divide by \( 10^6 \) or one million. Very often in wireless work capacities are expressed in \textit{micro-microfarads} (m.mfd. or \( \mu \text{fd.} \)) or millionths of a microfarad.

\( \text{(To be continued.)} \)

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\textbf{CATALOGUES RECEIVED.}

The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, E.C.4.—Illustrated catalogues of Ediswan mains- and battery-operated receivers; mains accessories; component parts, and a 50-page valve book containing curves and descriptive matter dealing with every new Mazda valve. Also general radio catalogue and descriptive folders of "Tan- gar" battery chargers.

A Dilemma.

B.B.C. engineers are in a dilemma regarding the opening of the second station at Brookmans Park. For a reason which remains obscure, there is an insistent demand in some quarters that the regular London programme, i.e., 2LO's, should go out on the shorter wavelength of 261 metres, allowing the hitherto silent twin to carry out its tests on 355.3 metres.

To Wake Up the Public?

This would be the best way to proceed if the B.B.C.'s intention is to wake up the public to the realities of the regional scheme, especially in view of the likelihood that the tests with the new transmitter will be limited to news, talks, and poetry readings! In the scramble for new coals and condensers the listening public would begin to see the scheme from a fresh angle.

Nervousness.

This hesitancy in regard to wavelength is symptomatic of a growing nervousness at Savoy Hill over the behaviour of twin stations on the same site. The B.B.C.'s experience in this direction is mainly theoretical, being based on low-power radiation tests with the mobile transmitter. The case of 2XX and 5GB working on the same site can hardly be called a parallel one, for here the frequency separation is 483 kc., whereas the London Regional transmitters will have a separation of little more than 500 kc. with higher power also to be reckoned with.

Protracted Test Period.

As to the date on which the alternative tests will start, even the Chief Engineer expresses uncertainty. It is practically settled, however, that the experiments will take place during ordinary broadcasting hours over a period of at least two months. Assuming that the fun begins before the end of December, we shall have the season of spring and portable sets upon us before London Regional is functioning normally.

Scottish Regional Excitement.

Captain Eckersley has caused a flutter in official dovecotes by a statement in a speech at Edinburgh last week. The ex-Chief indicated that a site has already been selected for the Scottish Regional station at Larbert, midway between Glasgow and Edinburgh. As a matter of fact, no decision has yet been arrived at. The B.B.C. mobile transmitter has roamed over most of the country in the neighbourhood mentioned, and three possible sites are now being considered. Larbert is one of them, but the most favoured is a spot to the east of Falkirk.

A Question of Money.

It will be a pity if announcements regarding the Scottish Regional raise false hopes. Many listeners in Scotland have been expecting that their new station would be ready by the end of 1930. If the work were begun at once there would be no technical bar to such a happy event, but there are grave financial obstacles. The Northern Regional must be paid for this year, and the B.B.C. will require more instalments of licence revenue from the Post Office before the Scottish Regional can be completed.

Relays from Germany.

Three experimental relays from the Continent are to be included in the programmes early in the New Year. The first, I understand, will take place on or about January 3rd, when Germany's new cross-country landlines will be put to the test in a relay from one of the eastern transmitters, probably Königs- wusterlausen.

The programme value of these relays will also be considered. The first will comprise classical music, German light music and vaudeville with the other relays.

Suffocation in the Studio.

Few broadcast artists deserve to be suffocated in the studio. Yet this fate nearly overtook a well-known performer at Savoy Hill recently when he strayed too near a ventilating tabe which had been cleaned with paraffin. He is only just recovering from an illness which has lasted for weeks.

The problem of studio ventilation will be one of the first considerations of the designers of Broadcasting House, Portland Place. Entirely new methods are to be tried, as it is realised that the present system at Savoy Hill is hopelessly inadequate.

An Revoir, Sir Walford.

All classes of listeners—highbrow, lowbrow, technical, constructional, and the rest—will miss the weekly talks of Sir Walford Davies. There is something arresting in Sir Walford's microphone manner which compels one to listen, whether interested in music or not. Most of us will be glad that the well-known "Good-night, listeners all!" on December 31st will be only in the nature of an au revoir.

Cinema Assists Broadcast Artists.

Anthony Hope's play, "The Prisoner of Zenda," will be broadcast from 2LO on December 20th. The adaptation for the microphone is the work of Holt Marvell, who has conceived the idea of arranging a special show of Rex Ingram's film version for the artists who are to take part in the broadcast to enable them to "absoob" the atmosphere of the story.
ANODE FEED.

Sirs,—Much print has been used in the last year or so in an effort to popularise the "anode feed" scheme. Admittedly it has great advantages over the "common" potentiometer, and it has enabled "Mr. Everyman" to use modern valves to a fairly good advantage, but in my opinion better advantages are to be gained by using a potentiometer for each valve. The cost of wire-wound potentiometers, such as Truvol and Varley type, is little over that of fixed resistances, and among the advantages of this scheme are:

(1) Voltage more constant in spite of anode current fluctuation.
(2) Change of valve involves a simple adjustment instead of the purchase of a new anode resistance.
(3) In the case of A.C. H.T. eliminators the small but constant load on the transformer secondary safely guards the components from harm should the valve filaments be unlighted from any cause while the elimination is under load.

I have used this scheme in several cases when "motorboating" has occurred, in spite of the anode feed scheme, with complete success. I would be interested to know of other readers' opinions on this scheme.

A. NEWMAN.

THE REGIONAL SCHEME.

Sirs,—Re your editorial and correspondents' comments on the regional scheme. I, too, have thought the B.B.C.'s policy may have, in part, provided for "wipe-out," so as to limit stations received to those at home; but surely, to be effective, there must be a full and adequate programme provided. I mention my sixty-one stations have been reduced to fifty-nine, and should Tweedledum cause a further reduction no more serious and the B.B.C. not extend its Sunday programme, I will continue my mauvais-tasting in tuning in foreigners—particularly on Sundays.

I remove headgear to Iliffe and Sons Ltd., the gay foreigners and the frame aerial. HENRY J. BELL.

Wendover, Bucks.

NON-RADIATING SETS.

Sirs,—May I add my name to that of Mr. Henry W. Moss? Re-radiation from other receiving aerials is the biggest trouble I have to contend with from a wireless point of view. I wish to point out about the streets interfering with their business or pleasure of other people, and neither should he be allowed to do it by radio.

I use a moving-coil loud speaker capable of excellent reproduction, but if there is anything on worth hearing I have to switch off in disgust at the distortion introduced by "silent point" oscillators and the howls of the actual heterodynes. I heartily agree that the use of reacting detector, or any other set capable of energising the aerial should be made illegal. Administration of the law would not entail great expense, as complaints alone would be sufficient indication of offenders.

If the business was sufficiently stressed in journals, members and officials of radio societies and readers of technical magazines could get together and probably demand it. Also, why not go a step, in the right direction and stop set design and radio manufacturers from the practice of publishing diagrams of cheap (?) receivers capable of re-radiation. I am aware some cheap outfits for local stations only are always in demand, but one generally finds the owners trying to get America at full B.S. strength. Let us hear more views and get the whole miserable business stopped once and for all.

J ohn ROE.

Sheffield.

Sirs,—I have a great deal of sympathy with your correspondent, Mr. Henry W. Moss, being like him a sufferer from the howls emanating from my neighbour's set next door. I think something should be done to curtail the activities of the oscillating individual: at present the measures taken by the Post Office are not drastic enough. If reaction was prohibited entirely I am afraid many worthy people in humble circumstances would be tied down to the local B.B.C. programme owing to the high prices at present prevailing for screen-grid receivers. I am convinced from my own experience the reaction, if properly used, then it is practically no interference to neighbouring receivers. It is the selfish person who wants more service from his small receiver than it is capable of giving, and I hope steps will be taken before long to put a stop to this great nuisance.

Hugh McNEICE.

London, W.2.

GRAMOPHONE PICK-UP DESIGN.

Sirs,—Mr. F. L. Devereux, in dealing with the above subject in a recent issue of The Wireless World, mentions that serious amplitude distortion is caused by a single-acting type of pick-up, and that one advantage of the single-acting type has given place to the differential or double-acting type.

While this is obviously theoretically correct, the fact remains that in practice the amplitude distortion (due to the square law mentioned) is of no importance when compared with the mechanical controlling factors, such as mass of the reed, moment of inertia, restoring force, etc., which otherwise was also mentioned in the article.

It is not difficult to find amongst commercial pick-ups differential types with a response curve definitely inferior to that of a single-acting type. I believe I am correct in stating that the new Marconophone pick-up employs a reed in which the whole of the flux passes through it, and the curve of this pick-up is unquestionably good. The same principle would seem to be involved in the case of a loud speaker movement, when mention can be made of the Amplion Lion speaker. Here again the performance is definitely superior to that of many balanced armature systems. The predominating factors in both cases are mechanical more than electrical. If the same desirable mechanical conditions were combined with a balanced electrical or rather magnetic, system, then the results might possibly be even slightly better. My own experience in the design of pick-ups during the last three years clearly indicates that the fundamental controlling factor is the magnetism, and this certainly seems to be borne out by the examples mentioned above.

Paul D. TYERS.

Watford.
It would probably not be far wrong to assume that daily close upon one hundred wireless receivers are connected to public electricity supply mains for the first time. Some of these sets have been designed and built expressly to operate either partially or wholly from mains, while others have been converted from battery-driven receivers by the addition of various parts collectively called an eliminator or mains unit. In both these classes there is a further sub-division of "bought," i.e., completely finished, equipments and "home-built" or "home-made" apparatus in which the various parts have been collected together and assembled by an amateur.

There is every reason to believe that, with the improving discernment in the matter of quality of reproduction on the part of the general public, at no distant date practically all stationary receivers will be mains operated, so that a few notes on the legality of the use of public mains will not be out of place.

**Board of Trade Regulations.**

To begin with, let us consider how supply authorities are regulated. Before a company or a borough council may proceed to excavate the public roads for the purpose of laying mains, it has to obtain parliamentary powers. The granting of such powers virtually gives a company a monopoly within a prescribed area, and in order to prevent the abuse of such a monopoly the company is governed by certain Acts, notably the Electric Lighting Acts of 1882 and 1899, and a set of Board of Trade Regulations. In general, the Regulations are of more interest to the consumer than the Acts. The concern to which powers have been granted is referred to in the Acts as an Undertaker.

The Mutual Obligations of Set User and Supply Company Explained.

The Board of Trade Regulations (now called the Regulations of the Electricity Commissioners) are expressly headed as being:

(a) For securing the safety of the public, and

(b) For ensuring a proper and sufficient supply of electrical energy.

They are obtainable on demand at the price of sixpence per copy by a consumer from the Undertaker in whose area of supply he resides, and are the only legal Regulations governing that supply. They may also be obtained with certain blanks left in the final clause, which makes them specific to an undertaking, from H.M. Stationery Office.

Now to deal with the Acts and Regulations as they affect the consumer who wishes to use power from the mains to operate his wireless receiver. Although it can be assumed that anyone who is contemplating the use of supply mains to drive his wireless set has already a supply (and a supply company is bound by section 27 (i) of the 1899 Act to give and maintain a supply subject to certain conditions), it must be assumed that the addition of a mains-driven wireless set to his power-consuming apparatus is such a serious matter in the eyes of the supply company as to warrant reconsideration of the original agreement for the supply of electricity to that particular premises.

The only technical condition under which a company may refuse supply to a consumer is when there is found to be a leakage of more than $\frac{1}{10,000}$th part of the maximum supply current on his (the consumer's) wiring and apparatus, and in refusing the company is bound, under penalty, to call attention to the consumer that he may, if he doubts its tests, on payment of a fee, have the tests carried out by a Board of Trade inspector. This is covered by Regulations 29, 30, and 31.

**D.C. Mains and Condenser Tests.**

Sections 27 (4) of the 1899 Act refers to the use of any lamp or burner (electric motors were not even legislated for in those days) in a manner calculated to interfere unduly or improperly with the efficient supply to any other body or person as a good and sufficient reason for the refusal on the part of the company to supply. In view of the contacts or fuses mentioned in Regulation 26 and the leakage specification in Regulation 29 of the Board of Trade, the foregoing clause does not appear to have any very specific meaning. A possible case coming under this clause might occur if a consumer installed a piece of apparatus which took a very heavy momentary current, say, once every second, the current being just of insufficient duration to blow his main fuses, but sufficient to cause an unpleasant flicker in the illumination of the lamps on neighbouring premises. This state of affairs is not likely to occur in a wireless receiver.

With regard to the current leakage referred to above, this can be prevented with certainty in an A.C. set operating off A.C. mains by the use of a transformer with adequate...
Wireless World

Supply Regulations and Mains Sets.

Insulation between the primary and all other windings, and in a D.C. set by the use of a good condenser in the earth lead, together with a further condenser in the aerial lead if series tuning is not being used and the aerial insulation is not above suspicion. The recognised standard test for the insulation value of first-class British-made apparatus intended to be used on supply mains is the application of 2,000 R.M.S. volts A.C. of commercial frequency, e.g., 50 cycles for one minute between conductor and earth. This test is not really as severe as it sounds, and there should be no difficulty in insulating transformer primary windings to pass it when all other windings are earthed; in fact, there are certain inter-valve transformers whose insulation is sufficiently good to withstand this voltage. There must, however, be very few condensers at present in earth leads which are able to pass this test, and in view of the size and cost of a condenser of this grade it is doubtful whether a company could be considered as reasonable in demanding compliance in this respect.

Protection from Shock.

The Regulations, beyond stipulating the maximum permissible leakage on a consumer's system, do not mention insulation value. As regards its own network, the company is only bound to test a new low or medium pressure (i.e., voltage) main at its working pressure, or not less than 200 volts before being put into service. Even on high-pressure work the company is only called upon to test at 50 per cent. over working voltage for one hour. The corresponding up-to-date test in the British industry is 23 times working voltage, plus 2,000 for one minute, and certain manufacturers test at three times working voltage for this time.

There remains a further direction in which legislation might be expected, namely, in the protection from shock. Now it is one of the rather remarkable facts that in the matter of Regulations dealing with installation work, an Englishman's home has remained his castle for such a long time. The Institution of Electrical Engineers has prepared an excellent set of wiring Regulations which are revised from time to time to keep up with modern developments and the introduction of new and better materials. Quite recently much work has been done to produce a specification covering the essential points in eliminator design, but although these Regulations may be referred to by consulting engineers, buyers, insurance companies, etc., as indicating a certain standard of excellence, they do not appear to have any legal significance as far as the house is concerned. On the other hand, an insurance company, say, might refuse to accept as a fire risk a building in which the electrical installation fell below the standard set by the I.E.E. Regulations.

To sum up this section of the article, there seems to be no valid ground on which supply may be refused to a mains receiver which does not actually produce a leakage to earth from either mains greater than the prescribed amount.

We come now to the question as to where the owner of a mains-driven wireless set stands when it is decided to change over the mains from D.C. to A.C., and it is unfortunate that at present the legal position is still obscure. From enquiries made, it is understood that the matter will eventually be fought out by means of a test case.

Much consternation was created in the electricity supply world by a letter which appeared in the correspondence columns of this journal some years ago now, in which a resident in one of the towns on the Northern outskirts of London expressed satisfaction at the treatment received from the supply company, who provided him with a complete A.C. eliminator (possibly then worth ten pounds) when they converted their network in that particular area from D.C. to A.C.

Most supply authorities who have had to face a change-over have accepted the moral obligation to render sets connected to their mains suitable for the new supply, but the method adopted has had to vary with individual sets. The obligation is generally considered to consist of leaving the control of the set unaltered.

Variation in Supply Voltage.

In some cases, only an H.T. eliminator is supplied, or possibly a metal rectifier for battery charging. In general, no difference is made between home-buit and professionally built sets, but the new H.T. eliminator will probably only supply semi-smoothed current, reliance being placed on the smoothing apparatus of the original D.C. arrangement to complete the process. This seems quite reasonable, and it must be remembered that this modern development of mains-driven wireless receivers presents a very difficult and costly problem to supply authorities whose area happens to be mainly residential.

Before completing this article, mention should be made of a direction in which a number of supply authorities fail badly. This is in the matter of pressure at the consumer's terminals. By Board of Trade Regulation, the total permissible variation in supply voltage at the consumer's terminal is 4 per cent. up or down, but it is within the writer's experience to have his mains voltage vary by as much as 12 per cent. down on a cold winter evening, and 10 per cent. up on a bright Sunday morning.

Such a wide variation, which, of course, affects the filament brilliance of the rectifying valves in the mains units, as well as their anode supply volts, and, therefore, produces something of a square law effect, can be the cause of much trouble in a high-class receiver.

There are two remedies, first, to use a transformer with a tapped primary, which will allow for compensation to be made by means of a multi-way switch, and, secondly, to complain to the supply company, who cannot ignore such matters.

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.

Plug-in Coils for the Aerial Circuit.

I am making up a receiver on the general lines of "The Wireless World" Kit Set. Will you please tell me if there is any reason why ordinary plug-in coils should not be used for aerial circuit tuning?

C. W. N.

Commercial plug-in coils can certainly be used in the open circuit, although there would hardly be room for them in a set having the same layout as that described and illustrated. The coils should be mounted with a reasonable spacing between them, and if they are placed coaxially it is not impossible relationship interconnection should be such that one winding forms a continuation of the other.

Mains Safety Precautions.

I am told that a set operated from the mains should not be directly earthed in the usual manner, and in consequence am surprised to find that there is a metallic connection between the aerial and earth terminals of my new receiver. Would you recommend the fitting of an external earth condenser as a safety precaution?

E. P. E.

This depends on whether your supply is A.C. or D.C. If the former, it may be stated definitely that no series condenser is necessary as the set will be effectively isolated from the mains by a double-wound transformer. We expect that your mains are of this type, but if you have a D.C. supply, the condenser should be added, unless the aerial-grid transformer has separate windings. If it has, and if the insulation between these windings is adequate, the set will be quite safe, in spite of the fact that a test will show continuity between aerial and earth terminals.

Needle Scratch.

I have recently converted my set for gramophone reproduction, and notice that there is excessive needle scratch. This is not due to the pick-up itself, as the same instrument functions quite satisfactorily and without serious extraneous noises when used on a radio-gramophone belonging to one of my friends.

Can you suggest a probable cause of the trouble?

S. G. T.

Excessive scratch is often brought about by misalignment of the pick-up carrier, and we believe that attention to this detail will overcome, or at any rate mitigate, your trouble.

An accumulation of dust in the record grooves generally brings about a similar effect, and if you have not already done so we suggest that you will find it worth while to obtain a proper cleaning brush.

Coils and Convolutions.

I am winding a pair of H.F. transformers on similar lines to those described in the "Record III," but, due probably to the fact that a different method of construction is adopted, have become confused both with regard to the method of connecting the various windings and their direction.

I think that part of my trouble is due to the fact that the drawings show sectional windings, which are possibly easy enough to follow when copying the exact design, but are confusing in my own case. Would it be possible for you to give me a rough sketch showing these points in simplified form?

L. W. B.

We hope and think that this matter will be made clear to you by a consideration of Fig. 1, which shows all the windings for both medium-wave (M.W.) and long-wave (L.W.) windings. Confusion is most likely to arise when dealing with the neutralising sections, particularly with the single turn used for the medium band. It is convenient to consider these windings as continuations of the primaries wound in the same direction, and, in an attempt to make this matter more clear, we have shown by a dotted line an imaginary continuation between the two coils, although in actual fact there is no direct electrical contact. It makes no real difference, either to the direction of winding or to the ultimate connections of the various ends, whether the coils are in the form of single-layer solenoids or in sections.

Primary, secondary, and neutralising coils are connected in series, and arrangements are made to short-circuit all the latter when receiving on the medium band. In our drawing, external connections are indicated by lettering corresponding with that appearing in the diagrams of the original article.

Fig. 1.—Sketch showing arrangement of combined medium- and long-wave transformers for the "Record III." Special attention should be paid to the direction of windings and connections of the neutralising coils.

**Figures and diagrams are not transcribed in the text.**
H.T. Supply for the 1930 Everyman Four.

With a view to equalising the discharge of the coils in my 180-volt accumulator H.T. battery, I should like to arrange matters so that the necessary voltage-dropping devices are included in the set, in order that only one positive H.T. connection to the battery need be made.

I already have a 50,000-ohm wire-wound potentiometer, and take it that this component will be suitable for making critical adjustment of screening grid voltage.

E. B.

A skeleton circuit diagram showing the necessary modifications to the anode circuits is given in Fig. 2; your present potentiometer will do quite well for regulating screen voltage, but will pass a rather heavier current than is absolutely necessary, and some economy may be effected by inserting, in series with it, a fixed resistance of about 50,000 ohms at the H.T. positive end.

---

Condensers Out of Step.

I have been considering the design of the "Record III" receiver with a view to "lifting" several of its features for my own receiver, which is in course of reconstruction. One point puzzles me: is it not a fact that the variable condensers C₂ and C₃ cannot possibly operate in step with each other? I say this because their capacities are identical, whereas the inductance of the coils across which they are shunted is different. If this is correct, do you consider that the lack of synchrony is a serious disadvantage?

M. C. S.

What you say is quite correct, but in a highly specialised design of this sort it would be a difficult matter to arrange for synchrony, and in view of the fact that the tuning of the H.F. coupling is comparatively broad, the point cannot be considered as of any great importance.

---

Tuning Intervale Couplings.

I notice that, in tuning H.F. coupling transformers, it seems to be common practice nowadays to use condensers with a capacity of not more than 0.0005 mfd., whereas a year or two ago capacities of 0.0005 mfd. were generally employed. Why is this?

J. W.

By maintaining a comparatively high ratio of inductance to capacity, magnification is increased, and side-band attenuation is reduced. Both these factors are to the good, but unfortunately circuits designed on this plan tend to be less selective; this difficulty is nowadays overcome by providing more selective input arrangements than hitherto.

---

Single H.T. Supply.

Is there any objection to increasing the values of the decoupling resistances in the 1930 Everyman Four, so that a common voltage may be applied to all the anode circuits from an accumulator H.T. battery?

E. R.

As far as the variable circuits of the H.F. and first I.F. valves are concerned, this plan is quite in order. There would be no serious disadvantage in applying it to the detector valve if the voltage to be absorbed in the resistance is not very great; but it would be better, both for this circuit and for the screening grid, to include a potentiometer rather than a simple series resistance.

---

Filament Transformer Output.

I have a step-down low-tension transformer with a rated output of 8 amperes at 4 volts; would it be quite safe to use it in the construction of a three-valve A.C. set, for which the total current consumed by the heaters would be only 5 amperes?

T. S. W.

This depends on the voltage regulation of your transformer, and we would not like to offer a definite expression of opinion. Unless the regulation is good, the voltage will rise considerably if the load imposed on the secondary is considerably less than that for which it is apparently designed. We suggest that you should consult the makers.

---

FOREIGN BROADCAST GUIDE.

RADIO PARIS

(G. France).

Geographical position: 48°50' N 2°20' E.

Approximate air line from London: 214 miles.

Wavelength: 1,725 m. Frequency: 174 kc.

Power: 12 kw.

Time: Greenwich Mean Time.

Standard Daily Transmissions:

6.45 and 7.30 a.m. Physical Exercises (ex. Sunday: 8 a.m. news; 12.30 concert; 15.45 concert; Sundays: 15.30; 18.30 gramophone records; 20.15 or 20.30 main concert.


Opening signal: Several strokes on gong, followed by Westminster chimes, the latter repeated before all main transmissions.

Time signal: Twelve sharp short dashes, the last one indicating half or full hour. When closing down, the announcer's last words are: Bonsoir Messieurs, Bonsoir Messmadames, Bonsoir Messieurs, usually followed by the "Marseillaise."

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

The Amplion BA2 Unit has volume-handling capacity coupled with a degree of sensitivity far beyond normal. With adapter plate to fit different types of chassis and adjustable values of impedance for use with power valve or pentode. The BA2 means new power and mellow purity of reproduction. Ask your dealer for a demonstration.

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came first

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"1930 EVERYMAN FOUR"

"KILOMAG 4" & "RECORD 3" as specified by "Wireless World."

Complete with Wood Base and two Small Aluminium Screens. Beautifully finished in ROSEWOOD, WALNUT or JACOBEAN effects.

£3.0.0 Finished IMITATION LEATHER effect,

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IMPORTANT: These Cabinets are exactly as submitted to "The Wireless World" and are thoroughly electrically sealed.

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Metal Workers,

North Bridge Mills—BOLTON.

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- Popular Model 16/-
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THE 1930
"WHITE SPOT" CHASSIS

gives moving coil results at a fraction of the cost.

When ordering please state for which unit chassis is required.

The "White Spot" Chassis fitted with a fabric suspended cone will give really wonderful results. It can be supplied to take either of the following units: Argus, B.A., Brown Vee Movement, Blue Spot, Triatron and Ormond unit. Made in solid aluminium casing, weight about 2 lbs. Insist on having a genuine "White Spot" and ensure satisfaction and value for money.

THE WOLVERHAMPTON DIE CASTING Co.,
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Get improved reception with this long-life BATTERY

66 Volts
7'9"

Superior (Single Capacity)

60... 7/6
65... 7/8 11/12
66... 7/8 12/12
66... (with G.B. Tappings) 7/11

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60... 13/6
61... 14/3
60... 15/3
66... 22/-

Get Dublier's Booklet—"A Bit about a Battery"—from your Radio dealer.

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That tells its own tale—

The unique Semi-Oil Submerged feature of Britain’s Best Battery absolutely prevents surface leakage losses. No other Battery possesses this feature.

H.T. accumulators, 60 volts, 3 amp. hours type, Complete as illustrated, or 70 deposit & 3/6 per month for 3 months.

**Price**

22/6

**Double Capacity**

30/-

Type, 60 volts, 6 amp. or 30 deposit & 6/- per month for 4 months.

Londo. Distributors—CECIL POHLMAN, 77, Great Portland Street, LONDON, W.I.

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B & J

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Shale 1965.

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THE WIRELESS WORLD November 20th, 1929.

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That means Columbia—definitely the world's best batteries.

Use Columbia for all Receivers.

18d.

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PRESENT THE 

PERFECT PICK-UP

AS USED FOR THE TALKIES.

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GUARANTEED IN EVERY RESPECT.

THE ONLY PICK-UP WITH A STRAIGHT LINE RESPONSE FROM 25 TO 8,000 CYCLES.

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RECORD WEAR ELIMINATED.

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if you would have life, and colour in your reproduction.

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WE Guarantee the Best Accumulator Maintenance in South London. Fast rate circuits and expert personnel; meticulous attention given to top-coat, cleaning and drying of H.T. accumulators; troubleless free collection and delivery. Every battery includes G. Oldham H.T. and L.T. batteries.—Official Oldham Service Station, Audio Radio (associated with Stanley Products), 36, Hindman Rd., East Dulwich, S.E.22. Tel.: Nor Cross 4074.

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THE WIRELESS WORLD

Advertisements.

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W.W. as specified CABINETS.

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Now, you can buy the "Mite" complete with this New DRUM DIAL!

This new Dial will help at the front of your panel in the same way that the "Mite" assists at the back—it will economise space, and at the same time provide that efficiency and smart finish for which "Utility" Components are famed. Note how readily the readings can be taken through the central aperture of the Dial, and gauge the diminutive size by the size of the "Mite" Condenser—itself a very small component.

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1929 EVERYMAN 57/- the Set
NEW KILO-MAG 50/- RECORD III 50/-

CABINETS AND DIALS.

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FORTABLE GRAMOPHONE 50/- (W/W) 2/6

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That's all you do!

Not a single wire to disconnect

Simplicity itself—that's the Oldham H.T. Charger. In use and construction it is absolutely free from complications. Entirely automatic in action. Plug in—and the Charger gently restores your H.T. Accumulator to "concert-pitch." Plug out—and your Set is ready for use. No troublesome wires to connect or disconnect—no time wasted in fiddling with terminals—no possibility of harm coming to yourself or your Set.

Forget re-charging worries—fit an Oldham H.T. Charger to-day—suits any make of H.T. Accumulator—nothing to go wrong or wear out—it is built for years of service. Ask your dealer to tell you all about it to-day.

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that bear the
greatest name
in wireless

A battery by Marconiphone!
Made to expert specifications
—used in experimental work
by the Marconiphone engineers.
That is the battery you get
when you insist on "Marcon-
iphone." It gives your set
better tone, fuller volume,
through hundreds of pro-
grammes. Marconiphone
Co. Ltd., 210–212 Tottenham

Popular types: 66-volt, 9/6
108-volt, 15/6

Super-Capacity: 60-volt, 20/-

MARCONIPHONE

BATTERIES

IMPROVE ALL RADIO SETS

The first and
greatest name
in wireless.
The Wireless World and Radio Review

The Paper for Every Wireless Amateur

Wednesday, November 27th, 1929

Burton Self-locating Valve Holder

1/- each

Manufactured by C. F. & H. Burton
Progress Works
Walsall, Eng.

Folks!

Remember that "Air Chrome" is the magic password to natural radio... uniform frequency response from 60 to 10,000 cycles... the double diaphragm principle... balanced tension... gives a brilliantly realistic reproduction of music, speech and song. Hear it at your dealer's - to-night!

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Cabinet Models from - - £3 19 6
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RADIOGRAND
12/6

Telsen Electric Radio Grand Co. Ltd.
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Low in Price - Efficient in Performance

The Radio-gramophone you have waited for

Gives Perfect Radio & Gramophone Music on one instrument for battery or mains operation

The Craigweil Radio Gramophone

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ELECTRICAL RECORDING

DELIVERED

ELECTRICAL REPRODUCTION

Your gramophone can be easily electrified... economically, too

Electrical recording is undoubtedly the best method of making a record. Similarly, Electrical reproduction is the only way to make best use of it. It gives controllable volume, infinitely finer tonal quality, and if a B.T.H. pick-up is used, far less record wear. Tidious "handle-winding" is eliminated, too, if a B.T.H. electric gramophone motor is used.

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B T-H

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**H.T. UNITS**

- **Type 3005**
  - £3-17-6
  - It is cheaper to use a Philips Battery Eliminator and take your current straight from the mains than to buy rapidly wasting batteries at frequent intervals. Also it improves reception by the complete elimination of battery voltage-drop and makes your set absolutely reliable.

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  - £5-15-0
  - One of the three types of Philips Battery Eliminators meets your needs. Types 3009 and 3002 work off A.C. mains, Type 3009 giving G.B. as well as H.T. current. For D.C. mains there is Type 3005.

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

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**PHILIPS for Radio**

**PHILIPS RADIO, 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.
We much regret that a printers' error occurred in the advertisement of the Westinghouse Brake & Saxby Signal Co., Ltd., on page 2 of last week's issue, for which that Company were in no way responsible... The price of the H.T.3 Metal Rectifier should have been given as 21s. 0d.

The Publishers,
"The Wireless World."

Get Your Copy
of this useful Diary, full of information for wireless users!

"The Wireless World" Diary, now in its sixth year of publication, contains facts and figures to which wireless amateurs constantly refer, together with ample space for memoranda and notes concerning individual sets and other radio matters.

PRINCIPAL CONTENTS:

From All Booksellers and Stationers
Published jointly by
"THE WIRELESS WORLD," LONDON, E.C.4 and CHARLES LETTS & CO.

PRICES
Cloth Board, 1/- net. By post 11/-. In Leather Case, with pockets, pencil and season ticket window, 2/6 net. By post 2/7.-

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PUSH-PULL AMPLIFICATION

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 the harshness or "chatter" due to overloaded valves.

A descriptive leaflet, Wb412, gives full particulars, Transformer details and circuit. It should be in the hands of everyone interested in the combination of ample volume and quality reproduction. Ask your dealer or write direct.

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FERRANTI LTD.
HOLLINWOOD.
LANCASHIRE.

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The Grosvenor Battery
BRITISH MANUFACTURE

GROSVENOR BATTERY CO., LTD., 2-3, White St., MOORCATE, LONDON, E.C.2. Phone: Met. 6865

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

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

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

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

TANNNOY

MAKE YOUR SET "ALL ELECTRIC"
—and do away with dry batteries, which are always causing trouble.

Don't worry about an all—mains receiver, but fit a TANNNOY Unit to your present set and get better and more selective reception.

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Why be a "panel" patient when TROLITAX can cure your "panel" ailments once and for all. Not only that but TROLITAX will bring fresh life and colour to your set.

Supplied in many handsome wood finishes, there is one to match your set or cabinet. TROLITAX, besides having perfect insulating properties, is extremely workable. Ask your dealer all about this amazing new substance.

TROLITAX


Phone: Museum 8630 (4 lines).

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The "Dual Astatic" is the H.F. Choke that ensures perfect amplification from your screened grid valve at all broadcast wavelengths, a factor of vital importance now that the Brookman's Park Regional Transmitter is working. It entirely eliminates blind spots and absorption.

Its efficiency is demonstrated by the fact that the Wireless Press have been unanimous in its selection for inclusion in their star receivers for 1929/30. It is, in fact, the only High Frequency Choke guaranteed suitable for all modern circuits as well as other circuits. Fit one in your set to-day and benefit by R.I. research, which has received glowing tributes from Radio Scientists all over the world.

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Write for the Dual Astatic Folder and the new R.I. Catalogue—gratis and post free.

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The Famous
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DE LUXE
LOUD-SPEAKER
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from 55/-
to 25/-
1000 only
as an advertisement.
Ask your Local Dealer or
send direct.

CUT OUT
THE NEW
STATION
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BULLPHONE
DUAL RANGE
COIL
12'6

BULLPHONE
4-Pole
Adjustable
Tone
CONE UNIT
15/-
Adjustable
Cone Chassis,
suitable for
any Cone
Unit,
per 3/- pair

Obtainable from your Local Dealer or direct from:
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The
IMPERIAL PINT
and T.C.C.

THE Imperial Pint is the Standard pint—
the pattern for all pints. Many pint
pots are etched with the Imperial Pint
mark—such a pot, filled, contains true measure.
There is also a standard among condensers—
and that is T.C.C. Every condenser marked
"T.C.C." is an assurance that it is up to
standard. T.C.C. Condensers, because of their
accuracy, dependability and good service are
to-day the recognised standard of all con-
densers—that's the opinion of experimenter,
scientist and amateur alike. Remember this
when next you want a condenser.

The illustration above is of the 2 mfd. Paper Con-
denser (Licensed under Design Reg. No. 723,471)
Price 3s. 10d.—Other capacities from .005 to 10
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November 27th, 1929.

THE WIRELESS WORLD

Advertisements.

500 HOURS

FAULTLESS SERVICE

AT A COST OF ½d PER HOUR

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FOR YOUR RADIO SET

TAKING TEN MILLIAMPERES

EVER READY WIRELESS DRY BATTERIES ARE TROUBLE-FREE, AND ENSURE THE PUREST AMPLIFICATION.

EVER READY "Popular Power"
(For 10-15 M.A. Emission)
60 VOLTS ..... 12½
64 " ..... 14½
99 " ..... 22½
105 " ..... 24½
120 " ..... 27½

EVER READY
BRITAIN'S BEST BATTERIES

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The battery that keeps interest at high tension!

60% longer life!

A most important consideration, is it not? A battery that lasts longer, that loses nothing of its power when out of circuit, that develops no "crackle."

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**DRY BATTERIES**

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

40 WATT Model £13-0-0
85 WATT Model £19-0-0

Power Supply Units our Specialty.

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**PUT HYDRA for safety BETWEEN YOUR MAINS AND SET**

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

Fit HYDRA for safety.

In all the best ELIMINATORS you'll find

**HYDRA CONDENSERS**

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

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LOTUS Components
will make the best of your set

Build strength, efficiency and reliability into your set. Build with success and enjoyment. Build with Lotus components. Every Lotus component, from a variable condenser to a simple switch, is the product of experience and experiment—a masterpiece of mechanical perfection. Lotus components are easy to fix, quick to assemble, neat, compact and sturdy. They work together in perfect harmony and ensure instant fulfilment of your highest hopes.

From all Radio Dealers.

LOTUS COMPONENTS

Lotus Drum Dial, 29/6.
Lotus Valve Holders, all types from 1/3.
Lotus Variable Condensers from 5/-.

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

GARNETT, WHITELEY & CO. LTD., LIVERPOOL.

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But:—  

Do you appreciate that within the next two weeks you will make a decision as to what music you will have for Christmas? Whether it is for your Club or your Home, you will require some instrument to entertain your friends, and why not make it a Radiogramophone and be up to date?

The R.G.D. Radiogramophone.

An entirely new six-valve instrument giving the highest possible quality for both radio and record, with ample volume, incorporating the latest design of moving coil speaker, operates entirely from electric mains, A.C. any voltage, or D.C. 200 volts or over. 

£75 in Oak. £80 Mahogany.

Place your order now to ensure delivery, to avoid disappointment.

Literature on application to

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COMBINED R.C. COUPLING UNIT AND VALVE HOLDER, Complete with Dumetohms 7/-

H.F. CHOKE, Four Types to meet all uses. Each 4/6

If unobtainable from your dealer, write direct to us giving his name and address.

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BC 252/0

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RECTIFYING VALVES

For:
- Reliable H.T. Supply
- Dependability
- Long Life
- High Efficiency
- Output
- Easily varied and smooth

The rectifier that has stood the greatest of all tests—TIME.

Representative Types

**TYPE 506**
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- Rectified current 75 mA.
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- Half wave. Filament voltage 4 volts. Anode voltage 400 R.M.S. Maximum rectified current 60 mA.
- Price 15/-

**TYPE 373**
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- Price 15/-

Obtainable at all Radio dealers.

PHILIPS for Radio

Advert. of PHILIPS RADIO, PHILIPS HOUSE, 145, CHARING CROSS ROAD, W.C.2

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M.P.A. RESEARCH DEPARTMENT OFFERS YOU THESE 3 NEW M.P.A. SPEAKERS, SCIENTIFIC MASTERPIECES! EACH ONE A TRIUMPH OF GOOD LOOKS, TONAL PERFECTION AND VALUE! HEAR AND COMPARE!

THE NEW M.P.A. POPULAR PLAQUE
A BETTER INSTRUMENT THAN EVER BEFORE—and AT A LOWER PRICE! Fitted with the wonderful new Mark VI unit: with new robust protecting grille a back; mounted on wooden base. Remarkably sensitive, clear and loud! Even response over wide range of frequencies, attractive mahogany or oak finish. 25/-

* Don’t forget also to hear the new Mark VI Speaker Unit. It is a 12/6, chassis with 14" wood baffle and 9" cone costs 10/-; full mounting instructions are given.

THE NEW M.P.A. POPULAR CABINET
ANOTHER EXAMPLE OF M.P.A. VALUE! An attractive speaker with a first rate performance. Yet low in cost! Like the Popular Plaque, it has the unique Mark VI movement. Extremely sensitive. Splendid reproduction. Exceptionally wide range. Handsome polished oak cabinet. Box resonance eliminated. Hear it and you’ll buy it! Price 45/- Mahogany Cabinet 47/6

THE NEW M.P.A. MOVING COIL SPEAKER
SEE AND HEAR THIS AMAZING NEW SPEAKER!! Whatever price you are prepared to pay, you will not get anything better! Here indeed is "Hearing that is almost seeing!" Built on entirely new principles. Permanent magnet. No separate energising current required. Patent baffling system eliminates box resonances. Glorious tone! Dignified design in polished oak. A delight for the eye and the ear! Complete Unit only on base. 15 Gns.

M.P.A. products above 50 can be purchased on easy deferred terms. Ask your dealer to-day.

"One Knob Control"
"No Hand Capacity"
"Stability"

The above are only a few meritorious features of the

IGRANIC
NEUTROSONIC
SHORT WAVE
RECEIVER

12½ to 70 Metres

Send for particulars of this Remarkable Receiver, addressing your request to Dept. U. 301.

A Pick-up of Distinction

The R.G.D. is something different.

The R.G.D. Magnetic Pick-up is designed after years of experiments, and we believe it to be as perfect as possible. No record wear, perfect tracking, a scientific instrument, specially developed for moving coil speaker reproduction. Price £3 in bronze, £3-3-0 in oxidised silver.

Literature on application.

The Radio Gramophone Development Co.,
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EBONITE
H.F. 'Choke Former

A first class quality Former, that worthily upholds the reputation of Redfern's for high grade components at moderate prices.

FOR BASEBOARD MOUNTING.
BASE CAN BE REMOVED FOR MOUNTING HORIZONTALLY.

Specification for winding:
In each slot wind 163 turns of No. 36 S.W.G., D.C. Wire.

Redfern's Rubber Works
Hyde, Cheshire. Ltd.

DICTIONARY
of WIRELESS
TECHNICAL TERMS

Compiled by S. O. Pearson, B.Sc.

Issued in conjunction with "THE WIRELESS WORLD."

THIS volume contains concise definitions of terms and expressions commonly used in wireless telephony and telegraphy, and serves as a guide to all those interested in wireless who come across, from time to time, unfamiliar words in their reading. Well illustrated and cross-referenced.

Price 2/- net. By post 2/3.
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GREAT STRENGTH—RIGIDITY—LONG LIFE!
THE THRHT FOR POWER.

At the recent Conference at The Hague the International Consultative Committee which deals with the technical aspect of radio communication classified the wireless wavelengths and also made the decision to limit the broadcasting energy of telephony transmitters to 100 kW. It would seem that having once set this enormous power as a maximum this is being regarded as the ultimate goal to which the broadcasting organisations of Europe should aim, without consideration of whether or not it is for the ultimate benefit of listeners in general. Some short time ago, writing under the title of "The Battle of the Giants," we pointed out the unfortunate effects which appeared to be inevitable as a result of individual European States acquiring higher powered broadcasting transmitters.

Far from curbing the ambitions of some countries to install giant transmitters, the recent decision at The Hague tends to support this race for power, and it does not require much imagination to visualise the increasing difficulties in the way of distribution of broadcasting services in the near future as the number of giant transmitters increases.

In the earlier days of broadcasting, both in the United Kingdom and on the Continent, the pioneers were satisfied with the erection and operation of stations providing from 1 to 1½ kW in the aerial. Germany, we believe, was the first country to increase the power of its stations, and still to-day has retained 4 kW. Transmitters as a general standard. As other countries in Europe began to put up broadcast transmitters their inclination was to copy or improve upon the example set by Germany, and so 5 and 10 kW. transmitters became quite usual. The schemes which have now been put forward by some of the principal European countries for improvements in their broadcasting organisation all call for higher power transmitters. Germany has until recently implied that the range of the German broadcasting stations was adequate for its requirements, but latterly this view has been modified and a reorganisation of the German broadcasting system is, we understand, now contemplated, having as its object the establishment of a number of transmitters of very much higher power.

Shouting One Another Down!

The German scheme is to install the new high-power stations as additional to the present transmitters and to combine them into groups, the lower-power transmitters operating on national common wavelengths with the high-power station of each group. In view of the energy which Germany has already shown in the development of her broadcasting system there seems little reason to doubt that we shall shortly be faced with a position where the German transmitters will once more dominate Europe and stimulate other States to follow her example.

These changes are coming about in spite of the fact that the insensitive crystal receiver is dying out and being replaced by valve sets which are capable of satisfactory reception over greater distances without so much necessity for high power at the transmitting end. The higher the power of a station, generally speaking, the more costly is its construction, and consequently the harder it would be to bring about a modification of the European broadcasting system in favour of lower power when at a later date the need for some such change becomes urgent. So far our own reception of the British broadcasting transmissions has not been seriously interfered with, but, as the giant stations rise up nearer and still nearer to our shores, it seems inevitable that we shall no longer be able to remain indifferent to the menace.
THE following design is given in response to numerous requests from readers for an A.C. version of the "Kit Set" described in the issues for September 18th and 25th.

Essentially the circuit remains the same. It has been found that the turns given for the tuning coils and H.F. transformer function equally well with indirectly heated valves. The only alterations are concerned with the method of volume control, the biasing of the detector valve, and the loud speaker feed. With A.C. valves, of course, the filament control of the screen-grid valve as a means of volume control must be abandoned. Its place is taken in the present design by a potentiometer arrangement controlling the potential of the screen-grid. For this purpose a 50,000-ohm moulded resistance is used in conjunction with a variable wire-wound resistance of maximum value, 25,000 ohms. This ensures that the maximum screen-grid potential specified by the valve makers is not exceeded, and at the same time gives an exceedingly smooth control of volume from zero upwards.

The resistance values in the circuit are suitable for valves in the Marconi series with indirectly heated filaments. The first valve is an M.S.4, the detector an M.H.L.4, and the power valve an M.L.4.

By a merciful dispensation, grid current starts in the M.H.L.4 with the grid slightly negative. If the anode potential is kept between 50 and 75 volts it is possible to work this valve as a leaky grid detector with the grid returned to cathode, i.e., with zero grid bias. This conveniently solves what would otherwise be a troublesome problem; there is no further need for the grid potentiometer specified in the original design, neither do we require a separate cell for positive bias.

The M.L.4 is an output valve of the same calibre as the P.625, and is capable of driving a moving-coil loud speaker. The filter feed circuit was introduced primarily with the object of keeping strong L.F. currents out of the eliminator, but it also serves the useful purpose of bypassing the steady anode current of about 18 mA. from the loud-speaker windings.
Some revision of the anode feed arrangements has been found necessary. There are still two positive H.T. tap-pings in order that additional smoothing may be provided for the detector. Connections between the receiver and the eliminator are made through shrouded plugs and sockets instead of terminals, so that if the eliminator is inadvertently switched on with the leads disconnected no damage can result through short-circuiting.

The eliminator is built in a simple tinned-iron case, details of which are given in Fig. 6. The base is of three-ply covered with tinned iron lapped over the edges. The cover pushes down over the edges of the base and is secured at one corner by a length of 2B.A. screwed rod and in the diagonally opposite corner by a wood screw driven into the edge of the vertical sub-panel supporting the mains transformer. This transformer is mounted horizontally, and the end carrying the terminal strips is supported from the base by small brass feet, one of which is used for earthing the core to the metal base. Although a five-pin horizontal valve holder similar to that used for

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View underneath the base showing choke filter output circuit and shrouded terminals for connections to the eliminator.

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Fig. 1.—Complete circuit diagram of receiver and eliminator unit. C1, 0.0005 mfd.; C2, C9, 0.0033 mfd.; C3, 0.0002 mfd.; C4, 0.0005 mfd.; C5, 0.0001 mfd.; C6, C7, 0.1 mfd.; C10, C11, 2 mfd.; C12, C13, 2 mfd. (500v. A.C. test); C14, 4 mfd. (500v. A.C. test); R1, 2 megohms; R2, 40,000 ohms; R4, 601 ohms; R5, 50,000 ohms; R11, 1,000 ohms; R12, 25,000 ohms maximum; CH, 110 henrys; CH2, CH3, 32 henrys.
The Wireless World Kit Set A.C. Mains Model.—

The screen-grid valve has been specified, only four of the contacts are utilised, the centre one being ignored.

Current from the A.C. mains is fed to the Parmeko Type No. 2 A/2 transformer, which provides windings giving 180 + 180 volts for rectification by a full-wave U5 valve, 5.5 volts for heating the U5 filament and 3 ampere at 4 volts for the indirectly heated receiving valves.

After rectification the H.T. current is smoothed first by a 4 mfd. condenser tested at 500 volts A.C. and designed to work on 250 volts A.C., and then divides through a 32-henry choke to the H.F. and output valves and through a 110-henry choke to the detector. Additional smoothing is provided on the receiver side of each choke by 2 mfd. condensers, also rated for a working voltage of 250 A.C. To avoid the possibility of shocks in the event of any fault developing in the eliminator, the transformer core and the common negative lead are bonded to the case at E (Fig. 3). No switch or fuses have been included as a switch on the eliminator itself leaves the mains leads live. The set should be switched off at the main, and the fuses associated with the power point should be reduced to 1 or 2, and at the most 5 amperes.

The disposition of the eliminator unit is left to the discretion of the reader. It may be concealed behind the set or mounted in a sub-base under the receiver cabinet as shown in the title of this article. Details of a suitable sub-base are given in Fig. 7.

With regard to the layout of parts in the receiver itself, the position of all the more important components associated with the H.F. and detector stages remain un-

Eliminator with cover removed showing method of mounting in suggested sub-base.
Fig. 4.—Dimensioned layout of components above and below the receiver panel. A = 3/8in. dia.; B = 5/16in. dia.
Fig. 5.—Complete wiring diagram of receiver. Wires passing through the base are identified by corresponding numbers, and connections to the coil units are indicated by letters corresponding to the coil details on page 262 of the September 18th issue. The common negative lead is earthed to the metal base at K through one of the fixing screws of the S.G. valve holder.
Accordingly in the article the A.C. values specified, the performance is quite equal to the standard set by the original set. There is a slight tendency to instability towards the bottom of the long-wave range which suggests a revision of the long-wave primary turns. It is simpler, however, to reduce the screen-grid volts slightly, and this can be done without serious detriment to range or quality.

The eliminator, even when mounted immediately below the receiver, functions without the slightest trace of hum, and there is the same absence of background noise as in the original battery model.

The values of resistance specified for the screen-grid potentiometer give a range of 0 to 63 volts for the screen-grid potential. For screen-grid valves requiring a higher potential a Varley resistance of maximum value 30,000 or even 50,000 ohms should be used.

With a 50,000-ohm resistance in series with the detector valve a measured anode current of 2.8 mA was obtained with the particular valve used showing the anode volts to be 49; a convenient value for grid rectification with zero grid bias. A higher anode voltage and +15 volts grid bias were tried, but without any definite improvement in efficiency.

This receiver is available for inspection at the Editorial Offices, 116-117, Fleet Street, London, E.C.4.

Fig. 6.—Leading dimensions of tinned-iron case for eliminator unit. The base is a piece of three-ply wood with the metal lapped over the edges. The leads are bound with insulating tape or sleeving and passed through a slot in the cover. 189 volts. With this voltage on the anode of the M.L.4 output valve a bias of -18 volts is not quite enough.

Accordingly a 1,000-ohm resistance has been introduced in the anode circuit. This in conjunction with the D.C. resistance of the chokes reduces the voltage on the anode to about 165, for which a bias of -18 volts is suitable. At the same time, the 1,000-ohm resistance and its by-pass condenser assist in smoothing and provide a measure of decoupling for the last stage in addition to that provided by the choke-feed output.

For a full description of the method of tuning, the reader is referred to the article on page 307 of the September 25th issue.

Fig. 7.—Suggested sub-base for housing the eliminator underneath the receiver.
A Useful Hint on the Controlling of an Anode-Bend Detector.

By BERTRAM HOYLE, M.Sc.

There is a distinct indication in modern wireless receiver design of a tendency to follow one of two divergent policies. One is to design a very perfect musical reproducer, which has of necessity to sacrifice extreme selectivity and range, making it more or less a local station and 5XX set with nearly perfect side-band retention. The other is to design a wireless set from the point of view of obtaining most broadcast transmissions in Europe, both musical and otherwise, and that has a selectivity such that it can tune in to the centre of a distant transmission situated some 8 or 10 kc. away from some much more powerful transmission and still leave no background of the latter.

A wireless set in which this is brought about by virtue of its highly selective tuning apparatus must of necessity, completely cut out all the side-band frequencies approaching 5,000 cycles. This causes the distant station to take on quite an unnatural tone; boominess being a mild description of the malady, especially if on a coil-driven loud speaker. There must be many potential set builders who are divided in their choice between the two limiting types of set above mentioned.

The writer, whose chief aim is good-quality music, favours the type of set employing two screened-grid H.F. stages (one tuned-anode, one transformer stage), anode-bend detector and two low-frequency stages.

Fig. 1 indicates the essential parts of the detector and associated circuits and their constants. Scientific wiring is used for all H.F. and L.F. components. Decoupling resistances and condensers are inserted at all danger points.

High notes are well retained by employing only medium-loss coils in the H.F. part of the set, so that there is no great selectivity. The PM6D valve worked with low anode resistance also helps in the retention of high notes together with as small a capacity from anode to negative filament as practicable, such as 0.0001 mfd., or less in the case of really strong transmissions. Low notes are generously provided for by the use of a 0.1 mfd. mica feed condenser to the grid of a P625 as the penultimate valve. This valve is made to work at 250 volts with 20 mA., and has a specially constructed choke giving...
The Selectivity-Quality Problem.—

80 henrys at 20 mA. in its anode circuit. The fact that this choke is run well off the saturation point¹ and the transformer (a Ferranti AF5C) carries no magnetising current again helps in low-note retention.

To revert to the point of these notes, namely, high selectivity with good quality. The writer, in using this set at first, definitely did not attempt to listen to stations of good strength, with only 10 kc. separation, as there was sufficient overlap to cause trouble, the H.F. coils as already mentioned being made purposely not low-loss coils. Neither is the set used on any transmission that may be weak at the time that it is wanted. There are now many strong stations rather closely placed on the long-wave band which would be well worth listening to at times; but the selectivity demanded is such that their quality is impaired by the time they are tuned in.

To take a concrete example, Berlin, Konigs wusterhausen 183.5 kc. (1,634.9 metres) is received in England at a very considerable strength, but is only separated by 9.5 kc. from Daventry 5XX, which is immensely stronger.

By putting up the detector bias and by close adjustment of the voltage applied to the detector from the potentiometer (R₂ in Fig. 1), a state of affairs can be reached where there is a very definite cut-off of all signals below a certain strength. This means that on tuning in to Berlin, say, on this none-too-selective receiver, the signal strength (in tune with Berlin) is B, and the strength of Daventry at this tune point is C (Fig. 2). A suitable bias and characteristic to enable the desired cut-off to be obtained is revealed in Fig. 3.

In the example chosen the strength of signal C from 5XX is insufficient to reach the rectification point of the characteristic in use; whilst the strength of that from Berlin is B, and is made sufficient to reach a reasonably straight part of the characteristic to be rectified. To do this requires a not very selective set, with two good H.F. stages and fairly strong transmissions to work on, and a fine control of detector volts. Then if the fringe of an unwanted station gives a strength C (Fig. 2), whilst the wanted one gives a strength B several times greater, it is quite easy to obtain the clear, crisp quality usually associated with a non-selective set, combined with a high order of "apparent" selectivity.

The chief drawbacks to making use of this device are:

(1) That it is another knob to control, and it tunes rather critically.

(2) That the set when left in this condition is insensitive unless all tuning dials are critically operated together.

Normally, if any two dials get near a station's setting something is heard of it, and one can proceed to get it easily. Very close logging would be necessary if much use were to be made of the method. Using the PM6D and a bias of −15 to −18 volts enables one up to keep up the detector anode voltage to about 150, which gives a very straight line characteristic and, therefore, excellent purity when signals are put on to it.

Those who would like to obtain better quality from stations otherwise too close together in wavelength to permit of it being accomplished without too highly selective coils and circuits, should try a few experiments on the above lines of using variable bias and H.T. voltages, reducing the H.F. selectivity if necessary to regain the high notes.

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1. The choke contains 3½ lbs. of copper and 11 lbs. of iron.
Operating Notes and Hints to Constructors.

The builder of a set like the Record III gets something more than the mere satisfaction of attaining the maximum sensitivity from its single high-frequency stage. Until the price of screen-grid valves reaches an appreciably lower level than that prevailing to-day, the single high-efficiency stage is likely to appeal, not perhaps so much on the score of reduced initial outlay as on the question of upkeep cost. No one should belittle the advantages of the multi-stage cascade high-frequency amplifier, but there are several reasons against its general adoption in this country—particularly in cases where other and perhaps simpler methods will yield the desired results.

No published receiver design can ever fully meet the precise requirements of everyone who may consider its main features to be attractive, and consequently it will be as well to devote a few words to modifications—permissible and otherwise. At the outset it should be made quite clear that anything approaching a sweeping alteration should be introduced with some hesitation and only if one has considerable experience. Liberties cannot be taken with impunity with a “500 times” H.F. amplifier; this holds good particularly with regard to screening, which can hardly be less complete than that of the original model, although there are admittedly other ways of carrying out this important part of the construction. At a pinch, it would be possible to dispense with a completely closed compartment for the aerial coils and their tuning condenser, but there remains the chance of un-desirable interaction between these coils and those parts of the H.F. anode circuit—including the valve anode itself—which are of necessity exposed.

Problems of Selectivity.

In order to provide high amplification without serious sideband cutting, the constants of the tuned intervalve circuit are such that this part of the receiver contributes less than usual towards its overall selectivity. This is inevitable, but, thanks to the provision of a separately tuned aerial circuit, the set is not particularly prone to interferences, and is, indeed, well above the average standard in this respect. In difficult situations, and when working on a wavelength close to that of a nearby station, it is a good plan to reduce aerial coupling (by moving the tap connection nearer to the earthed end of the secondary coil) to a value rather less than that providing loudest signals.

In some cases it will be considered worth while to make provision for continuously variable aerial coupling, although experience shows that it is often wise to defer

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1 The Wireless World, September 4th and 11th, 1929.
More About the Record III.—

This alteration till some practice has been had in the operation of the simpler semi-fixed coupling as described. Closed and open circuits may be linked through a small variable condenser in the manner familiar to most readers: this arrangement is much simpler than the alternative of using swinging coils, and does not greatly complicate the set. A suitable form of connection for continuously variable capacity coupling is given in Fig. 1, from which it will be observed that one pole of the wave-range switch is omitted. If a control condenser of the conventional capacity (0.0001 mfd.) is used, it will be necessary to move the taps on the secondary coils L₂ and L₃ towards their high-potential ends in order that sufficiently close coupling may be effected under all conditions.

Provided that a coupling condenser of sufficiently small overall dimensions is chosen, it may be mounted on the front panel, between the dials of C₄ and C₅.

Instead of picking up an artificial centre point on the heater transformer secondary by connecting the cathodes to a potentiometer slider it is quite permissible to use a centre-tapped winding in the manner shown in Fig. 2. The bridging condensers of 0.005 mfd. (C₁₁ and C₁₂) used with the original arrangement must be retained, and should be mounted in the set itself rather than in the eliminator, in order to avoid long leads; this will necessitate a three-wire cable between receiver and external transformer.

Questions are sometimes asked as to the percentage of sideband loss at given audio-frequencies; unfortunately, anything in the nature of a definite reply is quite out of the question, as everything depends on how the input filter circuit is operated. Adjusted to the best advantage, there need be no appreciable loss; indeed, by very skilful operation it is possible to give emphasis to upper sideband frequencies. To make the best use of this valuable feature of the receiver, it is easiest first to tune in the desired signal with the loosest possible coupling between open and closed circuits, and then to tighten the coupling until tuning is appreciably broadened. If detector over-loading is produced, a certain measure of control is afforded by reducing the capacity of the semi-variable aerial series condenser, afterwards retuning the open circuit. Incidentally, selectivity can be controlled to a certain extent by this adjustment, which should not be forgotten when interference cannot be cut out by methods already discussed.

It has already been stated that a very simple eliminator is suitable for supplying the set with high-tension current, thanks to the comparatively elaborate decoupling devices and to the fact that a single L.F. valve with a choke filter output is used. Tests have been made by introducing artificial resistance and inductance common to all anode circuits, and it has been found impossible to provoke either H.F. or L.F. oscillation. Of course, this is apart from the question of smoothing; reasonable precautions must be taken to obviate hum, but the receiver is not particularly prone to trouble from this source, partly because it includes H.F. transformer coupling.

A suggestion for a suitable H.T. eliminator is given in Fig. 3. Here it is assumed that the power transformer will include a low-tension winding for feeding the heaters, as this is the most economical procedure except where an existing high-tension eliminator can be used.

**Safeguarding the H.F. Valve.**

In the original article it was suggested that a common voltage of anything up to 160 might be applied to the receiver: it should, perhaps, be pointed out that this is rather in excess of the maximum specified for the H.F. valve by its makers, but, as the current consumed by a screen-grid valve is largely determined by screening grid voltage, this was not considered to be of great importance. To be on the safe side, there is no harm in substi-
More About the Record III.—

Substituting a voltage absorbing resistance of appropriate value for the 600-ohm decoupling resistance $R$, in cases where the maximum pressure is appreciably in excess of 150 volts. As an alternative, a separate high-voltage feed may be provided for the output valve.

Attention has already been directed to the need for thorough screening. Decoupling, or the isolation of individual oscillatory circuits, is almost as important, particularly in a high-magnification mains-fed receiver, and attention is drawn to Fig. 4, which shows how the high-frequency oscillatory components of plate and screening-grid circuits are deflected back to the cathode of the valve concerned. Similarly, it is vital that exposed grid and plate leads of H.F. and detector valves should be as short as possible, and it is for this reason that the connecting wires are passed through holes in the metal base immediately above their terminals.

Checking Transformer Windings.
The H.F. transformer windings are of necessity somewhat complicated, and, in the event of failure to balance the set, suspicion will naturally be directed to the connections of the neutralising coils. The writer can hardly do better than refer to those who are in difficulties with regard to this admittedly rather bewildering business of multi-section windings to a simplified sketch in the "Readers' Problems" section of last week's *Wireless World*, which should make the matter quite clear.

While on the question of neutralising, an apparent inconsistency in the design should be explained. It may logically be asked why a balancing arrangement is provided on the long-wave side, although the "goodness" of the coils for this wave-band is admittedly no better than that of those used in other sets that need no adventitious aid to stability. The explanation is simple. A feed-back path is provided through the medium-wave balancing winding and its associated condenser; this cannot be avoided unless a rather complicated addition to the present switching is made, and consequently it was considered simpler to balance on both wave-bands.

Any difficulty in getting the receiver into a state of satisfactory operation is likely to have its source in the H.F. amplifier, but, due to the use of a "decapped" detector, it is inconvenient to test this valve by the method of substitution. In the event of trouble, it is useful to remember that the detector and L.F. amplifier can readily be tested by removing the flexible lead from the H.F. valve anode and joining this wire to the aerial via a 0.0001 mfd. fixed condenser. With this connection, the set should function as a detector-L.F. combination.

Several readers who require a somewhat less ambitious receiver have asked for suggestions as to how the set under discussion may be "tamed." After a careful study of the technical considerations leading up to the main features of its design, it will be generally agreed that any sweeping alterations to this end are impracticable, and in such cases it seems wisest to recommend an A.C. version of *The Wireless World* Kit Set.

Regulating Screening Grid Voltage.
In the published "List of Parts" the value of the "Truvolt" wire-wound potentiometer ($R$) for controlling screening grid voltage was given as 50,000 ohms. This was used in the original model, but, in the interest of easy adjustment, it was considered advisable to replace this by a value of 25,000 ohms; this appears in the inscription under Fig. 7. Incidentally, the setting of screening grid voltage is fairly critical. This adjustment can be made very accurately with the help of the detector anode milliammeter. The best procedure is to work on strong local signals, with either grid or plate circuits of the H.F. valve detuned to avoid any stray effect. The potentiometer is then adjusted for maximum deflection of the meter, which will indicate that the applied pressure is correct for maximum magnification.

AN IMPORTANT

COMmencing with the December 4th issue the price of *The Wireless World* is to be 4d. instead of 3d.

This bare announcement is made by our publishers, but we feel that our readers may, quite naturally, expect to be taken a little more into our confidence and be told why it is that we ask them to pay 1d. more for their wireless journal in future.

The reasons for the increase will, we believe, be appreciated with very little explanation by our readers who have watched the rapid developments of wireless both in theory and in practice. The design of a receiver a year or two ago was at the most a matter of two or three weeks' work, the construction was comparatively simple and no great amount of theoretical investigation or measurement was involved. But to-day the position is very different, requirements of modern receiver design necessitating many weeks of careful laboratory measurement and investigation before the finished design is arrived at and the receiver ready to be constructed in *The Wireless World* workshop. The same view must be taken in regard to the preparation of theoretical articles, whilst *The Wireless World* alone amongst its contemporaries conducts a free technical information department for the benefit of its readers. These are all factors which have to be reckoned in the increased cost of production of the paper. If the standard which *The Wireless World* has set itself is to be maintained steadily in the future, and if *The Wireless World* is to continue to be right up to date in everything appertaining to its subject, then we hope our readers will not feel aggrieved when they are asked to contribute a very small individual amount towards the increased expense of production.

The extra 1d. may seem trifling a sum as to be of no consequence, but, whilst to the individual reader the 1d. is but a small increase, yet to the publishers it means a substantial contribution towards meeting the additional expenditure involved when each 1d. is multiplied by the figure representing the average weekly circulation of the paper.
LABORATORY TESTS.
A Review of Manufacturers' Recent Products.

"ELECTRAD" TABLE TONATROL.
This device consists of a variable high resistance connected across output terminals and loud speaker leads. Measurements showed that the resistance was continuously variable from 0 to 25,000 ohms. The contact travels over a wire track consisting of separate loops, each making contact with the resistance element. Wear on the track is practically non-existent, and it should maintain a constant resistance throughout. A flexible two-way cord is provided for attachment to the output terminals on the set, and two small spring contact sockets serve to make connection with the leads from the loud speaker or telephone. These should be finished off with pin terminals of suitable diameter.

"Electrad" table Tonatrol for use with telephones, loud speaker or gramophone pick-up.

The device is of American origin, and is marketed by The Rotherham Corporation, Ltd., 24-26, Maddox Street, Regent Street, London, W.1, at 10s. 6d.

CLAROSTAT "HUMDINGER" AND STRIP RESISTORS.
The "Humdinger" is a potentiometer device with an adjustable centre tap, and has been designed to provide a ready means of obtaining a connection to the electrical centre of the filament, or heater, winding on mains transformers not having a centre-tapped coil. The adjustable moving contact gives a variation in resistance of approximately 60 per cent. on either side of the actual centre point. For example, the sample tested was a 200 ohms resistance, nominal and measured, the variable contact giving a change of 60 ohms from the nominal centre to maximum movement in one direction, and 60 ohms change from the centre to the stop in the other direction; this variation being more than sufficient for all practical purposes. These resistances can be employed also as semi-variable potentiometer devices for obtaining "free" grid bias.

"Humdingers" are available in twelve resistance values ranging from 6 to 500 ohms, the price being 4s. in each case.

The fixed resistors are wound on thin strips of insulating material, neatly finished with end caps and provided with fixing holes and soldering tags. These vary in length according to resistance value. They are wire-wound, and available in values from 1 ohm to 5,000 ohms, and a 10,000-ohm unit is in production.

Some samples were measured, and the values found to be very close to the makers' rating.

### Clarostat Strip Resistors

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<th>Measured Value</th>
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<tr>
<td>200 ohms</td>
<td>198 ohms</td>
<td>±3.0%</td>
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<td>2,000</td>
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We understand that prices have not yet been fixed, but particulars can be obtained from Messrs. Claud Lyons, Ltd., 76, Old Hall Street, Liverpool.

NEW COILS FOR THE BROWN KIT SETS.
It will be recalled that on the last occasion we described the kit sets introduced by the well-known firm of loud speaker manufacturers, S. G. Brown, mention was made that interchangeable coils were fitted. Subsequently, a slight modification was made, and all models are now supplied with dual-range coils. These are wound on formers of the same type as used in the earlier models, the non-reversible base fitting being retained.

It is therefore a simple matter to replace the original coils by the new type, and this can be done without disturbing a single wire in the set. The change-over switches are carried on the coil formers, and, being placed in an accessible position, render change from medium to long waves a relatively simple matter.

The makers, Messrs. S. G. Brown, Ltd., Western Avenue, North Acton, London, W.3, are prepared to exchange the original coils for a set of the new style.

"LINCONE DUPLEX" CHASSIS.
These chassis are supplied by the Bristol Wireless Company (Wholesale), Radio House, Queen's Road, Bristol. Double cone linen diaphragms are used, these being mounted with their apices adjacent. The movement recommended is a "Blue Spot" unit, type No. 66K, with adjustment.

The chassis sent in for test measured 18in. x 18in. x 5in. deep, the front cone being 18in. in diameter, and the back cone 12in. On test, the response was found to be very good—indeed, frequencies from 300 up to 5,000 cycles being well brought out. There was practically no noticeable resonances between these two limits. There was a slight reduction in the output from 4,500 cycles down to 3,000 cycles, but between 3,000 and 300 cycles the normal level was again attained. Below 300 cycles sundry peaks were noticed; however, these were not unduly accentuated, and should not give an artificial base.

The price of this sized chassis is 22s. 6d. and the unit 25s. A larger chassis measuring 34in. x 35in. x 35in. costs 35s. 6d. "Lincone" chassis built into cabinets are available also. The prices of these models are £4 in oak and £4 10s. in mahogany.

New dual-wave coils for the Brown kit sets. Change-over switches are carried on the formers.

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CURRENT TOPICS

Events of the Week in Brief Review.

WHERE LISTENING IS COMPULSORY.
The Vaud (Swiss) Council of State has made an Order whereby apprentices living beyond a certain distance from a technical school must listen to broadcast courses. Communes affected by the Order are to be provided with Government receiving sets. There will thus be little opportunity to play wireless "truant."

AMATEUR TRANSMISSION INCREASING.
The French transmitting fraternity, as represented by the Réseau des Emetteurs Français, is rejoicing over a big increase in new members during the past year. The roll now includes 1,100.

British amateur transmitters number approximately 1,800.

POLICE RADIO NETWORK FOR LONDON.
Plans for equipping all police stations in the London Metropolitan area with wireless transmitters and receivers are, it is stated, being considered by Scotland Yard. The apparatus would be used principally for communication with the wireless-equipped cars of the Flying Squad, which have proved their worth with the limited radio facilities already available. The scheme provides for a wireless network embracing the whole of the Metropolis with wireless links to the most important provincial centres. The provision of a special police radio branch is being discussed.

HOME CONSTRUCTORS' SHOW IN MOROCCO.
Morocco's first wireless exhibition, to be strictly limited to the products of amateurs, will open its doors at Casablanca on Saturday next, November 20th. All entrants will be required to make a sworn declaration that the exhibits are home-made. Prizes will be awarded for crystal, straight valve, and superheterodyne sets.

IRISH RADIO SUCCESS.
The recent Dublin wireless exhibition made a poor start, the attendances being disappointingly low. Before the end of the week, however, public enthusiasm grew to such an extent that the show was transformed into a success, all previous shows being outstripped both in attendance and business transacted.

OLD AGE PENSIONERS MUST PAY.
In the House of Commons recently the Postmaster-General, Mr. Lees-Smith, said that the Broadcasting Committee of 1925 had considered the question of granting free wireless licences to old age pensioners, but had recommended that this concession should be made to blind persons only. He did not feel justified in asking Parliament to grant any similar concessions to other classes of the community.

THEORY MADE EASY.
The first five articles on "Wireless Theory Simplified," by S. O. Pearson, B.Sc., which appeared weekly in The Wireless World, were discussed at the last meeting of the Tottenham Wireless Society. General appreciation was expressed regarding the usefulness of the articles, and it has been decided to make them the basis of discussion at future meetings.

The series is proving of special value to many experimenters and constructors who have little opportunity to study wireless theory as presented in the average text-book. A useful aid towards deriving the maximum value from the articles is Mr. S. O. Pearson's "Dictionary of Wireless Technical Terms," which was first published in weekly installments in The Wireless World, and is now obtainable in pocket-book form at 2s., or post-free from our publishers at 2s. 2d.

NAVAL WIRELESS TELEGRAPHY.
At a meeting of the Wireless Section of the Institution of Electrical Engineers on Wednesday next, December 4th, at the Institution, Savoy Place, W.C.2, a paper will be read on "Naval Wireless Telegraphy Communications." The authors are Mr. G. Shearing, B.Sc., and Capt. J. W. S. Doriging, R.N.

BROADCASTING BATTLE IN FRANCE.
Two rival schools of thought pressed a checkmate at the French National Broadcasting Congress, which met in Paris on November 14th, 15th and 16th, with the object of influencing the coming legislation for establishing broadcasting on a new basis.

The public debates were marked by lively skirmishes, writes our Paris correspondent, the outcome being the dignified withdrawal of the minority party, which stands for State control. Those who remained to continue the discussion were divided into two groups, both striving for "controlled liberty," but each giving the term a different meaning. One faction, representing the trade, would like the present Bill passed in its entirety, as safeguarding national interests through the ministrations of a National Broadcast.
Bureau similar to the B.B.C. Th. partisans of the alternative scheme of "controlled liberty" aim at a National Bureau, the members of which would not be nominated by the Government, but elected by popular vote, representing various public authorities, intellectual and manual workers, trades unions and similar bodies.

It is doubtful whether this unsatisfactory gathering will influence subsequent events. The only point on which unanimity was reached was that the present broadcasting position is "lamentable."

---

CREATING WANDERLUST BY WIRELESS.

A mobile short-wave transmitter was used in a new experiment made on Sunday last by the French "Office National de Tourisme" in an endeavour to stimulate touring. A representative of the organisation motored through several delectable districts of "La Belle France" and at a preconcerted time set his short-wave transmitter in operation and broadcast an alluring account of the places he had visited. The transmission was picked up on a receiver on the outskirts of Paris and relayed to Paris PTT.

The test was a precursor of a special series to be started early in 1930.

RADIO SOCIETY'S £350 HOSPITAL GIFT.

When the Duchess of York visited Southend on November 12th to lay the foundation stone of Southend's new £200,000 hospital and to receive purses of donations for the funds, the Southend and District Radio Society presented a purse containing an undertaking to equip the hospital throughout with wireless at an estimated cost of £350. In addition, a second purse was given containing nearly £5, the proceeds of a collection at a recent meeting of the society.

It is of interest to recall that the society equipped the present hospital of hundred beds at a cost of over £120 and maintains the whole installation free of all cost and responsibility to the authorities. Every bed has its pair of telephones, and the children's wards and staff sitting-rooms all have loud speakers—eight in all.

---

SHORT-WAVE BROADCASTING STATIONS OF THE WORLD.

Arranged in Order of Wavelength and with Usual Times of Transmission.

<table>
<thead>
<tr>
<th>Station</th>
<th>Frequency in Kilocycles</th>
<th>Wavelength in Metres</th>
<th>Kilopass in Aerial</th>
<th>Times of Transmission (G.M.T.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motala, Sweden</td>
<td>3,033</td>
<td>99.9</td>
<td>—</td>
<td>Stockholm Programme Mon, Fri, 23.00</td>
</tr>
<tr>
<td>7RL, Copenhagen (&quot;Popular Radio&quot; Experimental)</td>
<td>3,561</td>
<td>82.24</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>8KR, Constantine, Algeria</td>
<td>3,750</td>
<td>80</td>
<td>—</td>
<td>Mon, Mon. 18.00</td>
</tr>
<tr>
<td>OHK2, Vienna</td>
<td>4,293</td>
<td>70</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>AFK, Döhlinz, Germany</td>
<td>4,454</td>
<td>67.65</td>
<td>5</td>
<td>Mon, Mon., Wed., Fri. 10.00 and 18.00</td>
</tr>
<tr>
<td>W8XF, Cleveland, Ohio (short-wave of WIKH)</td>
<td>4,650</td>
<td>66.04</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W2XBA, Newark, N.J. (short-wave of WAAM)</td>
<td>4,603</td>
<td>65.18</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W8XK, East Pittsburgh, Pa. (short-wave of KDKA)</td>
<td>4,800</td>
<td>62.5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pana, Radio Ll.</td>
<td>4,913</td>
<td>61</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Khabarovsk, Russia</td>
<td>4,990</td>
<td>60.12</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Prague, Czechoslovakia</td>
<td>5,172</td>
<td>58</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>AGJ, Nauen, Germany (occasionally)</td>
<td>5,291</td>
<td>56.7</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Rugies, Euro France (Journal des)</td>
<td>5,455</td>
<td>55</td>
<td>—</td>
<td>22.00</td>
</tr>
<tr>
<td>AFI, Bergedorf, Germany</td>
<td>5,769</td>
<td>52</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>AI, Casablanca, Morocco</td>
<td>5,882</td>
<td>51</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EAJ25, Barcelona (Radio Club), Spain</td>
<td>6,000</td>
<td>50</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>RFH, Moscow</td>
<td>6,000</td>
<td>50</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W2XBR, New York (R.C.A) (short-wave of WBNY)</td>
<td>6,020</td>
<td>49.83</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>W9XF, Downer's Grove, Ill. (GN Lakes Radio Broadcasting Co.)</td>
<td>6,040</td>
<td>49.83</td>
<td>5</td>
<td>—</td>
</tr>
<tr>
<td>W2XAL, Coytesville, N.J. (short-wave of WNJ, Experimenter Pub. Co.)</td>
<td>6,060</td>
<td>49.87</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W3XAL, Harrison, Ohio (short-wave of WIL and NBC Crosley Radio Corporation)</td>
<td>6,080</td>
<td>49.5</td>
<td>0.25</td>
<td>—</td>
</tr>
<tr>
<td>W9XU, Council Bluffs, Iowa (short-wave of KOIL)</td>
<td>6,090</td>
<td>49.5</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W3XAU, Philadelphia, Pa.</td>
<td>6,090</td>
<td>49.5</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>Station</td>
<td>Frequency in Kilocycles</td>
<td>Wavelength in Metres</td>
<td>Kilowatts in Aerial</td>
<td>Times of Transmission (G.M.T.)</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------</td>
<td>----------------------</td>
<td>--------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>UORZ, Vienna</td>
<td>6,072</td>
<td>49.4</td>
<td>0.4</td>
<td>—</td>
</tr>
<tr>
<td>W2XXB, Kearnan, N.J. (short-wave of WOR)</td>
<td>6,080</td>
<td>49.34</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W9XAA, Chicago, Ill. (Federation of Labour)</td>
<td>6,080</td>
<td>49.34</td>
<td>0.5</td>
<td>—</td>
</tr>
<tr>
<td>W6XAL, Westminster, Cal. (Pacific-Western Broadcasting Federation)</td>
<td>6,080</td>
<td>49.34</td>
<td>15</td>
<td>—</td>
</tr>
<tr>
<td>W3XAL, Bound Brook, N.J. (R.C.A.)</td>
<td>6,100</td>
<td>49.18</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>W2XXE, Richmond Hill, N.Y. (Atlantic Broadcasting Corporation, short-wave of WABC)</td>
<td>6,120</td>
<td>49.02</td>
<td>5</td>
<td>23.00</td>
</tr>
<tr>
<td>W8XXK, Pittsburg, Pa. (Westinghouse Electric)</td>
<td>6,140</td>
<td>48.86</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>11AX, Rome (Via Savoa 80)</td>
<td>6,667</td>
<td>45</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>XO51, San Lazaro, Mexico</td>
<td>6,818</td>
<td>44</td>
<td>—</td>
<td>07.00 and 19.00</td>
</tr>
<tr>
<td>1MA, Rome</td>
<td>6,896</td>
<td>43.5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EAR110, Madrid (Assoc. Nee de Radio-eachucas)</td>
<td>6,977</td>
<td>43</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>8AG, Perth, West Australia</td>
<td>7,142</td>
<td>42</td>
<td>—</td>
<td>10.30 and 15.00</td>
</tr>
<tr>
<td>DDAF, Cothen, Germany</td>
<td>7,900</td>
<td>40</td>
<td>—</td>
<td>17.00</td>
</tr>
<tr>
<td>EATH, Vienna</td>
<td>8,000</td>
<td>37.5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1MA, Rome</td>
<td>8,108</td>
<td>37</td>
<td>—</td>
<td>Sun. 16.00</td>
</tr>
<tr>
<td>H8PJF, Bangkok, Siam</td>
<td>8,108</td>
<td>37</td>
<td>0.2</td>
<td>Tues. and Fri. 13.00 and 18.00</td>
</tr>
<tr>
<td>W2XAC, Schenectady, N.Y. (G.E.C.)</td>
<td>8,966</td>
<td>34.5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2BL, Sydney</td>
<td>9,230</td>
<td>32.5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>FLJ, Isay-les-Moulineaux, Paris (Time Signals)</td>
<td>9,230</td>
<td>32.5</td>
<td>7</td>
<td>07.56 and 19.56</td>
</tr>
<tr>
<td>H8BDC, Berne, Switzerland</td>
<td>9,280</td>
<td>32.05</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>D7MK, Copenhagen (&quot; Radioposten &quot;.)</td>
<td>9,434</td>
<td>31.8</td>
<td>0.25</td>
<td>18.20</td>
</tr>
<tr>
<td>Posen, Poland</td>
<td>9,470</td>
<td>31.65</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Paris (Express)</td>
<td>9,494</td>
<td>31.6</td>
<td>1</td>
<td>18.00</td>
</tr>
<tr>
<td>Lyngby, Denmark</td>
<td>9,603</td>
<td>31.55</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3LO, Melbourne, Australia (temporarily closed)</td>
<td>9,606</td>
<td>31.38</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W9XXA, Denver, Colorado (short-wave of KOA, G.E. Co.)</td>
<td>9,630</td>
<td>31.48</td>
<td>0.75</td>
<td>—</td>
</tr>
<tr>
<td>W2XAF, Schenectady, N.Y. (short-wave of WGY, G.E. Co.)</td>
<td>9,630</td>
<td>31.48</td>
<td>0.75</td>
<td>—</td>
</tr>
<tr>
<td>PCJ, Enschede, Holland (Philips Lamp Works, Transmitter at Hilversum)</td>
<td>9,654</td>
<td>31.4</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Zeessen, Germany</td>
<td>9,660</td>
<td>31.38</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W8XXA, Bound Brook, N.J. (R.C.A.)</td>
<td>9,670</td>
<td>31.35</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>W8XXK, East Pittsburg, Pa. (Westinghouse Electric)</td>
<td>9,700</td>
<td>31.91</td>
<td>0.5</td>
<td>00.00</td>
</tr>
<tr>
<td>2FG, Sydney, Australia</td>
<td>9,950</td>
<td>31.25</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>LGN, Bergen, Norway</td>
<td>9,977</td>
<td>31</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W8XXK, Bound Brook, N.J. (R.C.A.)</td>
<td>9,756</td>
<td>30.75</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W9XC, Pittsburg, Pa. (Westinghouse Electric)</td>
<td>9,756</td>
<td>30.75</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Agen, France</td>
<td>9,756</td>
<td>30.75</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**NOVEMBER 27th, 1929**
Wireless World

BROADCAST - BREVITIES.

By Our Special Correspondent.

The Silent Carrier.—A Breakdown.—European Relay Network.

Warming-up the Twin Transmitter.
Wordless whispers are already issuing from the twin transmitter at Brookmans Park, which is now sending out an unmodulated carrier wave every evening from seven o'clock till eleven on its allotted wavelength of 261.3 metres. I understand that comparatively low power is being used, certainly not more than 5 kilowatts. ☐ ☐ ☐

Interlopers Not Wanted.
Since no real testing is being carried out, one may well ask why Tweedledum is wasting its fragrance on the desert air. I can suggest a probable explanation. Owing to the limitations of the Prague Plan there are a number of foreign transmitters wandering fortuitously up and down the wavelength scale in search of a vacant spot. The wavelength of 261.3 metres has been granted exclusively to Britain, but a homeless foreigner, finding that wavelength out of use, would probably acquire and hold it on the principle that possession is nine points of the law. Whether or not this explains the silent transmission, the B.B.C. would do well to keep it going until the tests begin.

Brookmans Park Breaks Down.
Meanwhile it is my sad duty to record the first breakdown at Brookmans Park. This occurred on November 18th, 1929, at 1.52 p.m., when a burnt-out meter stopped transmission for three minutes. How many listeners noticed the break? ☐ ☐ ☐

"Bed Sits" Sufferers.
Visits to the homes of listeners who have complained of inability to hear Brookmans Park on a crystal set have convinced the B.B.C. engineers that the greatest sufferers under the new regime are dwellers in bed sitting-rooms, the majority of these being unable to erect an outside aerial or to afford anything more expensive than a crystal set.

Retailers and Aerials.
Other crystal users with facilities for erecting outside aerials have been subjected to a new form of victimisation by the less reputable members of the wireless trade. In these cases the retailer has refused to erect an outside aerial unless the customer agrees to purchase a valve set, the excuse being that a crystal set will be useless even with the new aerial. The crystal user may well question the value of an outside aerial! ☐ ☐ ☐

From the Savoy Hill Post Bag.
"Brookmans Park is said to be a wipe out. It is a wash out."

Relaying from the Continent.
The relay of Strauss's "Salome" from Cologne on Friday next must not be associated with the special relay tests to which reference was made in these columns last week. The experiments beginning in January next will employ for the first time a new set of trans-Continental lines which are under test by the German Post Office. ☐ ☐ ☐

A European Network?
The aspirations of the long-distance listener are certainly not being considered by the B.B.C. or any other European broadcasting authority; on the other hand, ambitious schemes are afoot for the development of a European network of relay stations. This cable to be completed in two or three years' time. This cable will embody the latest improvements in amplifiers and repeaters, so that we may hope that the time will come when a landline broadcast will give us a reasonable band of musical frequencies. ☐ ☐ ☐

Neck to Neck
In a recent issue it was stated that the increase in the number of licensed German listeners in the last quarter amounted to 16,941. According to an official at Savoy Hill, the increase in British licences during the same period amounted to 17,025.

Radio Week in Bristol.
Bristol Radio Week will be held from December 8th to 14th. On the first day Sir Thomas Beecham conducts the National Orchestra of Wales, the concert being relayed to 5WA from Park Hall, Cardiff.

A Sailors' and Soldiers' Night, arranged in conjunction with the British Legion, will be relayed from Colston Hall on December 9th.

On December 12th "Smooth Crossing," a new play in one act by Mr. Froom Taylor, will be presented by Bristol's Little Theatre Company, and relayed to the Cardiff station.

Mr. Winston Churchill will be installed as Chancellor of Bristol University on December 13th. It is expected that his address will be relayed to Daventry 5XX as well as to Cardiff.
Now that the fundamental principle of condenser action has been described the various factors upon which the value of the capacity depends must be enumerated. If the two parallel plates A and B, representing the elementary condenser discussed in the previous issue (Part IX), and illustrated there in Fig. 1, are brought closer together, it will be found that the capacity is increased. In reducing the distance between the plates the length of the electrostatic lines of force has been shortened. The result is that a given potential difference between the plates is capable of driving more lines of force across the shortened gap in much the same way that a battery will drive more current through a resistance wire if the latter is shortened. The electrostatic field has been condensed into a smaller space and intensified, resulting in increased capacity. Hence the name "condenser."

By discharging a simple parallel plate condenser through a suitable galvanometer it can be shown that the momentary deflection is inversely proportional to the distance between the plates, assuming the same initial voltage between them in every case. This is only true provided the distance between the plates is small compared with their dimensions, because if they are far apart the lines of force will spread out at the edges and so upset the inverse proportionality. We see, then, that the capacity varies inversely as the distance between the plates when they are moderately close together.

Now since the capacity is evidently proportional to the number of electrostatic lines crossing from one plate to the other for a given potential difference, it is fairly obvious that the capacity can also be raised by increasing the area of the opposed surfaces of the plates, in the same way that the current given by a battery can be raised by substituting a wire connected between its terminals by another of larger cross-sectional area.

We see, then, that the capacity of a condenser with air as the medium between the plates can be altered either by changing the distance between the plates or by varying the effective area of opposed surfaces. For mechanical reasons an ordinary variable air condenser as used for tuning purposes employs the latter principle. A number of interleaved small plates are used instead of two large ones, also for mechanical reasons. They are divided into two groups insulated from each other, one fixed and the other movable at will, and the movable ones can be shaped to give any desired relationship between angle of rotation and capacity, e.g., square law, straight line frequency, etc.

Effect of the Dielectric on the Capacity.

There is yet another very important factor upon which the capacity of a condenser depends besides the dimensions of the plates and their relative positions, and that is the nature of the dielectric between the plates. Most solid insulating materials allow lines of electrostatic force to pass through them much more easily than air or a vacuum. Therefore, if a condenser with air as the insulating medium between the plates has the air replaced by some solid insulating material, or dielectric as it is called, the number of lines passing between the plates for a given potential difference will be increased, with consequent rise in the capacity. For instance, if a condenser with air dielectric has the air replaced by mica the capacity will be increased about six times. The number of times by which the capacity is increased when the air is replaced by some other medium is called the permittivity or dielectric constant of the new medium. Strictly speaking, the comparison should be made with a vacuum, but as air has a permittivity very nearly equal to 1, the above statement is sufficiently accurate for our purpose and is more practical. An older name for permittivity was "specific inductive capacity."

Mica has a permittivity of about 6, depending on its quality. It is extremely interesting to note that ice at a temperature of \(-13.5^\circ\) Centigrade has the enormously high permittivity of 22,000!

Fixed Condensers of Large Capacity.

Although it is not a very practicable proposition to use a solid dielectric for condensers where the capacity is to be continuously variable, a solid dielectric is almost always employed in condensers of fixed capacity. For small fixed condensers mica is usually employed between two sets of interleaved sheets of tinfoil or copper-foil. In condensers of large capacity, however,
Wireless Theory Simplified.—

say from half a microfarad upwards, the dielectric usually consists of a special kind of paper. A long strip of the paper is coated on both sides with a conducting material by a special process, the best known being the Mansbridge process. A margin of uncoated paper is left at each edge. The strip is then rolled up so as to occupy a suitably small space and enclosed in a container, one terminal being connected to each coating.

Obviously it is most important that the dielectric used should be a really good insulator, otherwise the charge will “leak” from one set of plates to the other through the dielectric, and the condenser would behave as though it were shunted by a resistance of high value.

Air is the best in this respect (except, of course, an absolute vacuum), and among solid dielectrics mica is one of the best. Mica has the further advantage that it can stand a much higher voltage across a given thickness without breaking down compared with most other materials. Air insulation is broken down by high voltages much more easily than most solid dielectrics.

If two or more condensers are connected in parallel as shown in Fig. 1, the resultant capacity C will be simply equal to the sum of the individual capacities, because the effect is exactly the same as increasing the area of opposed surfaces.

For the group of Fig. 1, then, we have

$$C = C_1 + C_2 + C_3.$$  

Note that this is the same law as for resistances in series.

When condensers are connected in series the resultant capacity is found by applying the same rule as for resistances in parallel. For instance, if we connect three condensers whose capacities are $C_1$, $C_2$, and $C_3$ in series, as shown in Fig. 2, the resultant capacity is given by

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}.$$  

The reason for this follows from the fact that in charging a single condenser, the quantity of electricity gained by one plate is exactly equal to that lost by the other. The same law applies to the series arrangement, so that equal charges must move from plate to plate throughout the series; in other words, each condenser will be given the same charge, $Q$, irrespective of its size.

But the voltage across each will not be the same, being inversely proportional to the capacity for a given charge. Thus, if the voltages across the three condensers of Fig. 2 are $V_1$, $V_2$, and $V_3$ respectively when the charge of each is $Q$ coulombs, the total voltage between the end of the series will be $V = V_1 + V_2 + V_3$.

But from the definition of capacity

$$V_i = \frac{Q}{C_i}, \quad V = \frac{Q}{C},$$

$V_2 = \frac{Q}{C_2}$, and $V = \frac{Q}{C}$, where $C$ is the resultant capacity.

Hence

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}, \quad \text{or} \quad \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}.$$  

This it is clear that the resultant capacity must be less than that of the smallest condenser in the series.

The Energy Stored in a Condenser.

It was shown previously that when a condenser is charged—that is, when a potential difference is applied between the plates—energy is stored in the electric field between them. Just as energy was found to be necessary to build up a magnetic field, so energy is required to build up an electrostatic field, no matter whether the field is produced in a vacuum, in air, or in any other dielectric, solid or liquid.

It is a very simple matter to determine the amount of this energy in terms of the capacity of the condenser and the voltage between the plates. As explained in the previous part, suppose that the charging current is maintained at a constant value of $I$ amperes during the charging period by reducing the series resistance in the circuit at a uniform rate from the initial value to zero during this time. Then, since the electrons are being transferred from one set of plates to the other at a steady rate, the voltage across the condenser will build up at a uniform rate. Suppose further that the charging period lasts for $t$ seconds. These conditions are shown by the graphs of Fig. 3.

It is clear that the average value of the voltage across the condenser during the charging period will be $\frac{1}{2}E$ volts, and in driving the current $I$ against this opposing voltage an average power of $\frac{1}{2}EI$ watts will be expended on the condenser for $t$ seconds. The energy consumed in charging it is equal to the product of average power and time exactly as in the case of the inductive coil, and so the energy required to build up the electric field will be $\frac{1}{2}EI \times t$ watt-seconds or joules. But the product of current and time is the quantity of electricity or “charge” $Q$ coulombs which has been transferred. Hence the stored energy

$$W = \frac{1}{2}EQ \text{ joules.}$$

Now the capacity of the condenser was defined as the quantity of electricity required to produce a change of one volt between the plates; in other words $C = \frac{Q}{E}$. Farads (see previous part), whence $Q = CE$.

Substituting this value of $Q$ in the expression for stored energy above, we get

$$W = \frac{1}{2}CE^2 \text{ joules.}$$

It should be noted that the expression is of the same form as $\frac{1}{2}LI^2$ for the energy stored in a magnetic field. The latter gives the energy in a field due to electrons in motion (current), whereas the former relates to the kind of field produced by electrons at rest but under the influence of an electrical pressure or voltage.
Wireless Theory Simplified.—

The action of a condenser can be likened to that of a spring in mechanics. Suppose that we take an ordinary spiral or helical spring and suspend it by one end from a rigid support so that it hangs vertically downwards. If now a gradually increasing force is applied to the lower end so as to extend it downwards, then, by a very well-known law of mechanics, the extension will be exactly proportional to the applied force. Let \( F \) be the force required to extend (or compress) the spring through a distance \( D \) (we need not concern ourselves with the units). Then \( F \) is the force required to produce unit extension of the spring, and this value may be called elasticity or stiffness of the spring. It should be realised that elasticity means the extent to which a body resists bending or distortion of any kind or the extent to which it resists compression.

Let \( S \) denote the stiffness of the spring, so that \( S = \frac{F}{D} \) or, in words, the displacement is proportional to the applied force and inversely proportional to the stiffness.

As the spring is extended the applied force increases from zero in direct proportion to the displacement until it reaches the value \( F \), when the extension is \( D \). Thus the average value of the force is \( \frac{1}{2}F \). Now, in mechanics, work done or energy consumed is equal to the product of the force acting and the distance through which it acts; so the work done in extending the spring will be \( \frac{1}{2}FD \), and substituting for \( D \) the value \( \frac{F}{S} \) found above we get: energy stored in spring = \( \frac{1}{2}F \frac{F}{S} = \frac{1}{2} \frac{F^2}{S} \).

Comparing this expression with that for the energy contained in a charged condenser, namely \( 4\pi \varepsilon \varepsilon_0 \), we see at once that they are alike in form, only the symbols used being different. \( F \) stands for the mechanical force and \( E \) for the electromotive force; in the formula for the spring \( \frac{F}{S} \) takes the place of the capacity \( C \) of the condenser, or, by inverting each of these, we can say that \( \frac{S}{F} \) in the one case corresponds to \( S \) in the other.

Putting this into words, it means that the reciprocal of the capacity of the condenser corresponds to the stiffness of a spring. The stiffer the spring the smaller will be the deflection and the smaller the energy stored in it for a given applied force; the lower the capacity of the condenser the smaller the amount of energy stored for a given electromotive force.

In case any reader should consider this rather detailed comparison between a condenser and a spring unnecessarily long and tedious, it should be explained here that this has been done purposely in preparation for further discussion relating to oscillating circuits. Inductance has already been likened to inertia or mass, and both of these analogies will be made full use of later.

Magnetic and electric fields are produced in the ether and are modified by the presence of certain materials. They are, however, of fundamentally different nature — it may be said that inductance is to the ether what mass is to material, and the reciprocal of capacity is to ether what elasticity or stiffness is to material.

(To be continued.)

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Forthcoming Events.

**Wednesday, November 27th.**

**Muswell Hill and District Radio Society.**


**Thursday, November 28th.**

**Radio Society.**


**Radio Society.**


**Radio Society.**


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CLUB NEWS.

Power from the D.C. Mains.

Owing to the fact that Muswell Hill and District Radio Society has been given a D.C. mains it has been a matter of difficulty economically to obtain both H.T. and L.T. from the electric supply. Mr. L. Hartle, B.Sc., A.I.C., however, gave some useful information at a recent meeting of the Society as to the best means of overcoming this problem. A high-power amplifier driving a moving-coil speaker was demonstrated, and, despite the fact that all current was derived from the D.C. mains, practically no hum could be heard either with or without speech or music. The wattage consumption, too, was commendably low. Particular emphasis was laid on the importance of a good condenser or smoothing circuit, as the local mains are notorious for their very pronounced ripple.

Hon. Secretary, Mr. G. E. W. Litt, 30, Compton Road, N.19.

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New Headquarters.

The Queen’s Park Radio Society has now changed its place of meeting to the Oddfellows’ Hall, 939, Harrow Rd., Paddington. Meetings are held regularly on Wednesdays at 8 p.m., and visitors are cordially invited. The winter programme includes many attractive items, Hon. Secretary, Mr. H. F. Murrett, 12, St. John’s Road, Wembley.

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Screened Grid Operation Explained.

In a lecture at the last meeting of Slade Radio Club, (Birmingham), Mr. N. B. Simmonds aroused special interest by discussing the detection stages of the Society’s screened grid receiver. Valve characteristics and all details of the circuit were fully explained in a manner which prompted members to incorporate a screened grid stage in their own sets. The annual general meeting of the Society will be held on Wednesday, November 27th, when it is hoped that all members will be present. Full details of the Society may be obtained from the Hon. Secretary, 11th, Billares Road, Gravetye Hill, Birmingham.
BROADCAST RECEIVERS

A Selective Long-Range Receiver

THE entry of the Columbia Graphophone Co., Ltd., into the radio industry was an event of considerable importance, and the receivers exhibited at Olympia were the subject of much discussion and favourable comment. We have now had an opportunity of testing one of the No. 304 table models, and the results are fully in keeping with the efficient appearance of the layout. There can be no doubt that Columbia sets bear all the marks of the thoroughbred, and the 1930 models can definitely be placed among the best half-dozen makes at present on the market.

Although three distinct types are available for operation from batteries, A.C. or D.C. mains, the receiver section is the same in each case and is housed in an aluminium screening box occupying the upper half of the cabinet, the space below being devoted to rectifying and smoothing gear. Valves with directly heated filaments have been standardised throughout, and although this somewhat complicates the problem of filament supply from A.C., the advantages from the production point of view are obvious. The standardised receiver chassis can be manufactured on mass-production lines and then taken from store and equipped either with battery, A.C. or D.C. mains supply according to fluctuations in the demand.

The screening box is well designed both from the electrical and maintenance point of view. The valves which, incidentally, are selected and graded by the makers, are isolated in separate cubicles at the back of the box, to which access is gained by lifting a top lid and dropping the hinged back. Horizontal screens are fitted in the three H.F. valve com-

Aerial terminal strip and wire-wound series condensers.

Interior view of valve compartments; the three right-hand compartments house the H.F. valves, while the detector is on the extreme left.
Broadcast Receivers—Columbia All Electric Model 304.—

Friction device couples the two drums, which, once set, can be moved together over the whole of both long- and short-wave ranges. All the contacts for wave-range switching are assembled on a horizontal shaft running underneath the chassis. A rocking motion is imparted to this shaft by the “Selector” knob on the front panel, which actuates a spiral-slotted sleeve.

Mullard P.M.32 screen-grid valves are used for all three H.F. stages, and some idea of the overall amplification obtained can be gathered from the fact that the anode bend detector, an Osram L.210, is biased to 16 volts negative. The H.F. amplification is sufficient to feed a considerable voltage to the detector even from distant stations, and it is found that resistance coupling between the detector and a P.625 output valve gives all the low-frequency amplification necessary to supply a moving-coil loud speaker. Stray H.F. currents are kept from the grid of the power valve by a series resistance of the Loewe vacuum type. A five-pin valve holder is now fitted for the output stage, and the centre socket is supplied with the necessary positive potential so that a pentode may be used if desired. In the D.C. mains model the loud speaker terminals are supplied through a transformer in accordance with I.E.E. regulations. In all other cases the loud speaker is connected directly in the anode circuit of the last valve.

Volume Control.

The volume control takes the form of a resistance regulating the filament current of the first H.F. valve. The regulating resistance is in the form of a potentiometer in order to keep the load on the filament circuit constant. By confining the volume control to the first H.F. valve and keeping the second and third valve filaments at normal temperature, distortion due to progressive rectification is avoided.

The particular model tested was equipped for A.C. mains, and is especially interesting on account of the arrangements for heating the valve filaments. The 2-volt filaments of the three H.F. valves and the detector are supplied with direct current through a Westinghouse metal rectifier, a smoothing choke, and electrolytic condenser, while the P.625 is heated with raw A.C. from a separate winding on the mains transformer. High-tension current is derived through a U.5 full-wave rectifier, and the usual smoothing chokes and condensers.

The receiver was tested within sight of the Brookmans Park aerials (53 miles, to be exact), using an outdoor aerial 75ft. in length. With the aerial connected to terminal A, (the smallest series condenser) the tuning drums were first adjusted in step, when it was found that the wavelength figures on each dial exactly coincided on both wave ranges. This setting was maintained over the whole of both ranges, and although a slight improvement seemed to result from readjusting the relative setting at the top of each range, the difference was not sufficient to justify frequent alterations. With the dials properly adjusted, at least 30 stations were received on the short waves at good loud speaker strength and without mutual interference. One can state without exaggeration that it is difficult to find any space on the dial unoccupied by some British or Continental transmission. Yet the selectivity is distinctly above the average. Bearing in mind the size of the aerial and the distance from Brookmans Park, the selectivity may be judged from the following facts: The London transmission was inaudible outside the band 275-390 metres, and 5GB occupied only 10 metres on either side of its normal wavelength. Using a shorter aerial, the width of these interference bands could be considerably reduced without appreciably restricting range.

The first impression on switching over to long waves was the entire absence of mush and background noise usually experienced on this wave band. All the high-powered stations came in with remarkable volume and clarity. The selectivity, however, was not of such a high order as on the short wave range. No difficulty was experienced in receiving Radio-Paris clear of 5XX, but Königswusterhausen, between these two stations, could only be heard during intervals in the 5XX programme. It was noticed, also, that Brookmans Park was forcing itself through in the lower part of the dial up to about 1,000 metres. Here, again, a shorter aerial would undoubtedly effect a cure.
Broadcast Receivers—Columbia All Electric Model 304.—
The smoothing arrangements in the A.C. eliminator do
their work well, and there is no trace of 50-cycle hum or
any other extraneous noise.

The volume control is smooth and noiseless in opera-
tion, but in the receiver tested its action was restricted
for most stations to approximately one-third of the total
movement. With Brookmans Park accurately in tune,
however, the remaining two-thirds could be usefully
employed. A rearrangement of the resistances in the
potentiometer scheme, so as to distribute the control more
evenly over the range of movement available, would be
a welcome detail improvement.

As is only to be expected, in an instrument emanating
from a firm of long standing in the art of acoustic repro-
duction, the quality of reception is beyond reproach.
The price of the battery model is £27. The A.C. and
D.C. mains models are both priced at £33.

"WORLD BROADCASTING" FROM GERMANY.

G

ERMANY'S short-wave "world" broadcasting sta-
tion at Königswusterhausen (Zeesen) has now begun testing. In
external design the short-wave plant strongly resembles the Telefunken
Company's standard long-wave transmitters for wireless telegraphy,
while in technical construction it is similar to that of the two high-power
short-wave transmitters used on the Nauen-Buenos Aires service.

The new transmitter has a single wire aerial about 180 ft. long, which is
suspended from one of the masts of the long-wave plant. The mean
aerial energy, i.e., carrier wave without modulation, is 8 kW., and
the wavelength is 31.38 metres.

The transmitter consists of seven units, with crystal modulation on the
first. The short-wave is ob-
tained by making use of the har-
monics of a comparatively low fre-
quency in the crystal-controlled oscillator. Suitable filters and
amplifiers in the ensuing stages pro-
duce the desired reduction of wave-
length and power when the final
stage is reached.

The valves in the individual stages are accordingly arranged to
give a successive increase in power. The first stage functions with one
valve of the power-amplification type, while the second stage em-

body a small transmitting valve of the 0.75 watt class. Two similar
valves in parallel make up the third
stage, and three in parallel com-
prise the fourth stage. The fifth
stage contains a single transmitting valve of average power (about 1.500
watts), and the succeeding stage
contains two valves of the same type in parallel. The seventh and final
functions with two 20 kW. water-
cooled valves in push pull. Modu-
lation on the well-known grid prin-
ciple takes place in the sixth stage
with the aid of three modulating valves connected in parallel.

This arrangement of valves, of
course, necessitates separate supplies of
power. A high-tension D.C. dynamo of 50 kW. 10,000 volts is
used for feeding the anodes in the
last stage; the valves in the fifth and sixth stages are fed by means of a 4,000-volt D.C. machine of
5 kW. In the second, third and
fourth stages the anode current is supplied from a common source, viz., a 2,000-volt D.C. dynamo of
2 kW., whilst the crystal stage is
fed by a 220-volt machine. For
filament heating in all except the
last stage a 20.2 kW. D.C. genera-
tor is used. A 40 v. 5 kW. generator
heats the water-cooled valves in the
final stage.

The filaments of the modulating valves are heated by an alternator
of high periodicity. Grid bias for
the water-cooled valves in the last
stage needs to be of a high value, taking into consideration the size of
the valves and the high anode cur-
rent, and is supplied by a special converter of 750 v. 2 kW.

All machines are started by means of push-buttons on the switchboard,
which is built into the lower portions of the transmitting panels. The
supply current for the converter is
derived from the transformer already
in use at the station connected with
an overhead electrical distri-
bution system.

Besides the actual transmitter there is also a low-frequency ampli-
plier dealing with the speech currents arriving from the land line, and the
anode circuit of this amplifier is fed
by an additional small converter.

The entire installation is equipped
with measuring apparatus enabling
the performance of every portion of
the transmitter to be checked.

ZEESEN'S NEW SHORT-WAVE TRANSmitter. Working on a wavelength of 31.38 metres and a power of 8 kW, this crystal-controlled station represents Germany's latest contribution to world broadcasting.
THESE valves are made by Messrs. Peter Russell, 14, Newgate Street, London, E.C.4, and are supplied with 2-, 4- and 6-volt filaments. Each class consists of four distinct types, viz., H.F. and Det., R.C., L.F. and power. The prices of these valves are very reasonable, being somewhat lower than usual. The H.F., R.C. and L.F. types are priced at 3s. 6d., and the power valves at 6s. 6d. each. Super-power valves are made in the 2- and 4-volt ranges only; they are offered at 10s. 6d. each.

The Two-volt Range.

The valves in this range are numbered P.R.2, 3, 4 and 20. The P.R.2 is an H.F. and Detector valve, the P.R.3 an L.F. amplifier, the P.R.4 a high-impedance valve for R.C. coupling arrangements or anode-bend rectification, and the P.R.20 a power output valve. A sample of each of these valves was tested and the characteristics measured. These results are tabulated below, the makers' figures being given also, as a basis for comparison.

With one exception, the measured values agree sensibly with the makers' rating. The sample P.R.4 tested would appear to be a faulty specimen.

A full set of curves was taken of the P.R.20, the power valve of this series, and from these some useful information can be gleaned.

<table>
<thead>
<tr>
<th>P.R. 2-VOLT VALVES.</th>
<th>Characteristics measured at H.T. = 100 v., G.D. = 0.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Make. Rating.</td>
</tr>
<tr>
<td>P.R. 2</td>
<td>25,000</td>
</tr>
<tr>
<td>P.R. 3</td>
<td>15,000</td>
</tr>
<tr>
<td>P.R. 4</td>
<td>60,000</td>
</tr>
<tr>
<td>P.R.20</td>
<td>7,000</td>
</tr>
</tbody>
</table>

Average values under normal working conditions: A.C. resistance, 4,600 ohms; amplification factor, 3.1, and mutual conductance, 0.67 mA/volt.

Under working conditions, with 120 volts on the anode and -10.5 volts grid bias, the average A.C. resistance was found to be 4,600 ohms, the amplification factor 3.1, and the mutual conductance 0.67 mA per volt. Grid current did not start until the grid was given a positive bias of 1.5 volts. The characteristics, particularly with low anode voltages, show a pronounced curvature, so that in the interests of quality of reproduction it would be advisable to apply slightly less negative bias than a casual examination of the curves would lead one to believe is the optimum value. The following values are suggested:

<table>
<thead>
<tr>
<th>P.R. 20.</th>
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<tbody>
<tr>
<td>H.T.</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>130</td>
</tr>
<tr>
<td>140</td>
</tr>
</tbody>
</table>

When this valve is used in the output stage of the set the loud-speaker could be connected direct in the anode circuit. Dry-cell H.T. batteries may be used economically, since the anode current is well within the capacity of the larger sizes to supply.

There is a super-power valve in this series, namely, the P.R.120. A sample was not available for test, but the makers give its characteristics as: A.C. resistance, 3,800 ohms; amplification factor, 4; and mutual conductance 1.05 mA per volt. The price of this valve is 10s. 6d.

The Four-volt Range.

This class contains a similar number of valves as in the 2-volt range.
The P.R.17 is an optional H.F. or detector valve, and could be used in a neutralised H.F. stage. In this case the best operating conditions would be 120 volts H.T. and 1/14 volts grid bias. As a leaky grid detector about 60 to 80 volts H.T. would be required, and the grid given a small positive potential. It is suggested that a potentiometer is used, as the positive potential obtained by returning the grid leak to the positive L.T. would be somewhat excessive. The anode current can then be kept below 2 m.A., and transformer-coupling could be used between the detector and the following valve.

The P.R.60 is a power valve suitable for use in the last stage where moderate volume is required from the loud speaker. This may be connected direct in the anode circuit of the valve, since the H.T. current is not on the high side. Under normal working conditions this will be about 6 m.A.—that is, assuming 120 volts H.T. and grid bias of 9 volts. The valve falls within the ordinary power category, and costs 6s. 6d.

The P.R.40 power valve takes about the same anode current as its 2-volt counterpart, and dry-cell H.T. batteries will prove economical in this case also.

A full set of curves was taken of the P.R.10, the L.F. valve, as it is a representative specimen and showed a mutual conductance very close to that of the makers' rating. This will make a good first stage L.F. amplifier, and can be followed by a transformer, as the anode current is relatively low. Under normal working conditions, with 120 volts H.T. and 42 volts grid bias, the anode current will be of the order of 2.3 m.A. only. The A.C. resistance remains unchanged as compared with that at 100 volts H.T., but the amplification drops to 9.5. The result is a slight lowering of the conductance, from 0.67 to 0.52 m.A. per volt.

The P.R.9, which is the H.F. valve, could be used in a neutralised high-frequency stage, or as a leaky grid detector. As a grid detector, with the grid leak returned to a point of positive potential, an anode voltage of about 60 to 80 volts would be about correct. The anode current will be relatively low, less than 2 m.A. probably, so that it could be followed by transformer-coupling. The specimen tested was not a good sample, so that precise figures cannot be given. The P.R.40 power valve takes about the same anode current as its 2-volt counterpart, and dry-cell H.T. batteries will prove economical in this case also.

The Six-volt Range.

These valves are numbered P.R.17, 18, 19 and 60, and comprise H.F. and Det., L.F., R.C. and power. A super-power type is not listed.

<table>
<thead>
<tr>
<th>P.R. 6-VOLT VALVES</th>
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<tbody>
<tr>
<td><em>Makers' Rating</em></td>
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<tr>
<td>Type</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>P.R.17</td>
</tr>
<tr>
<td>P.R.18</td>
</tr>
<tr>
<td>P.R.19</td>
</tr>
<tr>
<td>P.R.60</td>
</tr>
</tbody>
</table>

Average values under normal working conditions: A.C. resistance, 25,000 ohms; amplification factor, 16.6, and mutual conductance, 0.68 m.A/volt.

The Six-volt Range.

These valves are numbered P.R.17, 18, 19 and 60, and comprise H.F. and Det., L.F., R.C. and power. A super-power type is not listed.

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TELEVISION.

Sir.—In reading Mr. Bradford's letter in your issue of August 28th on Mr. Samuel Insentark's prophecy of television sets being installed in 14 million homes in America by now, the exact position can be deduced from an extract of Dr. Lee De Forest's article, "The Reminiscences of a Radio Pioneer," from September's issue of the American wireless magazine, Radio News:

"To my mind, we are entering a new era in radio—television. In time sight will come to join hearing in the complete home entertainment via the air. There are many problems in television. Our present efforts are not to be compared with the perfection of present broadcasting, but rather with my own crude attempts at broadcasting back in the days of acousticon microphones, carbon phones and the phonograph, receiver and microphone method of coupling. C. Francis Jenkins, pioneer in the field of television, has already made notable progress.

The vacuum tube (valve) is going to play an important role in television. Indeed, for the audion, television would be quite impossible; for let us forget for a moment the principles of present-day television date back several decades, but the fine means of applying those principles have been missing. We had the theory but not the practice until now. I look forward to routine television developments, with tubes of tremendous amplification factors so as to handle the delicate television impulses without distortion. The problem of distortion must always be a far more serious one in reproducing the television image than in reproducing the tone picture, for the eye is far more critical than the ear. Therefore, I envisage auditions of enormous amplification possibilities, used sparingly—not many stages of amplification—so as to reduce distortion to a minimum. I look forward to more powerful light sources than the present neon lamps. I expect intricate methods of dividing the television image into a large number of sections for simultaneous transmission and assembly, for greater detail. All these things are possible and probable, but it takes time, effort, and much money.

I trust this will interest everyone whose thoughts are turning to the prospects of television in the near future.

Oroydon.

H. GRAHAM MALLET.

THE B.B.C.

Sir.—In view of the inauguration of the Regional Scheme and the absence of any appreciable criticism of the recent activities of the B.B.C., perhaps it is time of all others that we should make the following suggestions in the hope that they may be of interest not only to other listeners but also to the B.B.C. itself.

First, with regard to programmes, these may presumably be considered as fairly satisfactory as a whole, but the following alterations would be definitely advantageous, at least to provincial listeners, for, after all, everyone does not live in London. Occasionally some programmes, worth listening to might be put on from, say, about 6.30 until 9, and the conglomeration of talks relegated to later in the evening. It should be observed that people in the North of England usually rise and go to bed at a time earlier than is common in London, and consequently the general tendency for the programmes to be of greatest interest to listeners in London that are thoroughly well listening to be put on very late is troublesome to anyone living in the provinces.

This state of affairs may possibly be remedied when the Regional Scheme is fully in operation.

The next point about programmes is that it is devoutly to be hoped that all the regional stations will not broadcast the London programmes. I know that this is not supposed to be the intention, but I am merely going by my experience up to the present, which proves, for example, that Manchester and nearly all the northern stations regularly broadcast little else than London programmes after 9 o'clock almost every evening, with the result that with the average set only the London programmes can be received, as 5XX always broadcasts the London programme, and 5GB is not as a rule easily receivable. With a reasonably good set, of course, one can tune in the Continent and not be dependent on the B.B.C., but this is not a satisfactory state of affairs. Perhaps it will be the case that one has to pay one's licence whether listening to the B.B.C. or otherwise.

On the technical side of broadcasting there seems to be room for some improvement in the following direction: it seems that it would be much better if the degree of modulation used by all stations could be the same, or at least could be the same for broadcasts of a similar general character, and, although there may be some very serious technical obstacles in the way of doing this, I should like to be informed as to what they are, as many people know the perfect detector has not yet arrived and each kind of detector functions most efficiently with a certain definite amount of modulation.

This difference in modulation makes it very difficult to make accurate comparisons of the quality of the broadcast from different stations and, of course, this may be the intention.

Referring to the broadcasts of gramophone records, it is to be hoped that the B.B.C. can afford to put aside an amount equivalent to that provided by comparatively few licences, to enable them to install electrically operated turntables and good pick-up devices, so as to avoid the amount of strain that has to be put over, but most especially so that the turntable motors do not run down in the middle of records, as has frequently happened in the past.

Another matter that might be considered in connection with the broadcast of gramophone records is that it should not be necessary for distorting overlapping at the transmitting end to occur with any particular record before adjustments are made at the transmitting end so that the broadcast is in order, but apparently in this particular direction the B.B.C. facilities are no better than those of the ordinary experimenter. Of course, it may be that gramophone records are considered to be beneath the dignity of proper attention when they are broadcast, but owing to the facility whereby records can be used to provide a really attractive programme, this surely should not be the case.

Manchester.

J. BAGGS.

Sir,—I have been an enthusiastic wireless "fan" since the year "dot," and am, of course, much interested in your editorials and the correspondence about the regional scheme. I think your opposition to Brookmans Park is fully founded, inasmuch as your main argument appears to be that it interferes with those of us who wish to receive transmissions from abroad which we have hitherto enjoyed. Are you always so much in a hurry then, that the B.B.C.'s first consideration should be to facilitate foreign transmissions being received in this country? I should have thought that the correct policy is to give as good a service as possible, in this country, of British broadcasting. If the main consideration is to be whether or not the "ringer out" is to be inconvenience, then surely the B.B.C. ought to close down altogether!

Then, again, I disagree with you about the "enjoyment" of foreign programmes. My own set is reasonably up-to-date—it is one of your own excellent designs—and I can get, practically any night now, from 10 to 15 foreign stations at reasonable strength on the loud speaker. My experience of "foreign listeners" compels me in honesty to say that the "enjoyment" of foreign transmission plus atmospheres plus satellite echoes plus fading plus more, I grant the "fascination" of reaching out, but utterly deny the "enjoyment" of the results.

No Sir! The "fascination" of reaching out is the last thing the B.B.C. should take into consideration.

Chipstead, Surrey.

A. W. SCOTT.
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.

**Wasted Energy.**

I have a 50-volt house-lighting plant, with a battery of accumulators. Would it be practicable and economical to charge my 5-volt L.T. battery from this source?

W. W. P.

It would be practicable, but not economical. This is because more than four-fifths of the energy consumed from your battery would be wasted in heating the necessary voltage-dropping resistance.

**An Old Friend.**

Have you ever published any constructional details of the band-pass filter arrangement shown in Fig. 1 (a) of the article entitled "Selectivity and Quality," which appeared in your issue of October 30th? If you have not, I should particularly welcome a word of advice as to the number of turns suitable for the inductance L, which I assume, acts as a coupling between the two separate tuned circuits.

E. B. C.

If you consider carefully the circuit diagram of several recent *Wireless World* receivers, such as the S.O. Regional set and the 1930 Everyman Four, you will see that the filter arrangement, to which you refer is similar in essentials to the aerial-grid circuits of these sets. We have redrawn this conventional filter circuit, showing it in comparison with the aerial input arrangement of the sets mentioned in Fig. 1 (a) and (b) respectively.

It should be realised that the coupling inductance L, is common to both circuits, and, instead of using a separate winding for the purpose of coupling, one can make a coupling on to either of the tuning coils; this latter arrangement is that adopted in this *Wireless World* sets.

It should be pointed out that in the arrangement shown in Fig. 1 (b), inter-circuit coupling is not purely inductive, as there is also a mutual inductance effect, and it is only in this respect that there is difference between the arrangements.

A full description of the windings are given in the articles in which the receivers are described.

**Why a Bigger Condenser is Necessary.**

After handling a friend's receiver fitted with differential reaction, I decided to install one of the new three-element condensers in my own receiver, and chose a capacity of 0.0001 mfd., which is the same as that originally used. The condenser is connected in the manner shown in your journal some time ago; but, much to my surprise, reaction cut out the " 0.0001 mfd. wire" before making the alteration; in fact, it is impossible to obtain oscillation except when the moving vanes are fully in mesh with the set of fixed plates which are in conjunction with the reaction coil. Do you think that the reaction windings of my coils are unsuitably proportioned for this method of control as full-on" setting.

It cannot be taken that the feedback through a differential reaction condenser of 0.0001 mfd. is equal to that of a normal condenser. This is due to the fact that there is a by-pass effect as the second stator is connected to earth; in consequence, there is less energy passed back through the reaction coil, except when the rotor is at the "full-on" setting.

We expect your trouble will disappear if you fit a condenser with a capacity of, say, 0.0002 mfd. between the rotor and each stator. We recommend this course because the larger capacity will probably improve detection efficiency, but, if you prefer it, matters could be improved by adding turns to the reaction coil.

---

**RULES.**

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

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

(3) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter. Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

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

(5) Design or circuit diagrams for complete receivers must be confined to conventional sets described in "The Wireless World" or to standard manufacturers' receivers. Readers desiring information on matters beyond the scope of the information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.
should be any serious loss. Matters are so arranged in the design that there is a certain amount of "pulling" between aerial and secondary circuits, without the need for observing any special precautions in operation. This tends to correct any high-note loss in the tuned intercalve circuit, and the overall result is that the set gives "bright" reproduction.

Using the High-power Pentode.

I am thinking of making the Foreign Listeners' Four, as described in "The Wireless World" for July 31st and August 7th, and should like to know if it would be possible to use a P.M. 24A pentode valve in the L.F. position. If so, will you give me some idea as to the alterations that will be necessary? I can get a power transformer delivering 310 volts across each half of the high tension secondary, and with suitable low-tension outputs.

L. P. A.

There is no reason why the new high-voltage pentode valve should not be used in this receiver, and we give in Fig. 2 a
couple the screen circuit of the pentode in the manner shown, and, as you will doubtless realise, care must be taken to see that the low-tension windings of the power transformer which feeds the cathode filament is redesigned, in order that it may deliver a lower voltage suitable for the pentode filament.

Fig. 2.—Super-power pentode output valve for the "Foreign Listeners' Four"; diagram showing circuit modifications.

Side-band Loss.

Will you give me an idea as to the probable loss of side-bands in the "1930 Everyman Four" receiver?

E. F. E.

It is not possible to give a definite answer to this question, as a good deal depends on the way in which the set is operated. As you will know, a coupled tuned aerial circuit is provided, and if the receiver is operated in such a way that there is a tendency towards double-bumped tuning—but there should not be more than a mere tendency towards this effect—there is no reason why there

FOREIGN BROADCAST GUIDE.

KOENIGSWUSTERHAUSEN
(Zeesen) (Germany).

Geographical position: 52° 17' N. 13° 37' E.

Approximate air line from London: 588 miles.

Wavelength: 1,635 m. Frequency: 1,633.5 k. Power: 20 kW.

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

Relays Berlin (Witzleben) and other German stations, but gives an alternative main evening programme; works throughout the day from 3.55 a.m. G.M.T. with talks, etc., including the following principal standard daily transmissions, G.M.T.:—

5.55 a.m. weather; 6 a.m. physical exercises from Berlin; 11 or 11.30 a.m. gramophone records; 1.30 p.m. children's hour; 7 or 7.30 p.m. main evening concert.

A male announcer. Call: Achtung! Achtung! Hier Koenigswusterhausen und der Deutscher weltverbindender und weile ein und dreisig komma acht und dreisig. (This is Koenigswusterhausen and the German world transmitter on 31.38 m.)

When relaying Berlin, this station, as well as Magdeburg and Stettin, are included in the call.

Interval signal: Metronome. 120 beats per minute.

Closes down with the German National Anthem, played to the melody of the Old Austrian Hymn (Haydn).
A DISCOVERY IN WIRELESS!

BY A MAN WHO SET OUT TO LOG THE WORLD

AN ACTUAL EXPERIENCE

of a wireless enthusiast whose desire it was to get world wide reception—and failed. He then changed his transformers and fitted Telsen, and writes that the moment he began to search around the dial, foreign stations came rolling in one after the other with strength and purity many of which he had never heard before—a discovery by him—profit by it—Fit Telsen Transformers now.

RADIO'S CHOICE FOR WORLD WIDE RECEPTION

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TELSEN ELECTRIC CO. LTD., MILLER STREET, BIRMINGHAM.
Accumulators Elite
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Scientific

AND BROOKMANS PARK.
The B.B.C. stated that the earth connection should be improved to get the best results from this station. You can do this by installing the above "Earth" which has been universally admitted to be the best ever devised, because of its very low resistance to earth. Owing to the demand for this "Earth," no other type can hope to equal it, taking equal area of contact.

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Tuning without irritating uncomfortable crouch or stoop.

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Bakers Window

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Bakers Window

BERKELEY VICTORIAN

Bakers Window

BERKELEY VICTORIAN

Bakers Window

BERKELEY VICTORIAN
VERB. SAP.

RIDDLE told me at the Club last Monday that he had been consulted regarding the purchase of a Portable for a friend. There had been sixteen makes of set on his own list, but he whittled the choice down to three when he saw me. What interested me, though, was that of the original sixteen every one was fitted as standard with Hellesen's H.T. Batteries.

"Naturally," he replied, when I remarked on this fact, "it's the first thing I look for. If a manufacturer standardizes Hellesens, the odds are that the other components he fits will be up to the same high quality. And anyway, an H.T. Battery that has to fit a small space and yet supply four or five valves must be considered as a very good one indeed. It needs to be a Hellesen's and nothing less."

"Verb. sap," I thought.

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NATIONAL and Loydon for A.C. Radios: make up your own inexpensive changers; blue print designs; written and workmanship guaranteed; numerous testimonials; free address, Shirley, Bermondsey.

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RADIO Gramophone, condenser, super quality, all 12 strings operated, push-pull amplification, B.T.H. pick-up, 300 grams, £25. For use in Liesse, Marconi, etc., £15. High quality coil-lesuiter; owner using going abroad. 150/- B.P. Batteries, 2852 for appointment to be sold.

30-40 6 valve panel, £20, £15, £10, £5 for wiring, mounted on box, with panel, instructions, etc., £15. Below.

Uniflex Eliminator Kits are the cheapest in England and sold all over the world; 20/-. Uniflex Eliminator Kit for wiring, £11 17s. 6d., sold complete with full wave rectifiers, D.C. 4 117 45s. 4d. L. Models Obtained for 10/- Deposit; take advantage of this and get constant high tension immediately.


"Koila" Eliminator, output 200 volts 100 ma.c.c. output voltages, separate smoothing for each tap. In Ferntow: metal case, output 200/100, 20/-; 50/10, 15/-; in B.P. or box, 10/-. To the Wireless World.

POTENTIAL Dividers, wire wound, variable tapping, ideal for eliminators and rectifying units; price 6/6, post free.—Bolton.

POTENTIAL Dividers, standard 20 m.A. type, variable tapping, supplied in all values; a first class job; price 2/6.—A.Thton Wireless Supplies, Aigburth, Merseyside.

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Many types available, write for list.


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Savages Mains Transformers and Power Chokes are carefully and individually constructed from first class materials, with a workmanship margin of safety.


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MAINTEN SPECIALITY Co., Ltd., invite new order to their fine and popular range of
MAINTEN Special A.C. Unit, including 2 variables—0-80 and 0-100, 120, 150, and 220 volts at 50 m.a. Full wave Westinghouse rectification and heater transformer for A.C. valves up to 4 amps. in hand; complete with metal cabinet; two £5/15, or without heater transformer £3/15.

MAINTEN Model A.G.M.100 H.T. Unit, similar to above, but with 100 m.a. output, complete with with Westinghouse rectifiers; £5.

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CONE or Horn-type 8 O.U. SPEAKER

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Make your new Set look even better than the last — at a Resistor Panel. Beauty is a Set—a good Set deserves it. Resistor Panels are distinctive in design and are cut from high grade bobs—known for their everlasting service, too. Ask your Wireless Dealer to give you particular, or write direct.

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W.B. present a neat, inexpensive Loudspeaker

chassis. Just what the home constructor needs.

Fits any Unit.

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Build your Speaker with the W.B. 4-Pole Raitzen-Assonnet Coax Unit. (Only 12/-.) Mount it on the W.B. Chassis. Total cost of Speaker 21/-.

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CHARGING Generators for Sale; bargain; includes every size and makes in stock. As low as £3. 4½ volts, 5 amperes, £4. 5½ volts, 6 amperes, £6. 6½ volts, 7 amperes, £8. 7½ volts, 8 amperes, £10. 8½ volts, 9 amperes, £12. 9½ volts, 10 amperes, £14. 10½ volts, 11 amperes, £16. 11½ volts, 12 amperes, £18. 12½ volts, 13 amperes, £20. 13½ volts, 14 amperes, £22. 14½ volts, 15 amperes, £24. (New or stock.)

SELECTION of Spares for all makes, new or stock, 5½ to 14½ volts, 1½ to 15 amperes. Offered at a very nominal price, with guarantee, 50/-.

New Dynamo Charging Dynamo, 30 volts 10 amperes, ball bearing, 4 pole, new condition, weight 60 lbs., £60. 4½ volts, £12. 5½ volts, £24. 6½ volts, £36. 7½ volts, £48. 8½ volts, £60. 9½ volts, £72. 10½ volts, £84. 11½ volts, £96. 12½ volts, £108. 13½ volts, £120. 14½ volts, £132. 15½ volts, £144. (Now reduced to 1/3.)

REPAIRS Our own work, 5½ to 14½ volts, 1½ to 15 amperes; with guarantee, 50/.

The word "OBETA" stands for LONG, CONSISTENT, BRILLIANT LIFE.

**OBETA H.T. BATTERIES**

<table>
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<tr>
<th>Standard</th>
<th>60 Volt 8/-</th>
<th>105 Volt 13/-</th>
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<tr>
<td>Power</td>
<td>60 Volt 10/3</td>
<td>105 Volt 16/-</td>
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Your Wireless Dealer can obtain them from:

F. L. LESINGHAM,
13, Victoria St., LONDON, S.W.1

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**CLIX**

There are 21 Varieties of contact in the Clix range and each one is carefully designed to meet the demands of modern requirements in contact.

**No. 10. CLIX-LOX WANDER PLUG.**
Adjustable to fit any socket. A turn of the insulator locks it. Special short insulator. Red, Black and Green.

**No. 15. CLIX ALL-IN PLUG AND SOCKET TERMINAL.**
The only complete panel terminal entirely insulated from the panel as well as when connected or disconnected. With it you will obtain safer, speedier and better contact. Price complete 8d.

**No. 4. CLIX HOOK TERMINAL.**
Ideal for speedy connection and secure contact. Lead coated for H.T. Nickel-plated for H.T. Red No. 4 and Black 2d.

Write for the Clix folder containing details of the 21 varieties.

LECTRO LINX LTD.,
254, VALHALL BRIDGE RD., S.W.1

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**DOMINION VERNIER DIAPHRAGMS**

Brownie are now producing 2,000 Dominion Vernier Diaps a day. That is why it is possible to offer this high-grade dial at the wonderful price of 2/6.

The mechanism is a special non-backlash design with a reduction ratio which makes fine tuning easy without becoming tedious.

Finished in plain black or beautifully grained mahogany Bakelite.

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**HUGE STOCKS**

AMAZING BARGAINS IN EFFICIENT STEEL MASTS

<table>
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<tr>
<th>STEEL MAST</th>
<th>26ft.</th>
<th>34ft.</th>
<th>40ft.</th>
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<tr>
<td>Carriage</td>
<td>London, 1/-</td>
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<tr>
<td>Midland, 2/6</td>
<td>2/-</td>
<td>3/-</td>
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<td>Elsewhere, 3/6</td>
<td>4/-</td>
<td>5/-</td>
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<td>Weights 40 lbs.</td>
<td>4/6</td>
<td>5/6</td>
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OUTFIT with MAST. Mast rings, ample stranded wire (cut to lengths), Pulley, Cleat, Solid Metal footrest and strong galvanised stay-fasteners. Note.—Our Masts are stayed at 4 ground points (not 3) which assures safety.

ACCESSORIES. Best Manilla Rope Halyards (will not rot) 60 ft. 1/-, 100 ft. 2/- Special Anti-rust paint (sufficient for mast) 1/6. Coppered excising tube, B.R. Special Aerial, has 14 strands of No. 28 gauge Enamelled high conductivity pure copper wire, 120 ft. 3/6.

Money refunded if mast returned intact and carriage paid within 7 days.

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**FAIRFIELD TUBE CO., 6, SOUTHEND ROAD, BECKENHAM, KENT.**

---

**LETTERS TO THE EDITOR.**

**Loud-speakers.—Contd.**

EPOCH—Moving Coil Speakers.

EPOCH—Moving Coil Speakers Speak for Themselves.

EPOCH—Ask any of the thousands of users of even the older models, but this season's models? Well, let the speakers tell you themselves.

EPOCH—Please do test them against any or every one make on the market—preferably with a quick switch over.

EPOCH—Your deposit instantly refunded in full if you are not more satisfied. No catch. No red tape.

EPOCH—Send for catalogue W.S.

EPOCH—16 pages crammed full of real information.

EPOCH RADIO MANUFACTURING CO., Ltd., are the manufacturers. City Office and Service Station, 5, Partington Avenue (Londongate Circus end), E.C.4. Phone: Central 1971 (6 Lines). Private Branch Exchange (1972)
The accepted Rolls Royce of Radio is that great success

DIX-ONEMONET

It is a Precision Instrument of universal use, with an ingenious system of multipliers which enable full-scale readings of any value to be made over a wide range. One milli-volt to 2,000,000, or 50 ranges to operation. Mm. mirror double scale, with readings edge to edge 22 in. Luxe model for only 50/-.

Multipliers, 6/8 each.

New A.M. ACOMETER. Model VAC.3. In case. A new Model for measurement of voltages on Alternating Current, a 3-range instrument reading 0-150, 0-300 and 0-600 m.v. Price, inclusive of case, 75/-.

TEST SETS. 10 Ranges. Crompton, Nalders, J. & F. or Everhardt, 0-600 v. and 500 ohms mult., 10 ranges. £8 10s. Fine 7-range Fitted Coils, Litis B2, quick new, 35/-, worth double. Valve Characteristics Test Cabinet, 3 Moving Coils meters on panel, 7in. X 9in. Socket for test valves, worth £10. Sale £6 each. A.C. Testers, 108/21, 4 ranges, 120 v., 5, 200 v. and 400 volt on, 40,000 cycle coil range, new, at 40/-; 4-5 M.W. Weston, 21in. dial 0-24 to 0-120 m.A. or 200 m.A. Cost £2. Sale 40/-.

Ferranti Laboratory Sets, mov. coil, mirror scale, built of 3 ranges. Millivolts to 200 v., 1,100 milliamperes to 25 amperes, and all between. Half-test load, £4 18s.

ANODE METERS, panel type for 20 m.A. H.T. output from Eliminators. £7 15s.

LABORATORY. A Set of Sullivan Standard Galvo., Scale and Shunt, £15; 3-range Tinsley Micro Ammeter giving 1 to 1000 range, £10; A.C. Set; type A.C.38 hired £10, £15, £25/-; also the following form type loudspeaker-units: type A.R.88 basis, 7£; ditto, ditto A.R.99, 7£; ditto, ditto A.R.100, 7£; ditto, ditto A.R.101, 7£; ditto, ditto A.RO. 4/6; ditto A.USA. 10/6; ditto A.USA. 12/6; ditto, ditto A.USA. £6. All of these were sent on approval together.

อมะ Fields, £8. £2 15s. to 21in. £2, £3, £4, £5, £6, £7, £8 per inch. £7 15s. to 21in. £5, £6, £7, £8, £10 per inch. £1 5s. to 21in. £5, £6, £7, £8 per inch. £7 15s. to 21in. £5, £6, £7, £8 per inch. £1 5s. to 21in. £5, £6, £7, £8 per inch.

VIEWING APPARATUS.

Say 99!

EPOCH

NEW MODEL 99 P.M.
MOVING COIL SPEAKER
will satisfy the most critical
of listeners.

No accumulator, no mains,
no suspension, no adjustments.
7 days’ free trial.

Send for new 16-page Catalogue
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MANUFACTURING CO., LTD.,
3, Farrington Avenue E.C.4.
Phone : CENTRAL 10122.

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POTENTIAL Dividers; 10,000, 15,000, 20,000, 25,000, and 50,000 ohms, 5 variable supplies; 2-ohm.—Below.

POTENTIAL Dividers, heavy duty, wire wound, 15,000 ohms, 7 watts; 6/6.—Below.

CONDENSERS, 1 mfd. and 0.4 mfd., 0.15/4/8 guaranteed; tested 500 volts.—Below.

CHOKE ES—1-Choke coils, excellent for smoothing, up to 20 milliamperes; 2—special heavy-duty choke coils for 100 and 200 milliamperes at 0.6/8 and 18/8 respectively; any articles on approval against Hugueni, Radio Engineer, Clacton-on-Sea.

BELLING-LEE Panel Fittings are designed to give any expert skill to any home-constructor of cabinets by Belling and Lee, Ltd., Queenstown Works, Ponders End, Middlesex.

Send for new 16-page Catalogue of real information.

POLAR FAST & SLOW MOTION
for TUNING and REACTION

REPAIRS
Any make of L.F. Transformer, Loudspeaker or headphones repaired and dispatched within 48 HOURS.—TWELVE MONTHS’ GUARANTEE with each repair. 4d. = Post Free.

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Depts. W, A, B, C, D, E, N, S, and Q.

BONA FIDE TRADERS’ GUIDE.
Send for our comprehensive Illustrated List.

THE WIRELESS WORLD
November 27th, 1929.

EXACT TUNERS
510 to 5,000 metres.

THE BRITISH TRANSFER PRINTING CO., Ltd.,
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DUTY TRENCHER

SAME DAY SERVICE

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THE WIRELESS WORLD

November 27th, 1929.
The MIDGETPHONE

(3,000 or 4,000 ohms)

A miniature wireless Receiver which equates in volume and portability of reproduction the leading full-size sets. In operation or storage, every box, bag, and miniscope is perfect form: in comfort and convenience, is the highest degree of modern design and positioning.

[Advertised as a highly efficient D.E.F. Aid]

The Midgetphone weighs 1.8 lbs., including case: measures 4 1/2 in. solid connect cord.

SUPER-MICROPHONICS

New, highly sensitive, made on the latest principle, a vast improvement over all other types; will pick up whispered words from a distance of several yards, also strongly amplify and transmit speech and music over a distance, through loudspeaker or headphones.

[Advertised as having NO OTHER MICROPHONE of equal merit, and priced with fit & solid connecting cord.]

[Full directions for use of Super-Microphone for many purposes, and illustrated List of Super-Microphone Add Free.]

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SURPLUS STEEL MASTS at below prices to clear.

28ft. ..... £1.75 each Carriage, London, £1.15
34ft. ..... £2.10 each Carriage, London, £1.50
40ft. ..... £3.15 each Carriage, London, £2.50

[OUTFIT WITH MAST. Mast rings, ample advanced wire (cut to lengths), Puller, Glast, Solid Metal footstep and strong galvanized stay required. Not our. Stayed at 4 ground points (not 3) which ensures safety.]

ACCESSORIES, Best Menina Rope Halyards (will not roil) 60 ft. £1.15, 100 ft. £2.6. Special Anti-rust paint (suitable for mast) Coppered earthing tube, £1. Special Aerial, has 14 strands of No. 28 gauge enamelled high conductivity pure copper wire, 100 ft. £3/6.

Money refunded if mast returned intact and carriage paid within 7 days.

ADELAIDE STEEL TUBE CO., LTD., KENT HOUSE ROAD, BECKENHAM, KENT.
Everybody's talking about this coil

The Sovereign 400 ohm Potentiometer is another popular component, smooth action, bakelite Form, three terminals, control dial and pointer in the "Magic Three," etc. 2/6 each.

The Sovereign Dual - Range Coil is a wonderful component, extremely efficient, highly selective and beautifully made bakelite Form, with normal mounting and treble fixing. Components 8/6 each.

WIRELESS Notes.—A monthly service of information for all those who want the very best in wireless equipment and accessories, with full details of receivers and components; immediate postal help and advice in all technical difficulties. It is both useful and unique; you must have it if you want to know the truth.—Full particulars from Professor M. H. Lamon, Langford, Ealing, W. 11. [6143a]

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GREAT Clarinet.—The following is a useful special: 'How to connect-high and low tension batteries to receiver, coil and plug and label.' Interesting set of that information, connected to a highly finished terminal bond, all batteries instantly connected or disconnected. These are used now, satisfactorily, £2.60, extra packing, etc.; money returned if lost during shipping.

G.P.O. Telegraph Keys, electric, complete; price £2/6 each; 6/ for postage.

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EXPERIMENTERS' Supplies.—All new and in good condition: Ferranti A.F.5 and O.P.T. 15/- each; 2 x 600 valves and £1250, 10/- each; 10 mfd. A.C.U. condenser, 4/6 each; 6/; A.C.T.S. condenser, 9/6; A.C. F.25, 1/6; A.C.U. 10/6 each; T.E.A. condenser, 9/6; B.B.C. coil, 3000; 2000 mfd. A.C.U., 15/-; Box 1983, £1.00 The Wireless World.

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COTT SESSIONS and Co., Great Britain’s radio microphone specialists, officially armed as wireless experimenters in the Wireless Society of Great Britain and the Wireless League; 1st set of every type repaired, re-built, modernised; ad for special conditions.

COTT SESSIONS and Co.—New set constructed with your or our components, guaranteed entire efficiency: we specialise in the Wireless World quickly; remember, we have satisfactorily equipped our British Isles and in three Continents, so desirous; we will design and construct radio apparatus to suit your special circumstances for efficiency, range and selectivity.—Tel.: Tudor 5326. Muswell Hill, London, N.10.

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R.I. Varley R.C.C. Unit, 8/-; Dubilier diode, 4/-; B.T.H. diode and valve holder, 5/-; Marconi Ideal anode 4-1 14/-; 6-1/2/1/06 diode, B.F. I., 1 ashley, 4/-; Lewoa, 6/-; Cimax, 5/-; Colvern 3, 5/-; Watson M.U. speaker, 11/-; coil sides, 1/6; Lea six wire coils, from 3/-; lamp resonant and potentiometers, from 2/6; scientific Development Co., 51, Fishgarth, Preston.

FOR Sale, several wireless high-tension and low-tension motor generators; also A.O. power eliminators, power amplifiers, and moving coil speaker casing, ready machined.—Full particulars from Power Supply Co., 14, Mount Pleasant, Liverpool.

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TWELEVE Months’ Guarantee Accompanies all our Repairs; many make of J.P. transformer, head-phones, etc.; special attention to tubes and circuits; 24 hours; 4/- post free; don’t disorder if burnt out; runs to trade.—Transformer Repair Co. (Dept. VI), 14, High St., Colliers Wood, S.W.19. 0011

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SEED FOR HANDBOOK, or 1-3 FOR FULL RANGE OF SAMPLES.

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GUARANTEED! Repairs by Experts.—Loud-speakers, headphone, ear units, pick-ups, any type re- wound; transformers, etc., from 1/-,—(Dept. H), 42, Frome Rd., Edgfield, Ashton-under-Lyne.

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WANTED, D.C. eliminator, 220 volts, Regentons No. 2, or similar, 50 m.s.a., 25 condenser dual drum control; cheap for cash.—Holmes, Glen Gardens, Addington, London. 7305

SPECIFIED Units for Maggi Three; state particulars and lowest cash price.—Trader, 18, Wadham Rd., Jocicle, Liverpool. 7358

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WIRELESS WORLD.” From 1928 to 1928, bound to 1928.—E. Thomas, Worsley St., Manchester.

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WANTED, 4-change, 14/0 transformer.—Ingersoll, 34, Newbold Rd., Chesterton.

WANTED, Ignite 7-2/01 O Transformer, Watney dual tuner, (Gryon 0000) Beve, as new.—Burston, 9, Nottingham Rd., Clumber, S.E.5.

WANTED, 2 or 3-bass A.C. electric receiver, ‘phones, 4/3, Olive Rd., Cricklewood, 7356.

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COMPLETE Pelman Course, over £210 asserted of components, etc., hand system, Overhead 28/6 reinжив, wanted, H.T. pic-up, H.T. A.C. eliminator, Trickle chokes, Potenti—or Facen, round.—Price, 3/6.—Box 3953, c/o The Wireless World.

YOUNG’S Old Apparatus Taken in Part Payment for Latest Type; see our advert, in columns Receivers—Sale.—Scientific Development Co., 51, Fishgarth, Preston.


THE RADIO EXCHANGE, Treville St., Plymouth, the exchange specialists, a trial solicited. 7324

WILL Accept Your Surplus Components or Accessories (making you a high allowance on same) to part payment for any new or second-hand components for complete apparatus; send, without invoice, together with a list of your requirements, and by return post we will make you an offer. If you accept our offer the articles will be sent c.r.s. or cashed, otherwise your own articles will be returned carriage paid.—[H. A. & Company Ltd., 14, Westbourne Terrace, London, S.W.23. 7351


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Would you have the kindness to tell me that your B.S. 1 Loud-speaker is the finest speaker I have ever heard, and if so will you make arrangements to sell them to every possible customer?—Yours faithfully, George H. Talbot, Vice-President the South Cynthia Wireless Society.

Send for particulars to:

STAR ENGINEERING

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The leading All-Mains Transformer.
Three selections from our Disc. List.

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HEAYBERD Transformers refuse to break down, give constant and exact voltage, are made in every conceivable variety, give no trouble, and are WORTH THEIR WEIGHT IN GOLD.

Full Lists Free.


(One minute from Moorgate Station.)

WORLD'S FINEST VALUE

Graves 'Vulcan' 2-Valve Wireless Set is the World's greatest achievement in Wireless Value and Efficiency. Even if you are only a beginner, this magnificent installation will enable you to start where others leave off, or if you are an experienced wireless operator, this superb set will give you a sense of power and command over the mysterious forces of the ether which will astonish you. The Graves principle stands for Highest Quality, with own Price, and Easiest Terms.

SPECIFICATION Cabinet (as illustrated below) of polished Oak, beautifully finished with hinged lid, all internal parts (including valves) easily accessible. Dull Emitter Detector and Power Valves of proved efficiency, anti-microphonic valve holders. No coil to change. Latest type H.T. Battery. Zvox Accumulator and complete Aerial Set. Cost of upkeep negligible. The LOUD SPEAKER (as illustrated) is of exclusive design Cabinet Type in Oak to match the Set. Price, con, and wide range of musical frequencies the Unit being of the four pole balanced armature type, with a large magnet, ensuring the highest standards. Price for Set $10, and carriage paid $15. 10/6.

TERMS Our inclusive bargain price is for delivery and installation, and includes all conditions. One payment, now and 14 monthly payments of $10.60 if satisfied after trial, or perfect outfit in your home. Money back if not satisfied. A splendid offer. Terms of 6 months.

FREE Amplifiers and Condensers.

For Eliminator Circuits

You cannot afford to use any but the best Condenser in an eliminator circuit.

**Helsby Condensers**

are made and guaranteed by a firm with 30 years' experience in condenser making, from small telephone and radio condensers to Power Condensers weighing upwards of 2 tons.

Guaranteed working voltages :

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All Helsby Condensers are vacuum dried and impregnated with a special non-hygrosopic material which renders them moisture proof.

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PRESKOT - LANCs.
Makers of PRESKOT and HELSBY cables

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**Oh for an L.T. I can depend on!**

You need never again experience the disappointment of missing part or all of a much looked forward to programme through your L.T. suddenly giving out. Get a Peto & Radford P.G.F. accumulator which gives you warning that its energy is low. The P.G.F.'s indicating floats ensure that you always have a sufficiency of current to carry you through the programme. A single glance at these tells you whether the accumulator is charged, half-charged, or running out.

It embodies these further special features:

The plates are sturdy. Plate is held by interlocking grids. The lid is of crack-proof, acid-proof Dagenite, hermetically sealed at the edges. Terminals have acid-proof glands, and because of their different diameters they cannot be reversed. There is ample acid-room, and plates are held in place by glass key-waves in the box. Like every other P. & R. Battery, the P.G.F. is guaranteed for six months. Send a postcard for Catalogue to

PETO & RADFORD,
93, Great Portland Street,
(Telephone: London 1473.)

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Peto & Radford
**ACCUMULATORS**
The beginning and the end in **POWER**

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**The National Accumulator Co., Ltd.**

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ON WORLD'S LONELIEST ISLAND!

Where letters come once a year, Marconi Valves keep touch with civilization.

TRISTAN DA CUNHA! In mid-ocean — 3000 miles from America — 2000 miles from Africa. Ship calls once a year. Yet every day islanders get World's latest news — concert from Europe — dance music from New York — through Marconi Valves.

Chaplain of Tristan da Cunha uses Marconi Valves in radio set — island's only constant link with outer world. Because of their reliability, their wide range, their long life. They would improve your set, too. Make its tone clearer. Give it greater volume. They fit any set. Cost not a penny more.

MARCONI VALVES

The first and greatest name in wireless.

Write for an interesting valve catalogue to the Marconiphone Company Limited, 210-212 Tottenham Court Road, London, w.1.