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The Wireless World

AND RADIO REVIEW

The Paper for Every Wireless Amateur

Wednesday, January 22nd, 1930.

BurTON SELF-LOCATING VALVE HOLDER



1/- each

Pentode - Valve - Holders 1/6 each

Patent No. 316708

MANUFACTURED BY C. F. & H. BurTon

PROGRESS WORKS WALSALL, ENG.



TELSEN
L.F. TRANSFORMERS

Radio's Choice

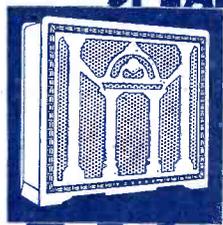
Have acquired a world-wide reputation for Quality and Value.

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

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

RADIOGRAND 12/6

HEAR THIS GREAT SPEAKER ACHIEVEMENT



The **ULTRA POPULAR "FIFTY"** embodies the famous Double Linen Diaphragm. Possesses all the acoustic advantages of small diaphragm for high, and large diaphragm for low audible frequencies. Even frequency response. Scientifically balanced for area, mutual tension and juxtaposition. In solid oak or mahogany. From all radio dealers and music shops.

50/-

ULTRA AIR CHROME SPEAKER

WITH THE DOUBLE LINEN DIAPHRAGM

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McMICHAEL PORTABLE RECEIVER 22 GNS.

Point No. 1.

SELECTIVITY.

At the gates of Brookmans Park (both wavelengths being radiated) both programmes and Continental stations were received with complete separation.

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179, Strand, London, W.C.2.



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EVER READY
WIRELESS DRY BATTERIES
ARE TROUBLE-FREE AND
ENSURE THE PUREST
AMPLIFICATION

**Special EVER READY units
for Portable Sets**

Careful attention has been given to modern practice in portable set construction, and the following three batteries are specially designed for use with them. These units should cover the range of replacements required for most standard models.

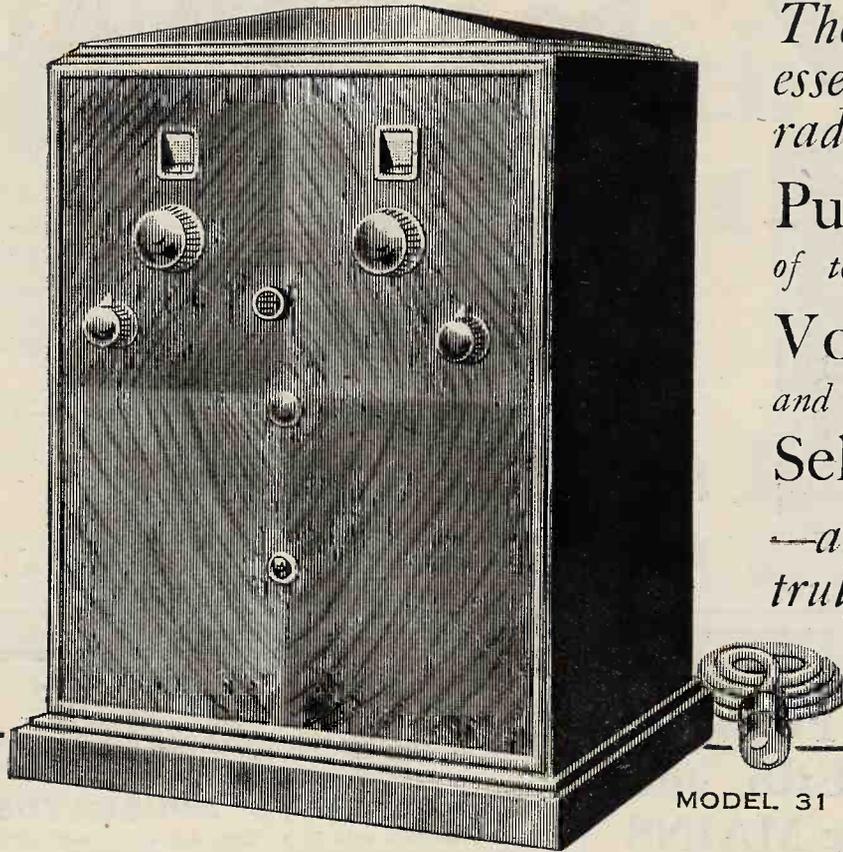
- 63 PORTABLE ONE VOLTS, 6" x 5" x 3" 8/6
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—with a great name behind it!

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MODEL 31

*The three
essentials of
radio reception—*

Purity
of tone;

Volume,
and

Selectivity

*—are well and ★
truly balanced.*

THE FERRANTI "All Electric" Radio Receiver is designed by experts in the art, and built on sound engineering principles.

★ Whilst we make no extravagant claims we can definitely declare that our Set has been scientifically measured and compared with many others, and found equal to any and better than most in all the three essentials.

*A special order from your dealer
will ensure prompt delivery.*

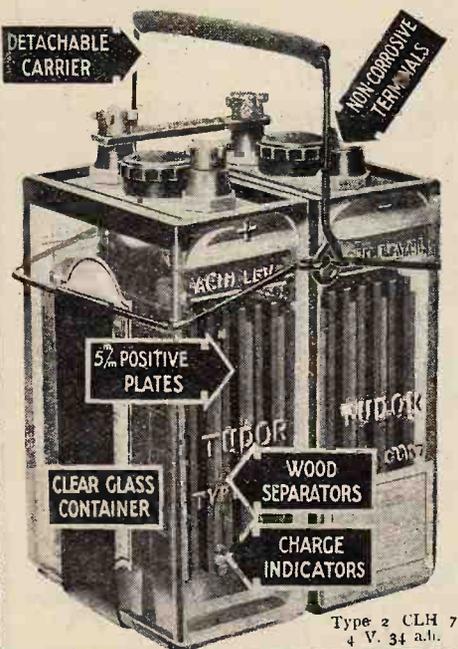
Write for illustrated book, and, if you are interested, we will arrange for a demonstration in your home.

The price, including valves, is £25 in Oak Cabinet, and £26 in Walnut or Mahogany Cabinet. Royalty £1 extra. This set is available for Alternating Current mains only, voltages 200/250, 40 cycles or over.

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Let your 1930 battery

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Type 2 CLH 7
4 V. 34 a.h.

In the field of good batteries Tudor, with its long life and reliability, always leads the way. The Tudor Monolt Unit is the ideal accumulator for your set. Every part has been carefully designed, and is the result of thirty years battery experience. With this accumulator you will obtain a definite refinement in reception, combined with a much longer life. Among its many characteristics are the charge indicators, which show you when the cells are running down. It has all the usual Tudor features, including non-corrosive terminals and 5 m/m positive plates. Despite these advantages, Tudor costs little more than ordinary accumulators, and in comparison with the excellent results obtained the slight extra cost is well worth while.

ESTABLISHED IN PUBLIC SERVICE.

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Complete

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Please send me full particulars of Tudor Wireless Batteries.

Name.....

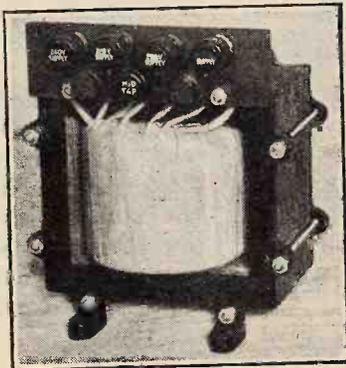
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Tudor Accumulator Co., Ltd., 2, Norfolk St., Strand, London, W.C.2.

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Superior A.C. POWER TRANSFORMERS and CHOKES for the MAINS

from
35/-
for all
Inputs
and
Outputs



Special Audio - Frequency Chokes and Transformers, and Smoothing Chokes for all purposes.

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SCIENTIFIC SHORT WAVE APPARATUS

A complete inductance outfit for a short wave detector receiver which can be followed by L.F. stages. Comprising variable aperiodic aerial coil, grid coil, Reinartz reaction coil and mounting stand. Highly efficient. Full instructions and diagram with every outfit. Interchangeable B.B.C. coils obtainable. 5 coils and stand.

TYPE A.V. UNIT. 18-90 METRES.



PRICE
20/-
Complete.

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2,000 to 12 METRES.

A redesigned model with an effective range of 2,000 to 12 metres. Specially suitable for screened grid H.F. circuit where the choke is of vital importance, and in all other positions. Used solely in "EDDYSTONE" short wave receivers. Takes up very little room and has an exceptionally small outside field.

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London Service Depot:
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W.C.2.

Tel.: Gerrard 2544.

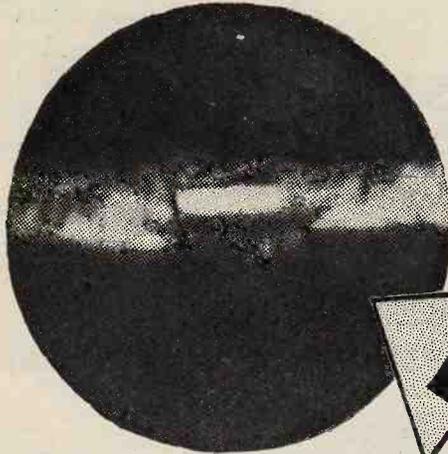
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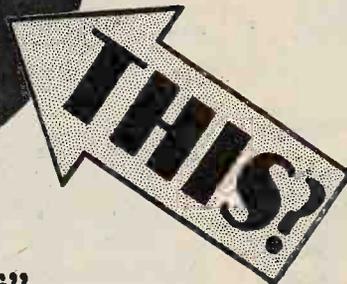
EVERYTHING



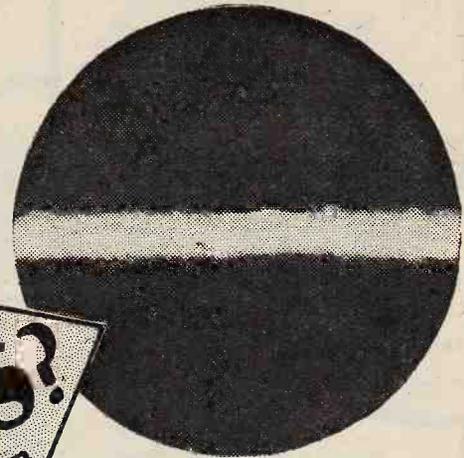
ELECTRICAL



Which would
you choose-



or



**A BAD Filament
WITHOUT
"TENACIOUS COATING"**

Reproduction from an untouched microphotograph showing 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.

**A GOOD Filament
WITH
"TENACIOUS COATING"**

This reproduction shows 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."

SOLD BY ALL WIRELESS DEALERS

**Osram
Valves**
with the
"TENACIOUS COATING"

WRITE for booklet "OSRAM WIRELESS GUIDE" 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.

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.25, .5, 1, 1.5, 2, 3, 4, 5 and 10 Megohms. Other Higher Values specially to order. Each **2/6**

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Any standard value. Each **1/-** Holder (Horizontal or Vertical). Each **1/-**



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(Horizontal Type)
10,000 to 100,000 ohms **5/-**
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for the asking—
the Dubilier Book—
let entitled "A Bit
about a Battery."
Get a copy from
your dealer.

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If you have any difficulty in obtaining Dubilier Products, please write direct, giving your Dealer's name and address, to
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Ducon Works, Victoria Rd., N. Acton, London, W.3

Cleaver

BC278/R

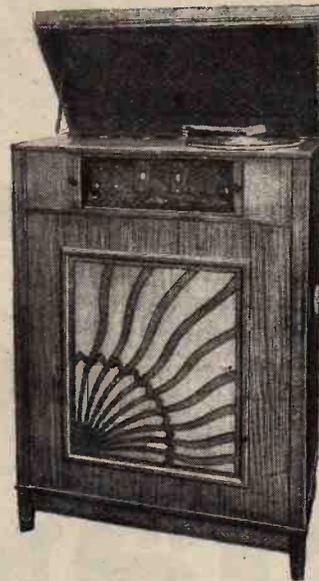
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Did You Listen ? RADIO WEEK

and were **YOU SATISFIED?**
IF NOT:—

YOU or YOUR friends may desire "something Better in Radio"—we believe we can Interest you.

Get the Experts to Advise You:—
The R.G.D. Radiogramophone

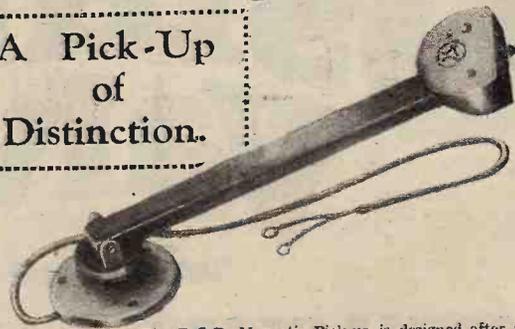


For the highest possible quality and tone for both radio and record, with ample volume, incorporating the latest developments in moving coil speaker; operates entirely from electric mains, A.C. any voltage, or D.C. 200 volts or over.

Mahogany **£80**

Oak **£75**

A Pick-Up of Distinction.



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.

Place your order now to ensure delivery and we shall be pleased to supply literature on application.

The Radiogramophone Development Co.,
St. Peter's Place, Broad Street, Birmingham.

AA



-and no crackle

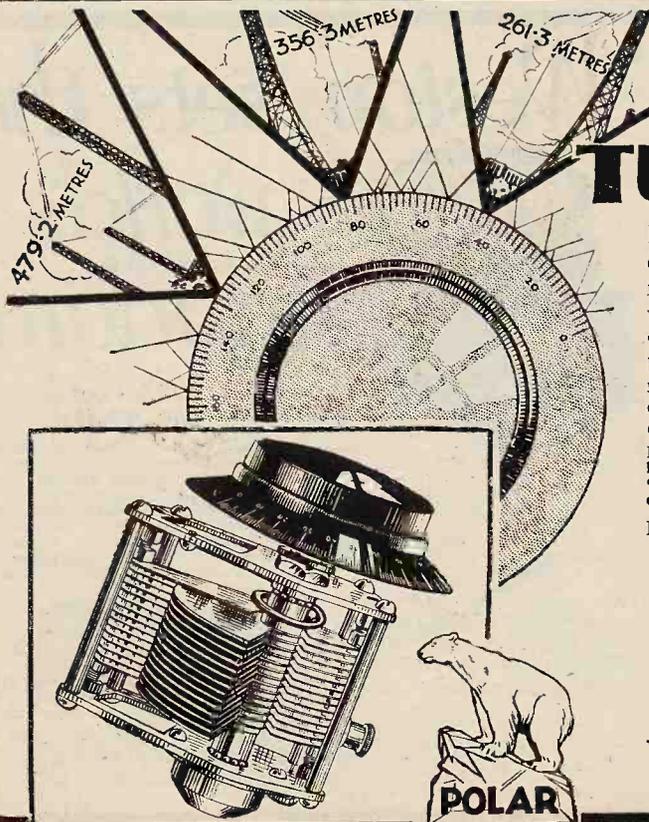
Every sal-ammoniac battery begins to "crackle" far too soon. "Pertrix" simply cannot "crackle," for its electrolyte produces no corrosion. Nor can "Pertrix" lose power when not in use. These two points alone place "Pertrix" in a peerless position.

Use no battery but that with "pep."

PERTRIX
SUPER LIFE
H.T. BATTERIES

PERTRIX LIMITED, Britannia House,
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Factory: Britannia Works, Redditch, Worcs.

LONGER LIFE!



WIDE TUNING RANGE

Because Polar Condensers are scientifically designed—have accurately spaced vanes and low minimum self capacity—they give you a definitely wider range of tuning.

There is no need to sacrifice listening to 5 GB (479 metres) because you want Brookman's Park (261 metres) transmission. The Polar "Ideal" or Polar "No. 3" Condenser of .0005 capacity will tune them all in on any standard circuit receiver.

Polar Condensers give velvet-smooth control, and the "Ideal" with both Fast and Slow motion gives knife-edge selectivity. Both the Polar "Ideal" and "No. 3" will make a wonderful difference to your range of reception.

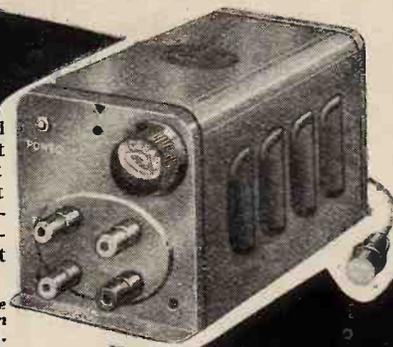
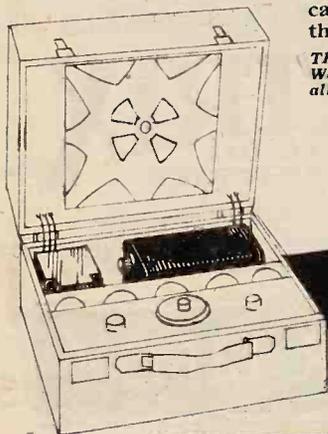
POLAR "IDEAL" .0005 12/6. POLAR "No. 3" .0005 5/9.
.0003 12/-. .0003 5/6.

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Obtainable from all Dealers. Write for Free copy of "Polar" Catalogue (W).

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The **REGENTONE** "Portable" H.T. Mains Unit



This new Regentone Model is specially designed for Portables. Three separate positive output sockets—one variable—on a separate circuit principle are provided to ensure those exact critical values of voltage so necessary in Portables for maximum efficiency. Special precautions have been taken entirely to prevent the possibility of any external field.

The Regentone 12 months' **GUARANTEE** covers the Westinghouse Metal Rectifier incorporated in this and in all Regentone A.C. Mains Units and Mains Receivers.

For A.C. or D.C. Mains.

A.C. Model **£4 5 0**

D.C. Model **£2 15 0**

Write to-day for **FREE ART BOOKLET** "Radio from the Mains" and for particulars of Regentone **HIRE PURCHASE TERMS**.

fits inside every standard

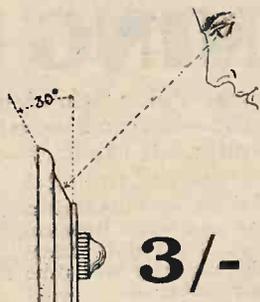
Portable



REGENT RADIO SUPPLY CO., 21, Bartlett's Bldgs., Holborn Circus, London, E.C.4. Telephone CENTRAL 966.

THE FINEST VERNIER DIAL OBTAINABLE

MECHANICALLY PERFECT, POSITIVE BRASS CONTACT drive on **SOLID BRASS SCALE** ensuring smooth movement, with absolutely **NO BACK-LASH**. **ROBUST** in Construction and Trouble Free. **SMALL, EXTREMELY ELEGANT, EFFICIENT.**



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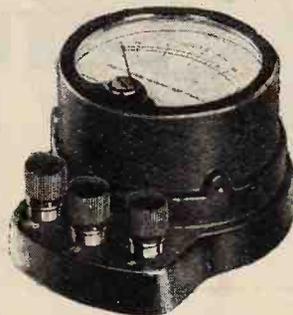
TUNING WITHOUT IRRITATING UNCOMFORTABLE CROUCH OR STOOP.

As pictorially shown, the scale and aperture are inclined at an angle of 30° from perpendicular, thereby permitting convenient unobstructed view of scale without need to crouch or stoop.

If unable to obtain from dealer please communicate with us. Full Catalogue sent post free on receipt of post card.

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Model 528, Pocket Size A.C. Tester

A small and reliable instrument essential to maintain accuracy and efficiency in Voltage control. The sensitivity is remarkably high, 6 m.a. for 600 volts with self-contained resistance. The Scale is very legible and the damping excellent. This instrument is capable of continuous service at full load.

Prices from

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

HELSEBY 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.
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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.



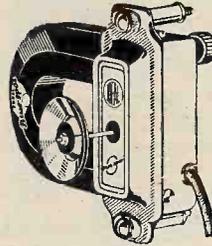
BRITISH INSULATED CABLES LTD

PRESCOT - LANCS.

Makers of PRESCOT and HELSEBY cables

GET THEM BOTH TOGETHER . .

66 K UNIT 25/-



When getting your 66K Unit, ask your wireless dealer to demonstrate the Blue Spot Chassis.

You will then hear what the 66K Unit really can do—for it is working under ideal conditions, driving a chassis specially made for it.

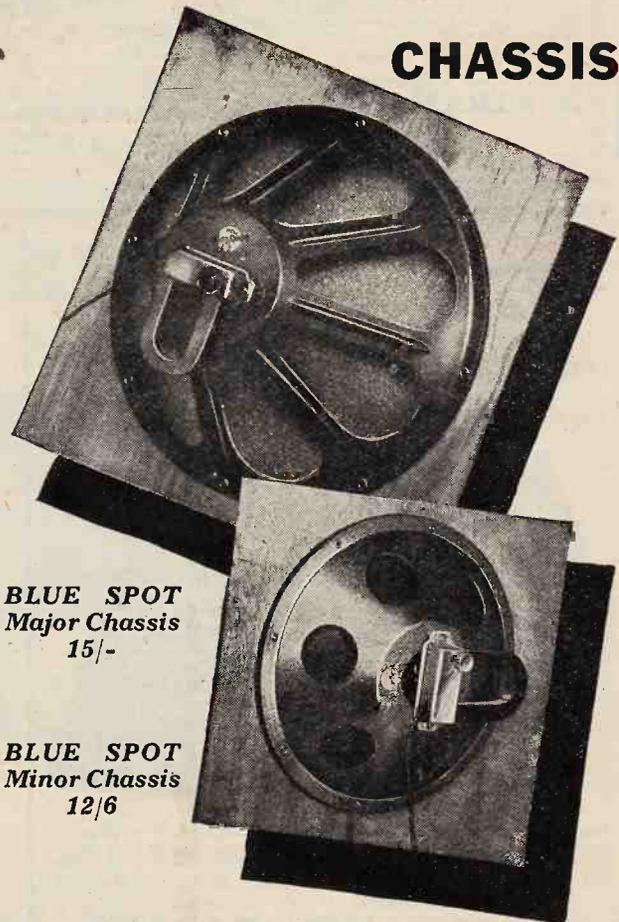
The Blue Spot Chassis is made in two sizes, complete with cone:

The Major (13" cone) 15/-

The Minor (9 1/4" cone) 12/6

Both Blue Spot and both the finest value obtainable.

BLUE SPOT CHASSIS



BLUE SPOT Major Chassis
15/-

BLUE SPOT Minor Chassis
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204-6 Gt. Portland St., London, W.1. 'Phone: Museum 8630 (4 lines).

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**The World
of Wireless
needs these helps**

THEY SAVE
ENDLESS WORRY,
WASTED TIME,
AND MONEY.

**THE "BENCHRACK."
(Tiltrack Principle.)**

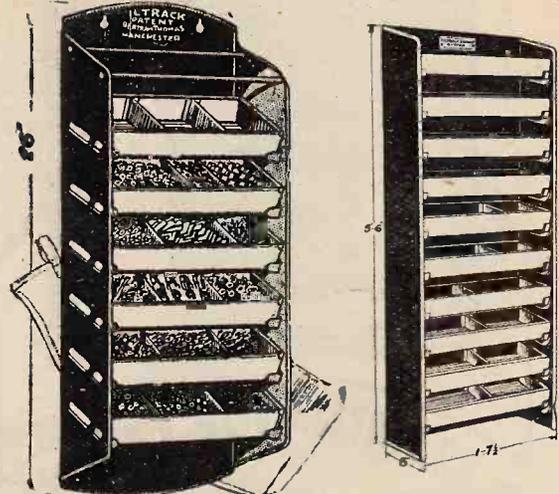
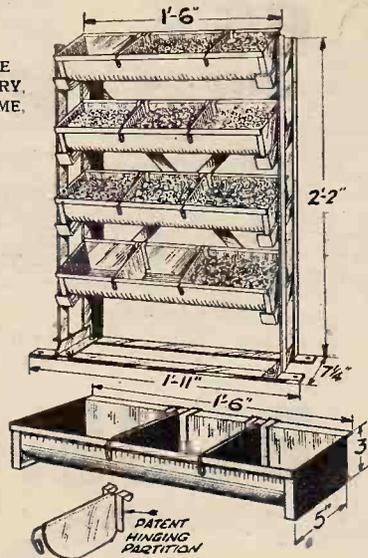
No builder of Wireless Sets, no Factor or Retailer should be without this splendid help. It stands on the workbench and enables all small parts such as Terminals, Nuts, Bolts, Washers, Condensers, etc., to be stored right to hand. All parts needed for the job in progress are thus on the spot. It is a tremendous time-saver. All the trays are tilted so that the parts stored can be seen at a glance; and, furthermore, to facilitate rapid removal of the goods the front faces of the trays are rounded. Each tray is provided with patent hinging partitions which can be rapidly moved to make larger or smaller compartments. They are all steel and a really sound job. They are stronger, neater, cleaner, and much more efficient in every way than wooden shelves, and they cannot catch fire. Being so accessible they save tremendous time when stocktaking. The Experimenter will do his jobs much quicker and with greater pleasure; and the Factory, Factor, and Retailer will save many pounds per year by installing this Benchrack.

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

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



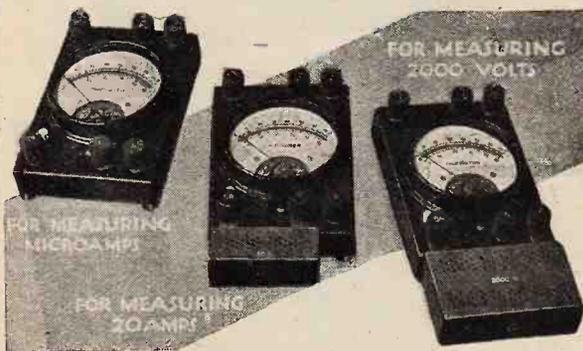
"TILTRACK" JUNIOR **30/-**
Post Free.

A splendid rack for storing small components. Made of steel and supplied with canvas protective cover. A most popular rack that very quickly pays for itself.

"TILTRACK" TWEENIE **70/-**
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A most useful rack somewhat bigger than the "Junior." Very compact with great storage capacity. Compartments sub-divisible at will.

*The
Dixonemeter
indicates the pinnacle of utility
for electrical measurements.*



50 ranges on one meter. Highest Grade at a low price.
METER ONLY **50/-** RADIO SET **£4 10s.**
Half the price of old-fashioned designs. Order one for 1930.
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**THE OUTSTANDING
FEATURE OF A
GOOD MAINS UNIT!**

Look at any good mains unit! See how often Hydra Condensers are incorporated! The best manufacturers and the wisest amateur constructors know that Hydra Condensers provide the greatest margin of safety—because Hydra are built to stand up to overloads and have never been known to break down under normal conditions.

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Telephone:
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T.C.C.
acquire Sole
Selling Rights
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Condensers—have pleasure in announc-
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rights in "Microfu," product of Micro-
fuses, Ltd.

The "Microfu" is made in various ratings,
from 5 milliamperes to 1000 milliamperes,
and is suitable for the protection of valves,
wireless sets, eliminators and all instru-
ments taking small currents. It remains
constant and will carry a load within 80%
of its blowing point. It blows to within 10%
of its rated value and operates with the
extreme rapidity of 1/1000 second.

The "Microfu" will now have behind it
the backing of the whole T.C.C. organiza-
tion, with its unrivalled and world-wide
reputation.

Cartridge : 2/-.
Complete with Holder : 2/9.
The "Microfu" is made in a wide
range of types to blow at from 5
m/a to 1000 m/a. Obtainable
from all dealers.



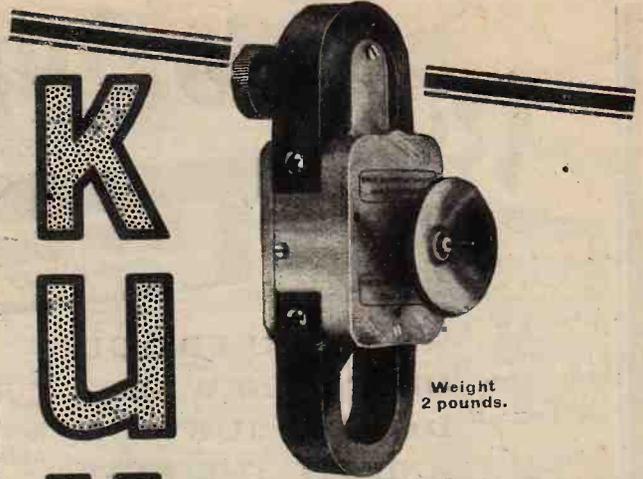
POLICY

The T.C.C. will continue as here-
tofore their policy of manufactur-
ing Condensers only.

**TELEGRAPH CONDENSER
Co., Ltd., Wales Farm Road,
NORTH ACTON, W.3.**

CA 3229

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Weight
2 pounds.

**K
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**The SUPER
SPEAKER
UNIT**

The unit that realises the possibilities
of your set. You do not know what your
set is capable of until you have heard
the "Kukoo."
Without fear or favour we claim the
"Kukoo" unit to give results equal to
Moving Coil. Radio Experts and Music
Critics are agreed that for faithful repro-
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it leads the field.

**Do Not Believe
Our Claims only—
READ THIS PROOF!**

TOM PRENDERGAST
24, UPPER BROOK ST., CUMM. MANCHESTER

7/12/29

*Genl. Have fitted the
"Kukoo" L.S. (Baffle Board 36)
& have obtained absolutely
Moving Coil results. Wonderful.
Thanks. Yours etc.
Prendergast*

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

Specially
designed
Kukoo
Chassis and
10 1/2" Cone,
15/6
post free.



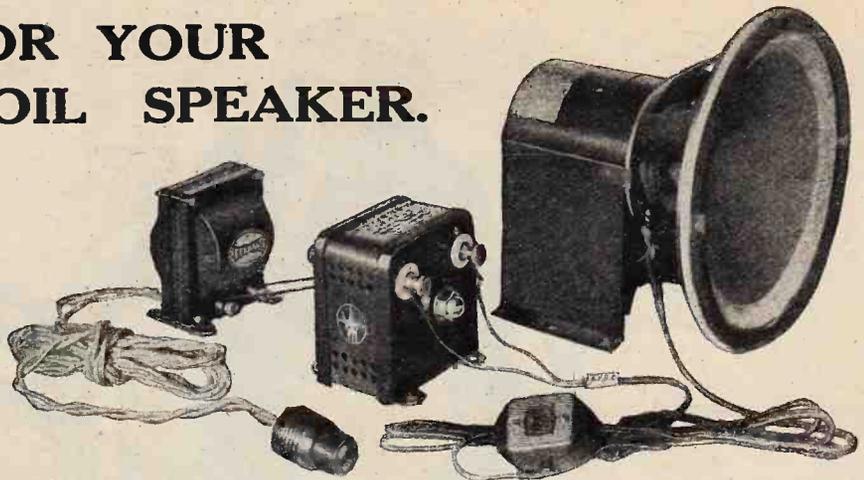
Phone :—20866.
Grams :—Magnet 20866 Sheffield.

Postage 9d. extra.

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CURRENT FOR YOUR MOVING COIL SPEAKER.

THE COMPARATIVELY HEAVY SUPPLY DEMANDED BY THE POT MAGNETS CAN BE VERY EASILY OBTAINED FROM YOUR A.C. HOUSE MAINS WITH THE AID OF



A



METAL RECTIFIER.

Full particulars, and circuits, showing how to use all types of Westinghouse Metal Rectifiers, are given in our 32-page book "The All-Metal Way, 1930." It includes a chapter of useful information on the running of moving coil speakers from the mains.

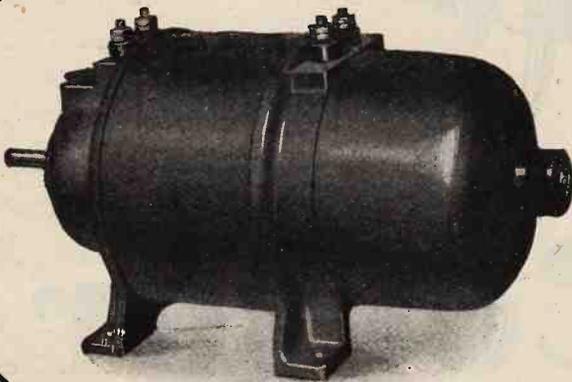
Send 2d. stamp for a copy.

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

IF YOUR SUPPLY MAINS ARE D.C.

You can use an A.C. All Electric Receiver By Employing The M.L.—D.C. to A.C.

ROTARY TRANSFORMER



Can be supplied to run from any Voltage 12-250 V. D. C.

Recommended and used by

Philips Radio,
Marconiphone,
Burndept,
Kolster-Brandes,
M.P.A., Etc., Etc.

40 WATT Model
£13-0-0

85 WATT Model
£19-0-0

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



WHEN you buy a Screened Grid Valve insist on the one which will give you the longest service—the *NEW* Cossor. The Interlocked Construction system, used exclusively in the *NEW* Cossor Screened Grid Valve has proved itself, *in actual service*, to be the most reliable, the most robust and the most dependable method of valve construction yet devised. For power, for reliability and for long life, use the *NEW* Cossor Screened Grid Valve in your Receiver. Every Dealer sells it.

The *NEW* Cossor 220 S.C.
(2 volts 2 amp.) Impedance
200,000. Amplification
Factor 200.
Anode Volts 22/6
120-150. Price

Cossor 4 and 6 volt
Screened Grid Valves are
also obtainable from all
Wireless Dealers.

The NEW COSSOR Screened Grid Valve

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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INDISCRIMINATE LISTENING.

WHAT is indiscriminate listening? Sir John Reith has recently described it as one of three great prejudices against broadcasting.

In an article in the *Daily Express* last week, referring to indiscriminate listening, Sir John wrote: "When wireless is first installed it is a novelty and people probably listen too much. The novelty wears off, interest flags, and boredom results. There are those who think they should be entertained or edified or instructed according to the particular desire of the moment.

"They are annoyed if, on switching on, they hear something they do not like. They may switch on haphazard a dozen times a week, and on each occasion hear nothing which pleases them. They sometimes forget that there is wireless apparatus in almost every second home in the land, and that there are millions of others whose tastes are certainly not identical with their own.

"Programmes cannot be modelled on individual

desire. They should be studied in advance, a selection made of the items which will be of interest, and these listened to seriously."

We are entirely in agreement with the view that listeners ought not to expect that at any moment when they switch on the wireless they are going to be entertained or amused with a programme item exactly to their taste. No sane person would contract the habit of buying theatre or concert tickets without first knowing at least something about the character of the performance to be given.

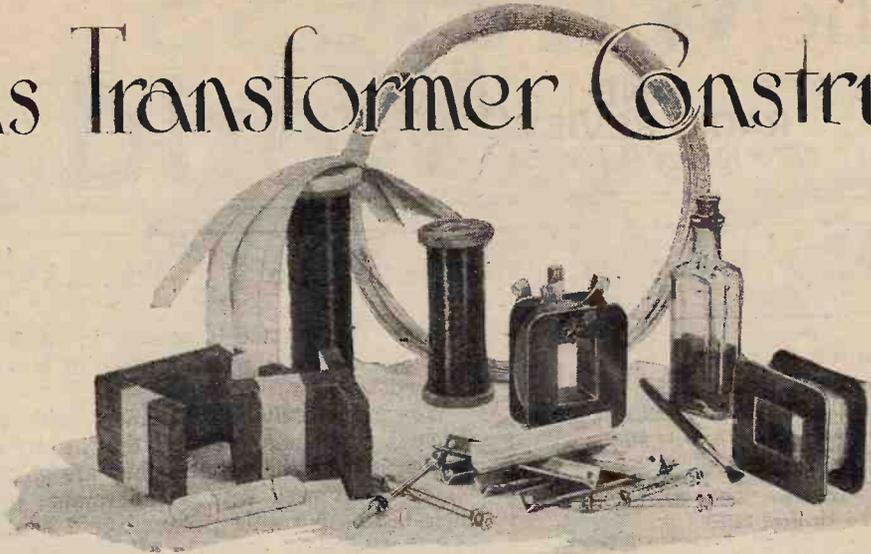
Indiscriminate Programmes.

So far, then, we are in sympathy with the views expressed by Sir John Reith, but, in calling attention to indiscriminate listening on the part of the public, has not Sir John also turned the spotlight on what, in the opinion of many, is the weakest part of the programme organisation of to-day? We refer to what can suitably be described as "indiscriminate programmes." Suppose the listener follows the advice of the B.B.C. and picks out the programme items to which he wants to listen, what does he find? Too often, we are afraid, as a result of the indiscriminate compilation of the programmes the listener finds that on very few evenings is there a programme which is mainly to his liking, and the odd bits of programme matter throughout the week which appeal to him are so short in duration as to compel him to hesitate between other engagements and remaining at home without commitments for those particular items alone.

What is needed in programme compilation is that the programmes should be less "scrappy" in character and that as much as possible should be done to avoid the devastating contrasts inflicted on us at present, where we get short snatches of high-brow educational matter, low-brow musical entertainment, modern music, jazz, and classical music all pounded into our ears in a single evening. Again, unless we are listeners with few engagements, we have to make our arrangements for listening-in some time in advance and can only do so by studying the *Radio Times* for the week. We know that only a proportion of the listening public reads the *Radio Times* and probably that proportion is made up entirely of regular users of wireless.

If the B.B.C. were to adopt the suggestion which we put forward some time ago of advertising particular programmes well in advance, we believe that much would be done to counteract the influence of indiscriminate listening, whilst it would also serve to attract many more to the ranks of the listening public.

Mains Transformer Construction



By
H. B. DENT.

Design No. 1.—Constructional Details of a Mains Transformer for an H.T. Eliminator.

THE purpose of this article is to give some helpful information of a practical nature on the subject of constructing small power transformers of the type used in battery eliminators. As a consequence the theoretical design will not be dealt with, but the general principles are those discussed in articles which have appeared from time to time in this journal. The design prepared for this particular purpose is one which, it is hoped, will meet the requirement of those who, having a battery-operated receiver, desire to put together an H.T. eliminator, and as a further convenience, operate the output valve entirely from the A.C. mains. Since any one model will have a limited application only, especially when dealing with the diverse requirements of mains-operated sets, it was felt that readers would welcome a number of designs which will be described in these pages as facilities are afforded. By a slight modification to the design chosen to introduce this series it is possible to extend the usefulness of the component to all-mains operated sets using the indirectly heated type of valves. This point will be discussed later.

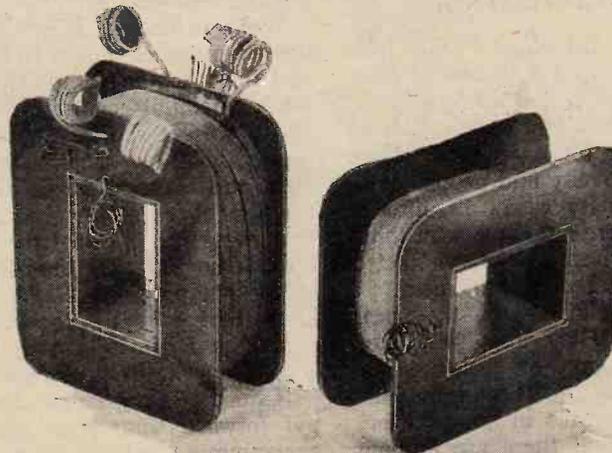
For the purpose of the present article it will be assumed that a popular type of four-valve receiver is in use, in which case the normal H.T. current is probably of the order of 15 mA. Now since the mains are harnessed the

opportunity might be taken to improve the power-handling qualities of the output stage, using a valve not hitherto possible in view of its heavy demands on the H.T., and possibly the L.T., battery. When designing the transformer this possibility was borne in mind and a six-volt winding included to supply the filament current for the last valve.

The high-tension secondary coils have been chosen to give a generous anode voltage and at the same time allow a sufficient excess to provide grid bias for the power valve. The adoption of these recommendations will demand a slight alteration to the receiver, but only the output stage is affected; the H.F. detector and first L.F. stages remaining much as hitherto.

In all there are four separate windings on the transformer, a primary, an H.T. secondary designed to give 250+250 volts at 60 mA; a 5-volt coil for supplying the filament of a Marconi or Osram U5 rectifying valve and, as mentioned above, a winding to give 6 volts at one amp. maximum.

If alternating current was supplied at a standard voltage and frequency throughout the country designing transformers would be relatively easy. Unfortunately it is impracticable to make a transformer which will function efficiently on all A.C. supply mains and certain limitation must, reluctantly, be



The two bobbins; one finished, the other only partly wound. Note the method of finishing off the thick wire coils.

Mains Transformer Construction.—

imposed. The voltage question is easily surmountable, but this cannot be said of the widely different frequencies. Fortunately the majority favour a 50 cycle supply. The transformer described in this article is suitable for use on supply mains of from 40 to 60 cycles. Having acquainted ourselves with the nature of the component it is proposed to build, attention can be given to the choice of the material. The stampings used for the core and the two special bobbins, were obtained from W. Bryan Savage, 146, Bishopsgate, London, E.C.2. In all 100 pairs of "Electra," Size No. 4 stampings, are wanted. The bobbins to fit these are listed as No. 4H, and since they cost only 9d. each it is not worth while bothering to make them up. Particulars of the wire and other small items are given in the full list of parts. It will be seen that the cost of the material is very low having regard to the fact that the component may be classified as a high-grade article.

The process of winding the coils will be greatly facilitated if a lathe, with a back gear attachment, is available. As an alternative a simple winder, something on the lines of that shown in the sketch, could be made up. Winding without the aid of some simple mechanism to hold the bobbins will be found rather tedious. The first coil to tackle is the primary. This is wound in two equal parts, half being put on each former. First drill a small hole in each of the end cheeks, one for the beginning and the other for the finish of the coils. These holes must be drilled through the shorter sides of the rectangular former. If the leads come through a long side they would be obscured by the iron when the core is assembled. One hole is on a level with the inside surface while the other, or exit hole, is $\frac{1}{4}$ in. up. The primary is wound as tight as possible, with turns touching and in layer form. A good example is to be found in the manner cotton is wound on its reel. Between each layer of wire place a layer of thin paper which can conveniently be cut into strips a fraction over an inch in width. As the former is one inch wide this will allow the paper to curl up slightly against the inside of the end cheeks and assure good separation between the layers of wire.

Insulation Between Primary and Secondary.

Having wound on the correct number of turns to suit the particular supply voltage on which the transformer will be used, this former can be laid aside and the other treated in like fashion. The following windings will be required for various supply voltages: 200 volts, 600 turns each bobbin; 220 volts, 660 turns; and 240 volts, 720 turns each bobbin, No. 28 enamelled wire being used for this purpose. In cases where the supply is of the order of 100 volts, two courses are open. The primary winding may be chosen for twice the supply voltage and the two bobbins later connected in parallel, or, a larger gauge of wire can be used and the correct

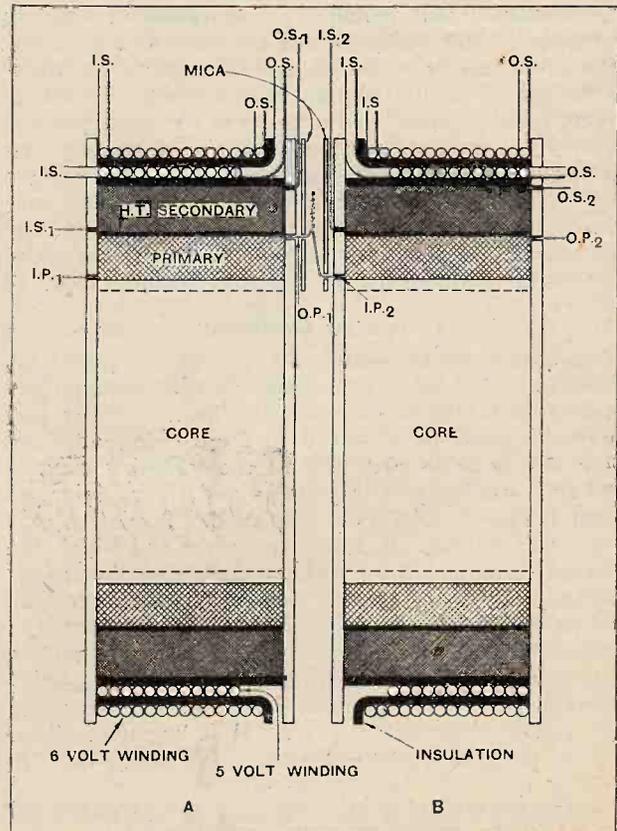
number of turns for the series-connected arrangement wound on each former. Assuming the adoption of the latter course, as this lightens the labour, No. 24 S.W.G. enamelled wire will be required for 100-, 110- and 120-volt mains. The turns on each bobbin will be 300, 330 and 360 respectively. As the area occupied will be somewhat less than in the case of the higher voltage windings the exit holes for the finishing ends of the coils should be drilled slightly lower.

The next point to consider is the insulation between the primary and the high voltage secondary, which is wound next. Three layers of "empire cloth" or similar insulating material, a fraction of an inch wider than the inside of the former, will suffice. It is essential that particular attention should be given to this operation, as it would be court- ing trouble if any cracks or crevices

were left down which the fine wire of the secondary could fall and contact with the primary. Possibly it would be well to give the covering a coat of shellac varnish, thereby ensuring a perfect seal between the cheeks of the bobbin and the covering.

The secondary is divided also into two equal parts, each former carrying 1,530 turns of No. 36 enamelled wire. To wind this in absolute layer form, with each

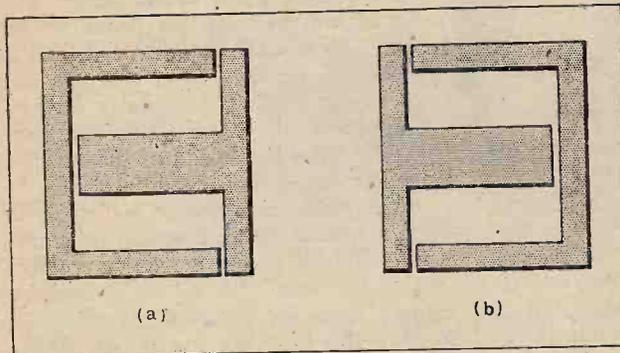
- MATERIAL FOR TRANSFORMER.**
- 9 doz. pairs transformer stampings, "Electra," size No. 4 (Savage).
 - 2 Bobbins for above, No. 4H (Savage).
 - 2 feet $\frac{1}{2}$ in. angle brass.
 - 1 foot 2BA screwed rod.
 - 2 doz. 2BA lock nuts.
 - 1 doz. 4BA $\frac{3}{4}$ in. countersunk screws.
 - 2 doz. 4BA lock nuts.
 - 1 doz. double-ended soldering tays (4B2).
 - 8 $\frac{1}{2}$ ozs. No. 28 enamel wire.
 - 7 ozs. No. 36 enamel wire.
 - $\frac{1}{2}$ lb. No. 20 D.C.C. wire.
 - Quantity insulating cloth or tape.
 - Approximate cost of material 17s. 6d.



Sectioned drawings of the two bobbins showing the disposition of the various windings.

Mains Transformer Construction.—

turn touching its neighbours, is expecting too much from any hand-operated winding mechanism, but it will be perfectly satisfactory if the turns are run on as evenly as possible with the apparatus available. The writer adopted this course, and found that a good coil could be made up by winding 160 turns in this manner and then putting on a layer of thin paper. This is followed by a further section of 160 turns, then more paper, and so on until the full number of turns has been wound on.



When assembling the core reverse the order of each pair of stampings. If (a) depicts the first pair then the second pair should be as in (b).

Before commencing to wind this coil the exit hole for the finish of the winding could be drilled through the side cheek $\frac{1}{4}$ in. above the surface of the insulation over the primary. Incidentally, the direction of winding should be kept the same throughout, and as a guide for future reference it would be well to engrave an arrow on the outside of the bobbins showing this. Thin wire is very fragile and inclined to break at the least provocation. As a precautionary measure the beginning, and the finish of the winding should consist of much stouter wire. This will prevent any likelihood of the wire breaking off where it passes through the holes on the side cheeks. A few turns of No. 28—the primary wire—might be used and the No. 36 gauge soldered to it.

Testing for Continuity.

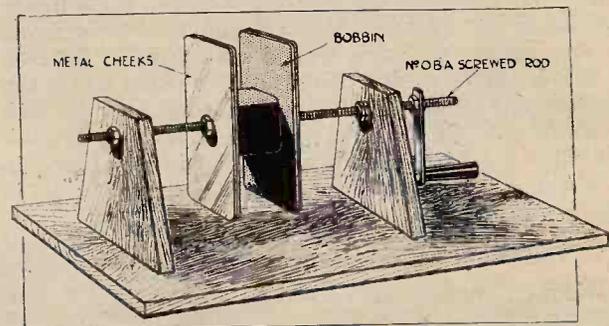
When the two secondaries have been completed the windings should be covered with insulating material and finished in the manner described above. Similar precautions should be observed in these cases, although there will be little likelihood of the following winding settling down between the cheeks and the covering, as much thicker wire will be employed. Insulation of a high order is essential, however, as the coil which follows the secondary is the filament supply for the rectifying valve. Readers who are familiar with valve rectifier circuits will appreciate this point, but for the benefit of those not so well versed on these matters it is well to bear in mind that the filament of the rectifying valve becomes the H.T. positive, while the centre point of the high voltage secondary coil is the H.T. negative. Thus there is a considerable difference in potential between the two coils.

Before proceeding further it would be well to test the coils for continuity, using a $1\frac{1}{2}$ -volt cell and telephones, or a galvanometer. It is highly improbable that any-

thing will be found amiss, as one advantage of employing enamelled wire is that a break would have been spotted during the process of winding. However, it is a safety measure well worth adopting.

For the next coil we require 16 turns of No. 20 D.C.C. wire on each bobbin. This is wound as a single layer with turns touching. The beginning of the wire may be passed through a hole in the cheek through which the starting ends of the other coils pass. This applies to one bobbin only. For explanatory reasons we will call this bobbin A. Reference to the small sketch, showing the disposition of the coils on the bobbins, will explain the reason. The overall width of the two formers does not permit any appreciable separation between them when assembled on the core; and if the ends which we will call OP₁ and IP₂ were brought out through the cheeks, which lie adjacent, the core stampings would not fit snugly together. An air gap in the magnetic circuit is highly undesirable, as it tends to lower the efficiency of the transformer. Therefore, when finishing the winding on bobbin A, bring the end out on the inside of the cheek. It is not difficult to arrange, as the wire can be anchored in position by binding with stout cotton. Likewise the beginning of the coil on bobbin B should come out on the inside of the cheek, but its end can pass through a hole in the other face. A coating of shellac may be applied if desired, but it must be allowed to set hard before commencing to wind the next coil.

The final winding supplies current to the output valve, and as a consequence there will be a difference in potential between this and the preceding coil equal to the high tension supply to the anodes of the valves. Particular care is required, therefore, in insulating these two coils. In addition to the layers of "empire cloth," place a strip of mica across the coil so that it completely isolates the end of the coil which is brought out on the inside face of the end cheek. Its function is to form an artificial cheek and assure good insulation between the two coils at the point where the wire is not fixed so securely



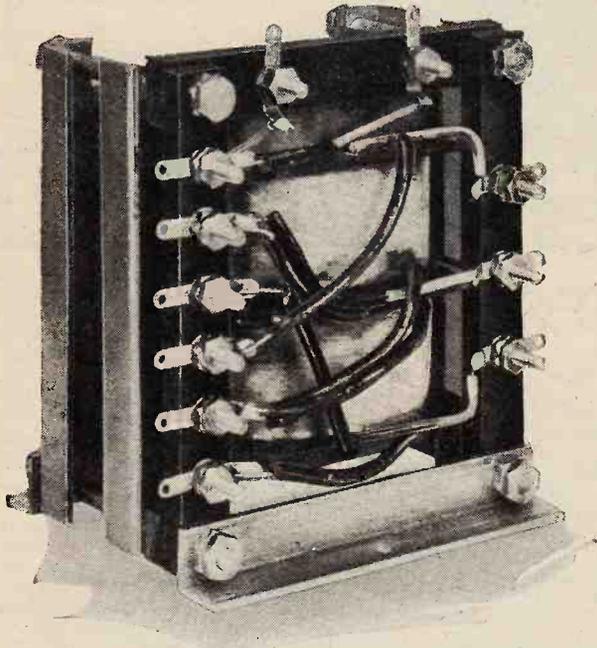
Layout of the coil winder mentioned in the text. Metal end plates are required to hold the bobbin and prevent bulging.

as would be the case if it had been convenient to pass the end through a hole in the side of the former.

Now for the final winding. This consists of 18 turns of No. 20 D.C.C. wire—on each former. The method of commencing and finishing this coil is the same as that described for the preceding one. The windings are now completed to conform with the specification outlined at the beginning of this article. If particularly

Mains Transformer Construction.—

desired the six-volt winding can be replaced by one suitable for the supply of current to three indirectly heated valves. In this case 12 turns of No. 18 D.C.C. wire should be substituted for the 18 turns of No. 20 D.C.C. on each bobbin. A thin coat of shellac, and finally a few turns of insulating cloth, to impart a pleasing finish,



This view of the finished transformer shows clearly the manner in which the terminal battens are attached to the holding-down bolts.

complete the winding, and attention can be given to the assembly of the core.

This is built up with thin stampings cut from specially prepared steel, on one side of which is a thin layer of insulating material. They consist of "T" and "U" shaped pieces, one of each forming a pair, and giving the distinctive shape to the core. The two bobbins should be placed side by side, with the long side of the rectangular core spaces at right angles to the bench. If the winding has been carried out in accordance with the details given here the arrows showing the direction of winding will both point in the same direction with all leads coming out from the top. If there is any difficulty in identifying the various leads, test through with a battery and telephones. Now cut two strips of mica 2½ in. long and ¾ in. wide and drill a small hole in each. One hole, through which should be threaded the OP₁ lead, will be ¼ in. up from the lower edge, and the other will be about 1/16 in. up to accommodate the IP₂ lead. Cut these leads, leaving about 1 in. of wire, remove the enamel carefully, using a piece of emery cloth, and solder together. When the two bobbins are butted together the primary join will be protected by the two mica strips.

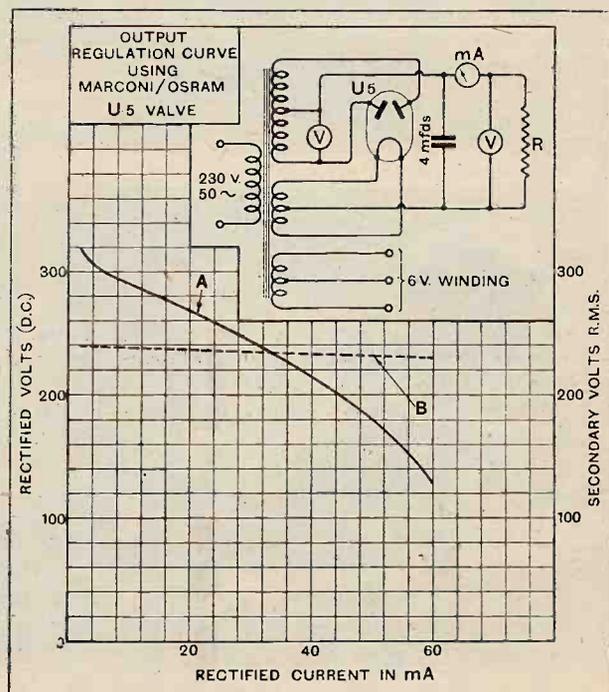
The core can now be built up by inserting the tongue of a "T" piece into the core opening and following by a "U" piece from the opposite side. The order of assembly must be reversed in each layer. For example,

if the first "T" piece is inserted from the right-hand side the second "T" piece goes in from the left. This is explained diagrammatically in the sketch of the core stampings. If (a) is the first pair, then the second pair should be arranged as in (b) and so on until as many pairs as the space will hold have been assembled. If the core is built up correctly it should be possible to accommodate 100 pairs. To clamp the iron, pieces of ½ in. angle brass, 4 in. long, can be used. Holes to pass 2BA screwed rod should be drilled 3/8 in. apart. This will allow sufficient clearance for the rods. The brass rods must not touch the edge of the laminations, otherwise all the advantages of using insulated stampings will be lost. Incidentally, when assembling the core keep the insulated sides of the stamping the same way up throughout, the object being to maintain a layer of insulation between each. Terminal strips, cut from paxolin, or ¼ in. thick ebonite, can be clamped on to the extension of the holding bolts and small terminals, or ¼ in. No. 4BA screws and nuts, used to finish off the transformer. The method of assembling these is shown clearly in the illustration of the finished model.

Voltage Regulation Curve.

Some practical tests were made with the experimental model and curves taken of the output voltages on load. These are shown in the graph reproduced here. At the time of test the mains voltage was down to 230, whereas its nominal value is 240 volts. All output voltages are thus reduced in the same proportion.

It was a pleasant surprise to find that this particular model was absolutely silent when connected up; generally a slight hum is present, which is brought into being by looseness in the core. The stout walls of the bobbins



Output voltage regulation curves. The full-line curve A shows the rectified voltage under load while the curve B is the corresponding R.M.S. secondary voltage.

Mains Transformer Construction.—

enable the iron to be packed much tighter without damage to the coils than appears possible with any other method of assembly.

The voltage regulation of the H.T. secondary may be regarded as satisfactory, since the variation between no-load and full-load—in this case 60 mA—is of the order of 7% only. No change in conditions in the H.T. circuits could be discerned when current was drawn from the 6-volt winding. On voltmeter load only, the voltage was 6, at 0.5 amp. it dropped to 5.85 volts,

and at 1 amp. to 5.7 volts. This is equivalent to a 5% change from open circuit conditions—an entirely satisfactory regulation.

Readers having access to a high range D.C. voltmeter and a milliammeter might well consider taking a rectified voltage characteristic curve, as shown at A on the graph. This will be found of inestimable value in calculating the values of voltage-dropping resistances. The requirements of the set will be known, of course, since it is assumed that batteries have been employed hitherto.

TRANSMITTERS' NOTES AND QUERIES

Irish Amateurs.

The Wireless Society of Ireland has appointed a sub-committee to consider matters affecting membership, especially with a view to increasing the scope of the Society and forming branches in the principal provincial towns. A writer in the *Irish Radio News* advocates a very considerable broadening of the membership to include not only amateur experimenters and transmitters, but listeners, traders, and broadcast artists, each section conducting its own meetings and business but having its representatives on the governing council. By this means he considers that all shades of wireless interest would be united and radio activity spread over the whole country instead of being confined almost exclusively to the neighbourhood of Dublin.

French Morocco.

CN 8MC, operated by Dr. G. Veyre, at 83, Avenue de General Moinier, Casablanca, Morocco, will relay the programme transmitted from Rabat, Morocco, the French P.T.T. Station, four times a week

on 43.60 metres, the times being: Tuesday, 20.00-21.00; Wednesday, 20.30-22.30; Saturday and Sunday, 12.30-14.00 G.M.T.

The Curse of Raw A.C.

The use of unrectified A.C. for amateur transmission is distinctly prohibited, under the terms of their licences, to British amateurs and, we believe, similar restrictions are imposed in all Continental licences, yet the interference caused by the use of unrectified or badly smoothed A.C. is still a source of great trouble on the 7,000 kc. and 14,000 kc. wavebands. British amateurs in general are careful to observe the regulations in this respect, but there are, unfortunately, Continental stations causing interference, especially on the 7,000 kc. band, by careless use of raw A.C.

We believe that most of the offenders are, in fact, unlicensed stations, but their interference is so great that many British amateurs have almost given up working on the narrow 42-metre band. The combined efforts of the R.S.G.B. and the R.E.F. seem unable to bring about any reduction of the nuisance. Probably the offending stations, being unlicensed, are hard to trace, but in the interest of amateurs in general no pains should be spared to induce them to "play the game" and to remember that the restrictions on amateur activities are even now considered rather drastic, and that any infringement of regulations or of the desirable courtesy of the ether, tends to tighten up these restrictions.

On the Riviera.

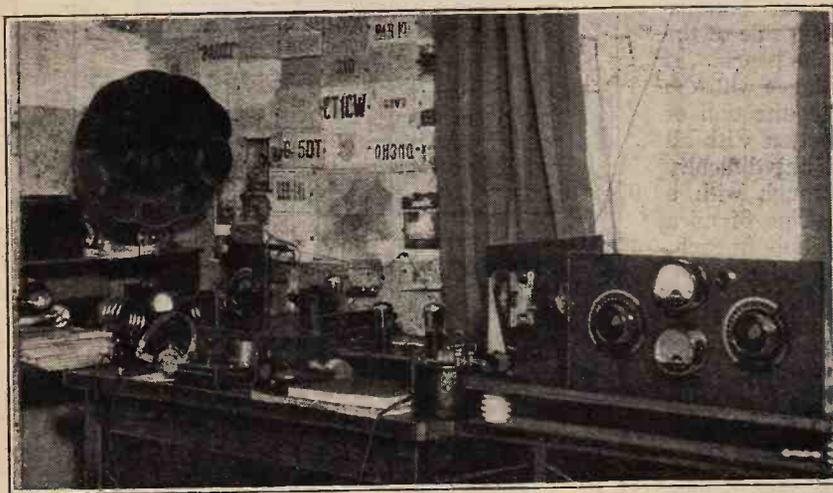
Mr. M. W. Pilpel (G 6PP) will be spending a month in Nice, and hopes to obtain some interesting notes on the comparative difference in conditions of reception in the South of France. He will probably be listening on most afternoons and some evenings up to the third week in February, and will be willing to report to any British stations on their 7 or 14 mc. signals, if they will write to him c/o Mrs. Schmidt, 14, ter. rue Buffa, Nice, France.

The Havoc of the Storm.

The gale on the night of Sunday, 12th, caused considerable havoc among amateurs' aerials. We hear that the 50ft. steel mast at G 5AR—the station of Mr. E. D. Ostermeyer, of South Woodford—which for six years has withstood every onslaught, snapped at the height of the gale and fell, carrying away trees and his neighbour's aerial in its wake. It may, therefore, be some time before G 5AR is again "on the air," and his neighbour lamented the destruction of his own aerial just before Radio Week.

New Call-Signs and Changes of Address.

G 5FA J. A. Farrer, The Willows, The Park, Buxton.
G 5QP J. V. Parsons, 24, Upper Holland Rd., Sutton Coldfield. (Change of address).
G 5NR (ex 2AJR), E. G. Nurse, 1, Cambridge Rd., Hammersmith, W.6.
G 5RJ W. G. Rose, 46, Trevinice Rd., London, S.W.20
2BIL E. W. Heron, 60, Alexandra Park Rd., London, N.10.



A COMPACT STATION.—G 2BY owned by Mr. H. C. Whatley at 37, Paddenswick Road, Hammersmith, W.6. The input is 10 watts in a T.P.—T.G. circuit. The H.T. supply is 400 volts maximum from an M-L rotary converter driven from accumulators.

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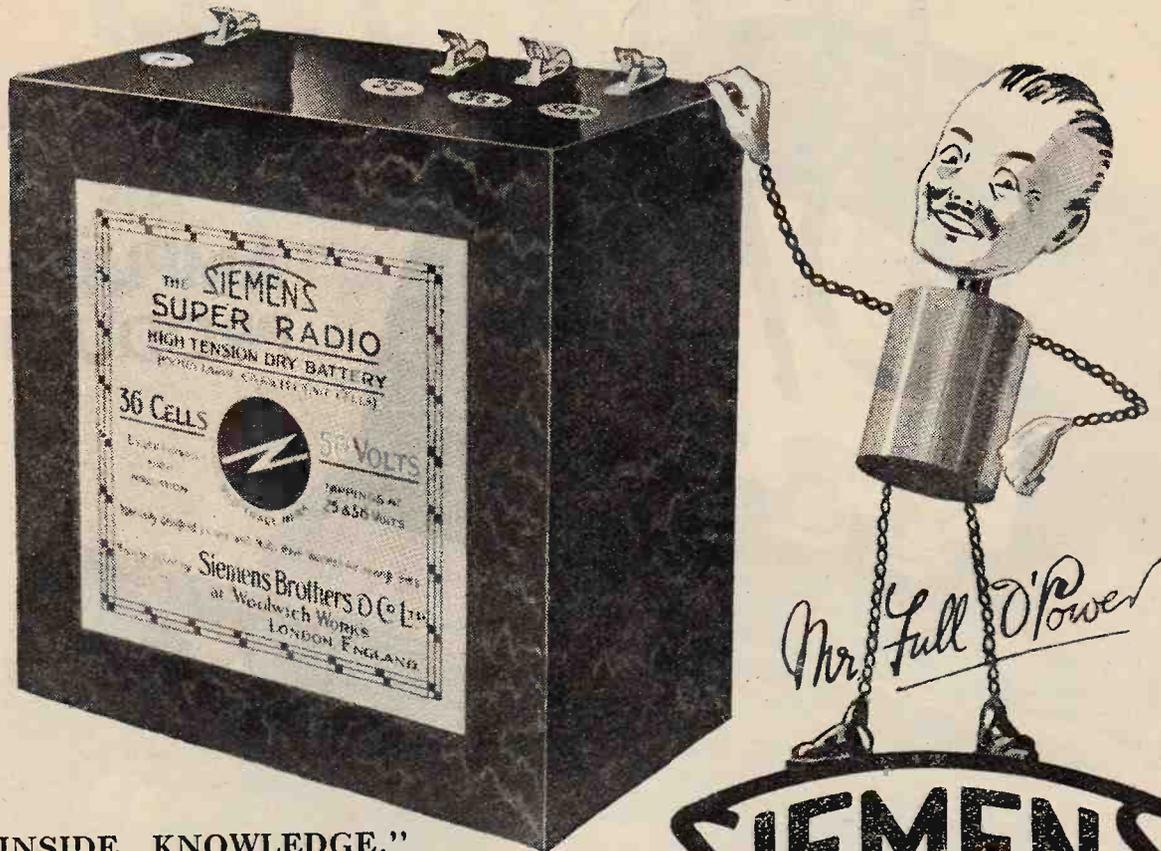
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Frequency Modulation

A Possible Cure for the Present Congestion of the Ether.

By JOHN HARMON.

It is well known that as soon as a broadcast station begins to speak its carrier wave becomes bordered by a halo of nearby frequencies, and the station, which is a mere spectrum line in the ether when silent, becomes a spectrum band when its jazz band begins.

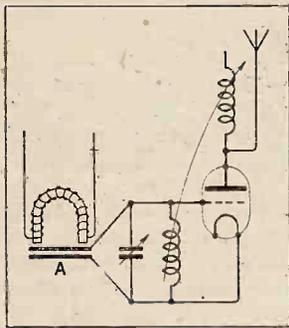


Fig. 1.—Speech currents vary the capacity of the condenser A and so the transmitter is modulated at speech frequency.

This frequency band extends over at least 5 kilocycles on either side of the carrier wave, so that each station requires a space 10 kilocycles wide for its exclusive use. This position was all right five years ago, but to-day the stations of the world have used up all the available frontage and there is no room for further extensions.

Accordingly, inventors have been intent on the problem of communications on narrower frequency channels. No improvement is conceivable while the principle of modulating the amplitude of the carrier wave remains, and so a completely different method has been tried in which the carrier frequency is wobbled while the amplitude remains constant.

Wobbling the Carrier Wave.

Imagine an oscillator set up as in Fig. 1. In parallel with the tuning condenser a small special condenser is inserted, composed of two parallel plates, one of which consists of the diaphragm of a magnetic telephone. If a 1,000-cycle oscillation be impressed upon the electromagnet the motion of the diaphragm will vary the capacity of the small condenser and the frequency of the carrier wave will alter 1,000 times per second, as in Fig. 2, while the magnitude of the frequency change will be proportional to the magnitude of the A.C. current which flows through the windings of the electromagnet.

Hence the usual picture of a carrier wave accompanied by two side-bands (Fig. 3) is replaced by a blurred carrier wave of unvarying amplitude, and the

important fact emerges that the transmitting station may now occupy a much smaller frequency channel.

Indeed, we can make the wobble as small as we please by diminishing the capacity of the two-plate condenser in Fig. 1. But the impressed wobble must be made considerably greater than the unavoidable wobble of the carrier wave itself.

A New Conception.

A wave of this kind is a new conception in wireless and has some peculiar features. If we listen to it on an oscillating detector we can never get a silent point; instead, we hear a gliding tone similar to those given by the Parlophone gramophone test records, where a note sweeps rapidly up and down the scale, producing a sound somewhat similar to the chirp of a bird.

Again, though a wave with amplitude modulation can be represented as a carrier accompanied by two side-bands, no such analysis can be got on a wobbling wave.

Reception.

If such a wave is received on a set tuned to the undisturbed frequency of the carrier, practically nothing is heard since the wave is sweeping back and forward with constant amplitude across the summit of the resonance curve, in which region the sensitivity to small frequency changes is least. The best place to receive the signal is on the steepest part of the slope (Fig. 4), so that the frequency changes may give rise to the maximum changes in amplitude.

Thus, if a single-tuned circuit is used for reception, the ratio of the reactance of the coil to its resistance, i.e., the coil magnification, being 100, which is a figure corresponding to a rather poor coil, the resonance curve at 300 metres is shown in Fig. 5 (a). If the incoming

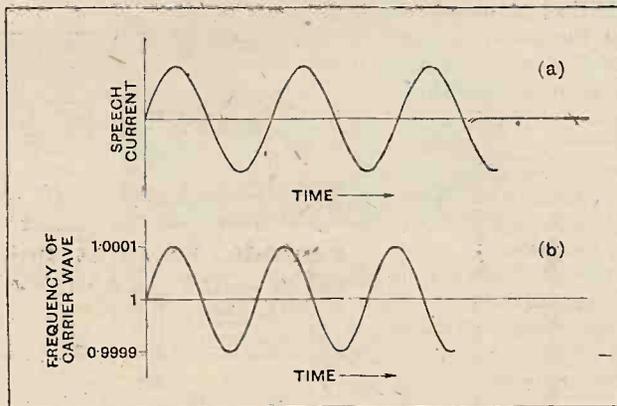


Fig. 2.—(a) Represents the A.C. current flowing through the windings of the electromagnet of Fig. 1; (b) represents the resulting frequency variations in the carrier wave.

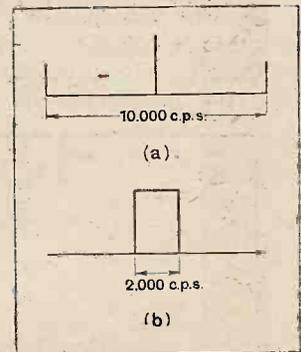


Fig. 3.—Illustrating (a) amplitude modulation; (b) frequency modulation.

Frequency Modulation.—

wave is received at the point A on the curve, then a frequency wobble of 2 kc. in either direction will be required to change the amplitude of the received signal by 20 per cent.

Fig. 5 (b) gives the resonance curve for the same wavelength of 300 metres when a 2-stage H.F. receiver is used having three tuned circuits, each coil having a magnification of 100. In order to obtain a modulation of 20 per cent. of the signal amplitude the wobble need only be 1 kc. each way. Hence the transmitting station need occupy only a frequency channel 2 kc. in breadth instead of the 10 kc. required with the usual system of amplitude modulation.

But we can go much farther by using a local oscillator at the receiving end to give a beat note of, say, 50 kc. with the incoming wave, and amplifying this intermediate frequency. If the intermediate amplifier has three tuned circuits, the magnification of each coil being 100, we get the resonance curve of Fig. 5 (c),

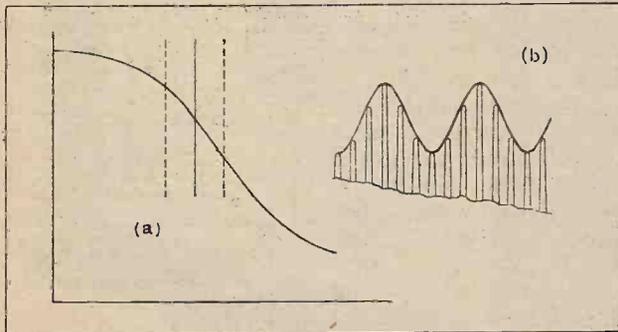


Fig. 4.—As the carrier frequency oscillates between the dotted lines (a) the received amplitude will be modulated as in (b).

and a 50-cycle wobble is enough to give 20 per cent. amplitude modulation.

Accordingly, we must conclude that frequency modulation is quite practicable from the point of view of building a suitable receiver, and it only remains to consider the necessary conditions at the transmitting end.

Quartz Control.

When a narrow-frequency band is used it is desirable to prevent accidental wandering of the carrier frequency; and a more precise method of wobbling the frequency is required than the one already described.

For this purpose a tuned-anode circuit is used, as in Fig. 6, and a slice of quartz, placed between cover plates, is inserted in the grid circuit; as is well known, a system of this kind oscillates at the natural frequency of the quartz plate, and the frequency remains constant to a few parts in a million.

The frequency may be varied slightly by loading the quartz by a coil in parallel and tapping part of this coil to earth through a resistance.

Accordingly, if this resistance is varied at speech frequency the oscillator undergoes frequency modulation. The resistance may be replaced by a valve (Fig. 6 (b)) whose grid is controlled by speech currents, and the varying impedance of the valve acts in the same way as the variable resistance in Fig. 6 (a).

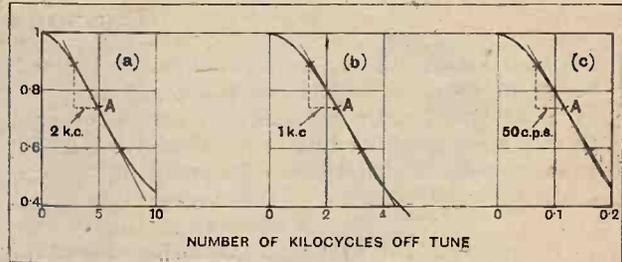


Fig. 5.—Transformation of frequency modulation into amplitude modulation with different types of receivers; in each case the magnification of the coil is 100 and the received signal is on 300 metres. (a) Receiver with single tuned circuit; (b) two-stage H.F. receiver with three tuned circuits; (c) superheterodyne receiver with three intermediate circuits tuned to 50,000 c.p.s.

The frequency modulation so produced is necessarily small, since the quartz plate is equivalent to an inductance of about 100 henrys in series with a capacity which is only a fraction of a micro-microfarad, so that the loading coil does not produce much change in the total inductance. However, it is possible to change the frequency by as much as 1 kc. in a 1,000-kc. wave.

It should be noted that this change is produced with no change of the amplitude of the H.F. oscillations. Readers who wish for more complete details of these inventions will find them in Patent Specifications 292,469, 293,803, and 296,678. The methods do not seem to have attracted attention in the wireless Press up to the present, but they are worth studying, and experiments on similar lines are well within the resources of the amateur.

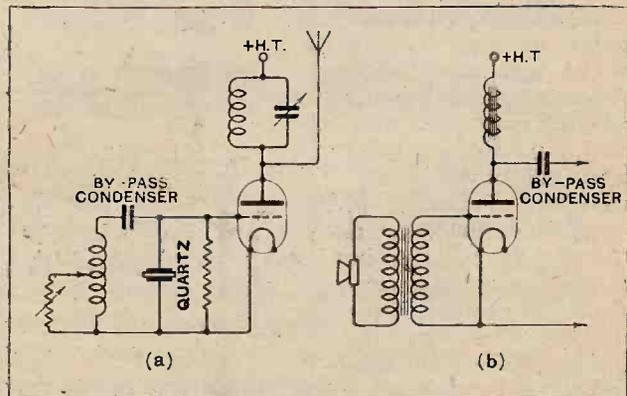


Fig. 6.—To prevent wandering of the carrier frequency, a tuned anode circuit is used together with a quartz-plate oscillator in the grid circuit (a). The resistance in (a) may be replaced by a valve as in (b) whose grid is controlled by speech currents.

WIRELESS THEORY SIMPLIFIED.

Part XVIII of this series dealing with Dynamic Resistance of Tuned Circuits will appear in next week's issue.

Current Topics

EVENTS of the WEEK in BRIEF REVIEW

ANOTHER POLYGLOT STATION.
The example set by PCJ, Eindhoven, in announcing items in several languages will probably be followed by Kalundborg in the near future.

WEEKDAY WIRELESS IN CHURCH.
Argyle Congregational Church, Bath, is being equipped with a wireless set for the daily reception of the morning religious service from Daventry. Passers by are invited to come in and listen.

ANOTHER GERMAN GIANT.
A new "super broadcasting station" for Germany is to be erected at Muelhacker, mid-way between Stuttgart and Carlsruhe, and within thirty-seven miles of Strassburg. French listeners are beginning to fear that the new Strassburg station may be within the interloper's wipe-out area.

ANTI-INTERFERENCE CLUB.
According to our Paris correspondent, a club has been formed in Campagnole (Jura) for the express purpose of suppressing interference to broadcast reception caused by noisy generators and other sources of "perturbation."
If the club ultimately fulfils its purpose, remarks our correspondent, it is assured of a very long life.

AN OBLIGING TRAMWAY DEPARTMENT.
The Nottingham Tramways Department is making special efforts to overcome interference caused to broadcast listening by defective "collectors" working on the overhead current wires. Experiments are to be conducted with an improved form of collector which has been found successful in Blackpool and Birmingham.

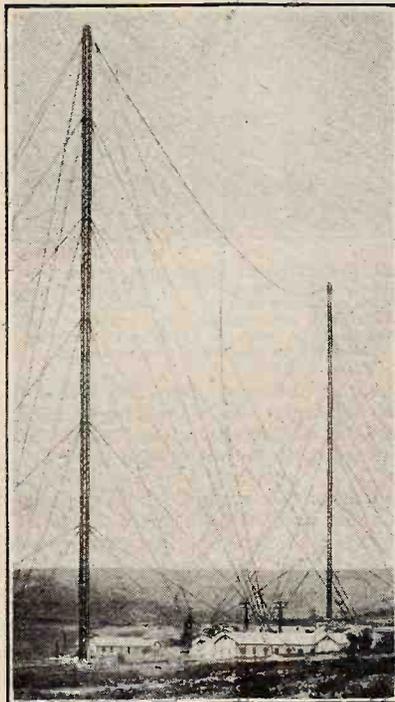
MAINS SETS ON TRAINS.
Living up to their reputation as the most enterprising of the world's railway systems from a radio point of view, Canadian National Railways are now installing mains-operated wireless receivers on their Trans-Continental expresses. The power is supplied from a motor generator driven by the car lighting batteries. It is stated that the new system will considerably reduce maintenance costs.

Another innovation is the use of electric gramophones for use in parts of the line, such as in the Rockies, where radio reception cannot be relied upon to give good quality.

GERMAN SHIP-TO-SHORE TELEPHONY.
The famous German coastal station at Norddeich is to be equipped with short-wave telephony apparatus for communication with fishing fleets in the North Sea and with German ships in all parts of the world.

POST OFFICE PATIENCE.
In the case of a wireless "pirate" fined at Pudsey, evidence was given that the Post Office sent three warning notices before taking action.

THE UPWARD TREND.
On January 1st Germany's licensed listeners numbered 3,066,682, making an increase of 431,115 during the past year. The British increase over the corresponding period was 328,344.



HAVE YOU HEARD THIS ONE? The Turkish broadcasting station at Stamboul, which operates on 1,200 metres with a power of 5 kw.

TELEPHONY FROM ARCTIC TO ANTARCTIC.
A new wireless record has been established jointly by the Byrd expedition in the South Polar regions and the Soviet station in Franz-Josef Land, believed to be the most northerly human outpost. The feat was accomplished on Sunday, January 12th, when, according to a Moscow message, the Soviet operator gave a telephone description of an Arctic dawn. A reply came from Commander Byrd's operator, who described an Antarctic nightfall. The distance traversed was 12,500 miles.

A HINT TO THE B.B.C.
Havana broadcasting stations are forbidden to transmit after 10.30 p.m., the object being to allow listeners to tune in the American stations.

R.M.A. GIFT TO THE BLIND.
Over £10,000 has been contributed by listeners in response to Mr. Winston Churchill's appeal on Christmas Day for the "Wireless for the Blind" Fund.

The Radio Manufacturers' Association has decided to present 1,000 complete wireless sets, representing a retail value of £10,000.

TEN YEARS FOR ILLICIT TRANSMITTER.
Alexander Pertini, the Italian lawyer who was recently arrested at Nice, charged with broadcasting anti-Fascist news from his villa there, has been sentenced in Rome to imprisonment for ten years and nine months, to be followed by three years of police supervision.

NEW RADIO SHOWROOMS.
London's latest radio landmark is Roxburgh House, 283, Regent Street, W., which houses the new West End showrooms of Burdept Wireless (1928), Ltd. It would have been difficult to choose a site nearer the centre of musical London, and the designers have availed themselves of the opportunities presented by introducing a modern scheme of decoration and furnishing which should satisfy the most discriminating visitor. A large selection of Burdept radio-gramophone instruments are available for demonstration.

HIDDEN ADVERTISEMENTS COMPETITION.
The competition announced in our issue of January 8th brought entries from all parts of the country and from the Continent. The following are the prize-winners:—

- 1st Prize (value £7 10s.).—Mr. Walter Beck, 13, Houlditch Road, Leicester
- 2nd Prize (value £5).—Mr. H. A. Fothergill, 9, Mosley Street, Nelson, Lancs.
- 3rd Prize (value £2 10s.).—Mr. William Branston, Lampool Maresfield, Uckfield, Sussex.

Consolation prizes (each to the value of £1) are awarded to the following:—Mr. F. Sytor (Antwerp), Mr. J. Godeck (Worthing), Mr. Henry R. Kiddle (London, S.W.9), Mrs. M. Diggle (Salford), Mr. H. J. Layzell (Herne Bay).

The following are the correct solutions:—(1) Brownie Wireless Co. (G.B.), Ltd.; (2) British Institute of Engineering Technology; (3) Sheffield Magnet Co.; (4) Dubilier Condenser Co. (1925) Ltd.; (5) Igranic Electric Co., Ltd. (6) Claude Lyons, Ltd.

CHINA FRIGHTENS THE CABLE COMPANIES.

Several high-power wireless stations are now being erected in China for communication across the Pacific, and the cable companies covering this route are growing apprehensive. According to a Shanghai message, China's radio zeal is being inflamed by American capital.

BELGIUM'S BEAM STATION.

The Belgian Government has concluded a contract for the establishment of a high-power short-wave station at Ruysselede, near Bruges, for international telegraphy and telephony communication. The station will be built on the Marconi beam system and will be primarily intended for working with the Belgian Congo. It will later be used for services to South America and Japan.

POLICE AND CAR WIRELESS.

According to several daily papers, the police view with alarm the advent of a wireless-equipped motor car, a saloon model of which is expected to be in production by August next. It is stated that the police base their anxiety on the probability that the new car will become popular with gangs of criminals.

Are our contemporaries forgetting that anyone can "equip" his car with wireless at a moment's notice by taking a portable?

SIR RICHARD GLAZEBROOK.

The Council of the Institution of Electrical Engineers have elected Sir Richard Tetley Glazebrook, K.C.B., D.Sc., F.R.S., to be an honorary member of the Institution. Sir Richard Glazebrook was the first Director of the National Physical Laboratory, and was a member of the Technical Committee inquiring into the Imperial Wireless Scheme.

A RADIO RAILWAY.

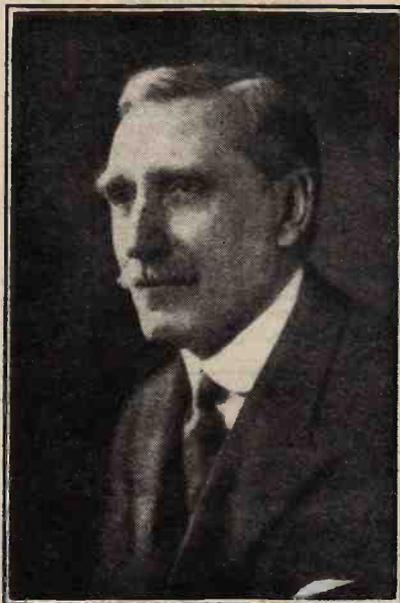
"Radio Features" is the title of a new monthly publication issued by the radio department of the Canadian National Railways. This brightly written and illustrated journal, which is distributed to passengers on the company's system, gives a résumé of the month's programmes with biographical details concerning the broadcasting artists besides interesting facts relating to the operation of the radio service.

There are now seventy-two cars permanently wired for radio reception, and in nearly all cars now under construction provision is made for the installation of wireless gear. A staff of nearly sixty uniformed operators specialise in the control and maintenance of the train receiving equipments.

DR. DE FERRANTI.

The death of Dr. Sebastian de Ferranti at Zurich on January 13th will be widely regretted. To the majority of wireless amateurs Dr. de Ferranti's name has become a byword through its association with the famous firm of transformer manufacturers; by electrical engineers generally, however, Dr. de Ferranti will also be remembered for his pioneer work in

electricity supply. Born in Liverpool in 1864, Sebastian Ziani de Ferranti spent most of his life in this country. As far back as 1886 de Ferranti's help was enlisted in the development of an electric lighting supply for the West End of London, and four years later he set up a



AN ELECTRICAL PIONEER. The late Dr. Sebastian de Ferranti, F.R.S., whose death occurred last week. Besides being associated with transformer design and manufacture, Dr. de Ferranti was an authority on electrical power supply.

generating station at Deptford with two 1,500 h.p. sets with a pressure of 2,500, which he transformed up to 10,000. As there was no form of meter in those days capable of registering such a pressure he was reduced to the expedient of connecting up a hundred 100-volt lamps in series, judging that the correct voltage was reached when the lamps gave their normal brightness!

FORTHCOMING EVENTS.

- WEDNESDAY, JANUARY 22nd.**
 Edinburgh and District Radio Society.—At 8 p.m. At 16, Royal Terrace. Short-wave Transmission.
 Golders Green and Hendon Radio Society.—At 8.15 p.m. Informal meeting at 45, Redington Road.
 Institute of Wireless Technology.—At 7 p.m. At the Engineers' Club, Coventry Street, W. Lecture: "Notes on the Fading of Wireless Signals," by Mr. A. M. Houston Ferris.
- THURSDAY, JANUARY 23rd.**
 Slade Radio (Birmingham).—At the Parochial Hall, Broomfield Road, Erdington. Test of members' loud speakers.
- MONDAY, JANUARY 27th.**
 Newcastle-upon-Tyne Radio Society.—At 7.30 p.m. In the English Lecture Room, Armstrong College. Lecture: "The Construction and Theory of a Push-pull Amplifier," by Mr. J. Rush.
- TUESDAY, JANUARY 28th.**
 Thornton Heath Radio Society (with South Croydon and Whitgift Middle Schools Wireless Societies).—At 8.15 p.m. At St. Paul's Hall, Thornton Heath. Cinematograph film exhibited by Messrs. Siemens, Ltd.

When in 1910, Dr. de Ferranti delivered his address as President of the Institution of Engineers, he boldly predicted a time when all fuel used for heat and power would be transformed into electrical energy and distributed throughout the country from a few large generating stations.

He was awarded the Institution's Faraday Medal in 1924, and in 1927 was elected a Fellow of the Royal Society. He received the honorary degree of D.Sc. from the University of Manchester in 1911.

CLUB NEWS.**Forewarned is Forearmed!**

Muswell Hill is one of the few remaining districts having a D.C. electricity supply, and in view of the fact that a change-over to A.C. will inevitably take place, the lecture by the Westinghouse Co., which was given before the Muswell Hill and District Radio Society on January 8th, was of especial interest, dealing as it did with the theory and practical uses of the well-known Westinghouse metal rectifier. A comprehensive series of lantern slides accompanied the lecture and a cinematograph film, illustrating in an ingenious manner the process of the rectification of an alternating current, was afterwards shown. Hon. Secretary, Mr. C. J. Whitt, 39, Coniston Road, London, N.10.

The "Slade Radio" Song.

An item which caused considerable interest and amusement at a recent meeting of Slade Radio (Birmingham) was the "Slade Radio" song, which has been written by one of its best-known members.

A very good programme has been arranged for the next three months and should prove interesting to all members.

Details of the Society will be forwarded on application to the Hon. Secretary, 110, Hilliards Road, Gravelly Hill, Birmingham.

Difficulties Dissolved.

"Faults Which Have Baffled Me" was the subject of an animated discussion between members of the Wembley Wireless Society at a recent meeting, at which many earnest experimenters had their problems solved.

A social evening has been fixed for February 7th. A special sub-committee has been appointed to deal with the arrangements for the programme, which will be a very attractive one. Competitions will be introduced and prizes will be provided for the ladies and gentlemen taking part.

A syllabus of the forthcoming meetings, which promise to be specially attractive, may be had on application to the Hon. Secretary, Mr. H. Comben, 24, Park Lane, Wembley.

Wireless Theory Simplified.

A recent lecturer before the Golders Green and Hendon Radio and Scientific Society was Mr. Maurice Child, who dealt in a helpful manner with H.F. amplification and selectivity. Mr. Child emphasised the importance of a knowledge of the fundamental principles of electricity, the lack of which was the cause of many amateurs' difficulties. The articles appearing in *The Wireless World* under the title "Wireless Theory Simplified" must be of the greatest value to members, said Mr. Child, and should be most carefully read and studied by all interested in wireless.

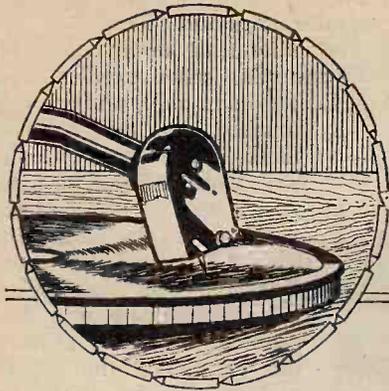
To satisfy the request for informal meetings, Mr. Zwanenberg has placed his laboratory and workshop at the disposal of members.

The Society's fourth dance will be held on January 30th. Full particulars of membership will be sent on application to the Hon. Secretary, Lt.-Col. H. A. Scarlett, D.S.O., 60, Pattison Road, Childs Hill, N.W.2.

For South London Enthusiasts.

"We are still going strong," is the report from the Faraday Radio Club, which holds meetings every Thursday at 7.45 p.m. at the Walworth Men's Institute, John Ruskin L.C.C. School, Beresford Street, S.E.5. Prospective members are always welcome.

Hon. Secretary, Mr. J. H. Payton, 39, Penton Place, London, S.E.17.



Gramophone Needle Wear

The Reasons for Frequent Needle Changing.

By E. M. PAYNE
(Research Department, The Gramophone Co., Ltd.)

Why do all the gramophone companies recommend the changing of the needle after every single record side has been played? Is it just another dodge to get the public to buy more needles? The answer is easily arrived at by examining the various figures in this article and considering the actual facts.

GRAMOPHONE needles may be roughly divided into three classes:—(1) Steel (loud, medium, soft, etc.); (2) Fibre; (3) Permanent. The wear on each of these three types is of a rather different nature, but in every case the effects upon music reproduction are similar. They are (a) loss of treble notes and (b) a peculiar combined woolliness and harshness. The effects upon the records themselves are disastrous in respect of the steel needles of class (1).

First, it is necessary to correct a popular fallacy. The term "soft" as applied to gramophone needles does not mean nowadays that the steel has been tempered to a lower figure in the hardening scale and is thus more easily abraded, but it is only a reference to the intensity of musical reproduction obtained from its use, thus a "soft" needle means a *quiet* needle. In the early days the loudness of a gramophone was easily regulated by using needles of different hardness temper, hence the origin of "soft" as applied to needles. A "soft" tone needle does not necessarily wear any faster than a loud tone, in fact, sometimes the reverse occurs.

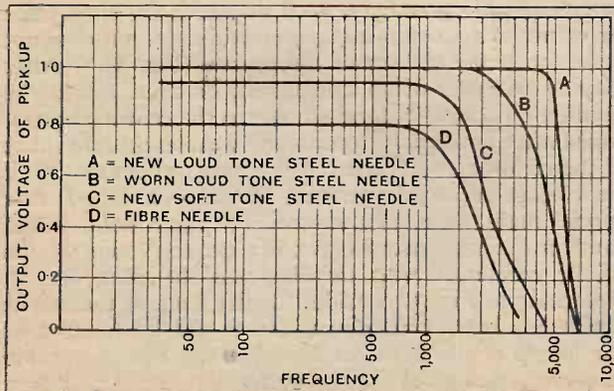


Fig. 1.—These curves reveal the behaviour of a gramophone pick-up when various types of needles are used.

An examination of Fig. 1 shows the R.M.S. voltage output actually obtained from a pick-up when playing a range of constant note records with various needle conditions. It will immediately strike the reader that

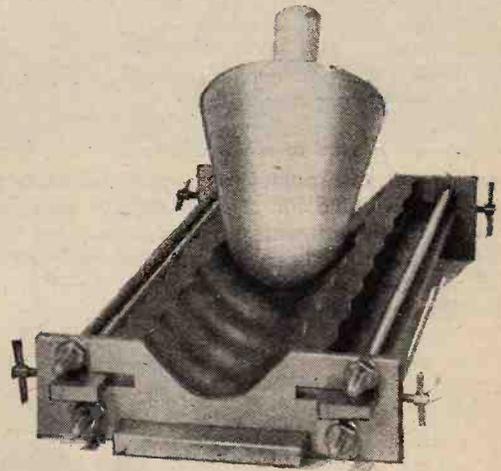


Fig. 2.—Large scale model of a steel needle moving in the groove on the record. The furrows represent a note of 4,000 cycles per second.

the principal effect of using a soft tone needle or fibre needle is to quieten the treble notes, the bass notes remaining almost as loud as when using a loud tone needle. This is a rather surprising fact. Curve B is of great interest because it shows us that the treble response is again reduced when we use a worn needle.

Why does this reduction occur? Record and needle groove models of truly gigantic proportions have been made up in order to solve this problem. Figs. 2, 4, 6 and 7 are photographs (considerably reduced in size) of the

¹ The photographs which accompany this article are reproduced by courtesy of The Gramophone Co., Ltd.

Gramophone Needle Wear.—

needle tip and groove. The scale of the model was 400 times full size, so that the complete needle would be a pointed steel cylinder, 20ft. long, weighing $11\frac{1}{2}$ tons, and the complete record stood on end would be as tall

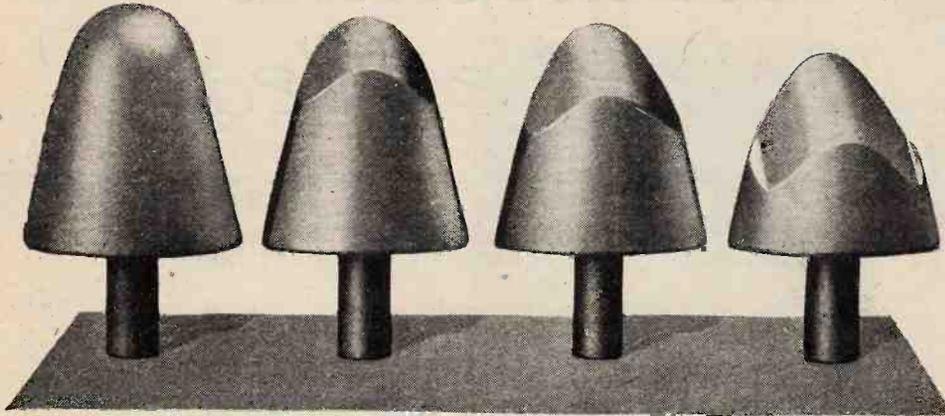


Fig. 3.—Progressive stages in the wear of a loud tone needle.

as St. Paul's Cathedral. To make the extreme tip of the needles was obviously easy, but to ensure the accurate production of the record groove cheaply was very difficult. Thousands of identically shaped laminae of very thin material were stamped out to the exact contour of the cross-section of an average record groove, and these laminae were gripped between a pair of blades in a special framework. The blades were about 18in. long, and were shaped up in pairs to various desired wave forms. The form in Fig. 2 is that of a 4,000 cycles per second sine wave.

Effects of a Worn Needle.

The best relative angle (65° – 70°) between needle axis and record face for a good quality pick-up was determined by experiments upon normal sized needles, and the big scale needles were cut away on their flanks so as to reproduce the various abrasions which had been noted from microphotographs of needles worn under

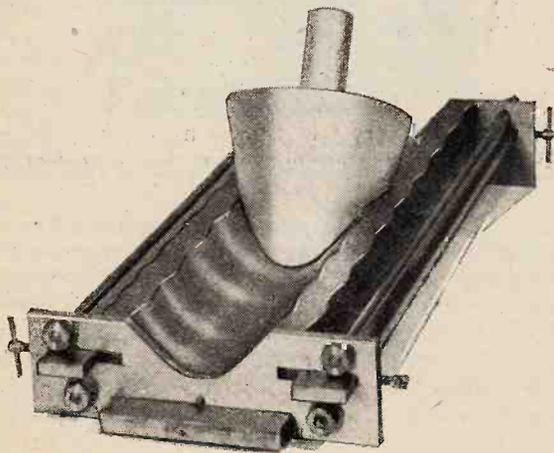


Fig. 4.—New needle the end of which has been devised to fit snugly into an 8,000 cycle groove, resting against the contours of a 4,000 cycle groove.

various conditions of playing, such as heavy and light orchestral passages, soprano notes and so on.

Incidentally, some very interesting discoveries were made in this work, for example, some needles were found to be worn off on the left-hand only, and scarcely touched on the opposite flank, while other needles were worn on the right-hand flanks only. It was afterwards found that in the first case the face of the record was not truly horizontal, and the pick-up was thus running down hill towards the centre of the record with the needle acting as a brake; while in the second case the pick-up arm back bearing had been adjusted too tightly, and thus the needle point had a very unfair load placed on one side of it. Needless to say,

the effect on the records was disastrous, and reproduction of music was "woolly" and dull towards the end of the record.

Now let us look at Fig. 3 which shows an average loud tone needle at various stages of wear. The

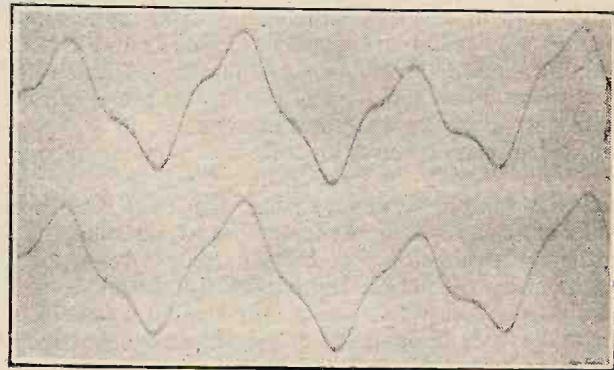


Fig. 5.—Curves showing the movement of the pick-up armature with a new needle (upper curve) and a worn needle (lower curve).

new needle has a nicely domed tip which fits snugly the curvature of a 5,000 cycles per second note, but does not quite touch the bottom of the groove (Fig. 4). After playing one side of an average 10 or 12in. record the needle tip takes up a form similar to the centre pictures, whilst after two heavy records the wear approaches that of the right-hand side view. We must, of course, work on average records in general, as it was found that special notes, such as a sustained soprano note, would cause a definite narrowing of the extreme point of the needle combined with striations on the worn flanks. Returning to Fig. 3, consider the flat flank of the needle which has been worn away, and it will be found that the length of the flat is of the same order of magnitude as the wavelength of a 4,000 cycles per second note on a record.

Gramophone Needle Wear.—

From actual measurements and calculation the above wavelength is around four thousandths of an inch on a two-inch radius groove, whilst the length of flat of the left-hand centre worn needle is around three thousandths of an inch. It is obviously impossible for the needle point to follow accurately the minute waves of fre-

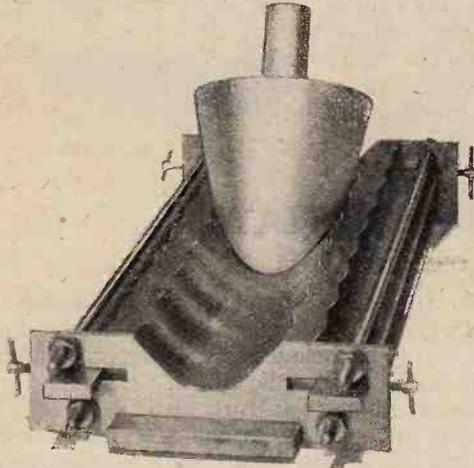


Fig. 6.—Badly worn needle riding on top of the groove walls. This gives rise to a scraping noise while the needle tip is free to wobble in the groove.

quencies above 4,000 cycles per second or so when once this flat flank has been formed by abrasion.

Here then we have, in our models, a tangible means of showing that there is a limit to the reproduction of treble notes which it is possible to obtain from a record-needle groove system. As a further check on this fact, greatly magnified traces of the angular motion of the armature spindle of a pick-up were made when playing a passage of music on a record with a new and a worn needle. These traces are shown in Fig. 5. It will be observed that there is a definite loss of the finer treble frequency "kicks" on the record. It should be remembered that top "C" of a grand piano is around 4,100 cycles per second. Now if we consider the right-hand worn needle of Fig. 3 which has two distinct flats, and also look at Fig. 6, the weight of the sound box is

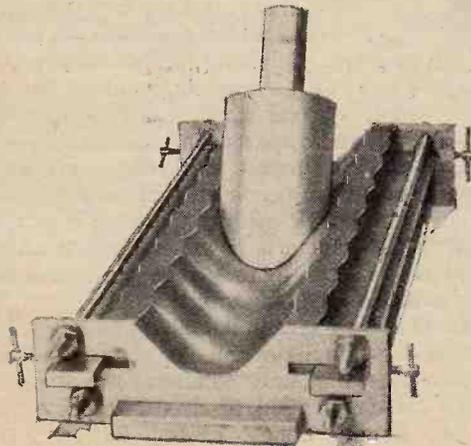


Fig. 7.—Worn Tungstyle needle where the width of the groove is greater than the diameter of the needle.

taken by these small flats which scrape along the top of the walls of the record groove. This causes a very objectionable scraping and tearing noise, while the needle tip itself is free to wobble about in the groove, being pushed over first by one side wall and then by the other. Distortion of all frequencies except the very lowest bass is caused. Thus we find that the loss of treble and the peculiar combined woolliness and harshness are definitely accounted for along quite obvious lines when we study these huge models.

Improved reproduction of treble notes can be obtained by increasing the radius of the music groove from the centre of the record; this has the effect of increasing the surface speed of the record, and hence increases the wavelength so that the flat flank of the needle is of small dimensions compared with the wavelength. This improvement unfortunately is not at present practicable. Another improvement may be made by using an exceedingly hard needle such as a diamond and shaping the point specially so as to reduce the above interference. These changes, however, are not commercially possible.



Fig. 8.—Microphotograph showing wear of record groove caused by badly worn needle.

Fibre needles are quite good for users who like to preserve their records indefinitely, but even with these it is essential that the record faces be kept clean and free from dust or grit, as the fibre picks up the grit and acts in the same way as a "lap" for cutting a diamond facet. The reproduction of treble notes when using a fibre needle is definitely poor, as is shown by curve D on Fig. 1. This is due, first, to the presence of distinct flat flanks quickly forming on the needle tip, secondly, to the very low stiffness figure which the stick of fibre possesses, and thirdly, to the quick formation of "shoulders" on the needle tip, which are rather similar to those of the much worn steel needle. The fibre should be repointed after every playing, and the point should be lowered gently into the groove always.

Fig. 7 shows the advantage of using a permanent needle such as the Tungstyle needle. The chief character of this needle is that in its extreme tip it contains a short piece of soft tungsten wire only six thousandths of an inch in diameter. Now the maximum width of groove on an average record is slightly larger than this diameter, so that no matter for how long the needle is worn away, it is impossible for "shoulders" to become worn on the needle tip, and the only distortion obtained with their use is to attenuate to a very slight degree the

Gramophone Needle Wear.—

treble frequencies around the high notes of the piano. Care must be taken when using these, or in fact, any needles to ensure that the pick-up is not dropped or handled clumsily when placing it on the starting grooves of a record, also it is not advisable to change the position of the permanent needle in the needle holder, as fresh flat flanks have then to be worn upon the needle tip, and the record grooves may suffer.

The flat flanks which so soon appear on steel needles act like chisel edges upon the rapidly moving record groove walls, and carve an ever-widening passage for

the needle tip in a similar manner to a bulky barge being dragged along a neglected canal (Fig. 8). Record wear, however, is a different study from needle wear, and must be treated separately, although always with very strict reference to needle wear.

This article has dealt with needle wear pure and simple, and does not take into account the differences of wear which are found when various pivot-bearing suspensions are used, or when various weights of pick-ups are used. The reaction of the needle to the groove in these cases plays a very important rôle at certain selective bands of frequencies.

THE RADIO SITUATION IN THE STATES.

By AN AMERICAN CORRESPONDENT.

IT may be interesting to British readers to learn how the recent financial crash in Wall Street circles has affected the American radio industry. One thing is clearly evident, namely, that although radio has been thought to have passed from the luxury to the necessity class, it was, with automobiles, almost the first trade to be affected by the financial troubles.

Just before the trouble came the bulk of the radio business was in the hands of the following makers: Radio Corporation of America, Zenith Radio of Chicago, Sparton, Atwater-Kent, Grigsby-Grunow, makers of the Majestic set and with the reputed biggest output in the States, amounting to over 6,000 sets per day, Stromberg-Carlson, and Crosley. The effect of the crash was electrical. Several companies immediately reduced their prices, notably Grigsby-Grunow, Atwater-Kent and R. C. A. Whether this panic legislation was due to the crash is known to themselves only, but rumour has it that the price reduction did none of them any good, but on the contrary hardly enhanced their reputation. Others, notably Stromberg-Carlson, actually increased prices, while Zenith immediately announced by nation-wide advertising that they were not going to reduce prices as their goods were worth every cent that was asked for them. The fact remains that several of the above-mentioned manufacturers with an output running into literally thousands of sets per day had to close down entirely, and that in the very busiest part of the radio season. Others, however, have carried on at a reduced scale.

One well-known company, Earl Radio, which incorporates Fried-Eisemann and Freshman, is now in the hands of a receiver, but it is said that it will probably be reconstructed on a fresh basis.

A significant fact is the entry of that gigantic automobile trust, General Motors, into radio by the launching

of a radio subsidiary company in conjunction with R.C.A. Dayfan Radio has also been bought up and others are said to be included in the merger. The result will be the provision of radio sets in automobiles in the General Motors range at an early date.

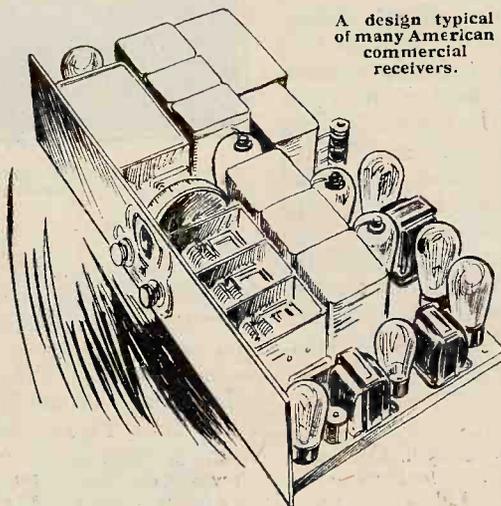
Everything here points to the fact that the radio industry will be in the hands of a smaller number of firms before long, just as the motor industry is mainly in the hands of General Motors, Ford, Chrysler, Packard and one or two more.

Another interesting rumour is to the effect that a set has been evolved without the use of valves, and that it has been thought to be so dangerous to the valve groups here that the inventor has been persuaded to take a large sum of money and his invention put on the shelf. This rumour is, however, not taken very seriously here.

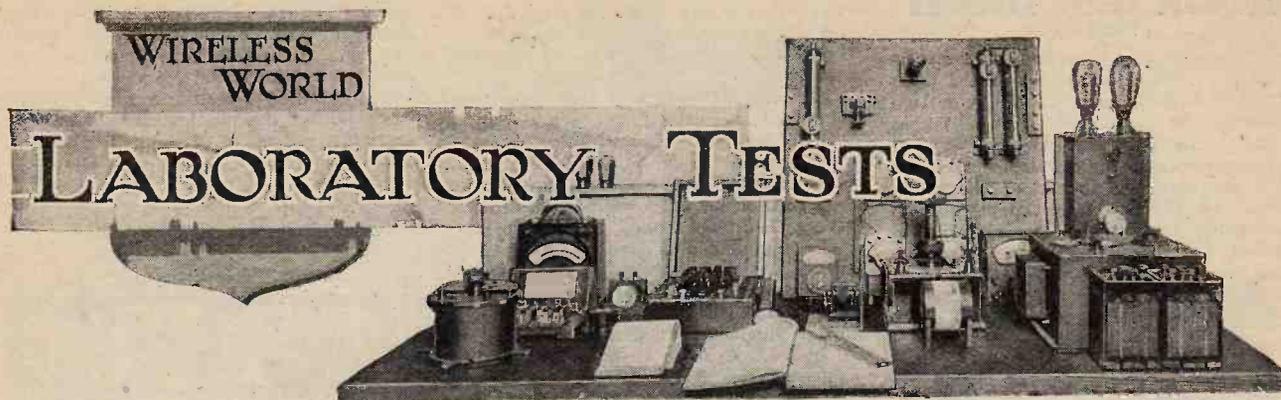
Considerable interest is still being shown in television in theory, but no manufacturer yet has dared to put out a television set. Enquiries among many of them elicit the fact that they still consider television to be an interesting scientific toy, but not having yet reached the practical stage. At the same time, a

noted maker of radio parts and accessories—Carter Radio Co.—is said to propose marketing television parts this season and to have predicted that television will be commercially practicable within a year. It is not believed that this statement is based on the use of any of the present television systems. The same company is preparing to market a home talkie.

Rumours of mergers are in the air continually, it being recognised that in the States the day of the small manufacturer has gone, and only combination can meet the pressure of the competition of the big groups. Home construction, having almost ceased for some years, appears to have suddenly revived, but it may only be a spasmodic attempt and not a serious revival.



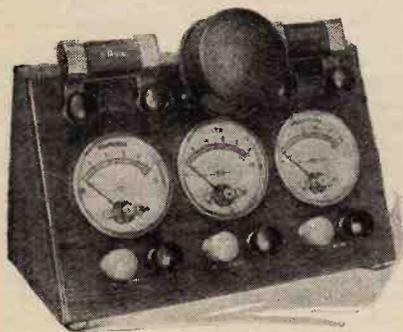
A design typical of many American commercial receivers.



A Review of Manufacturers' Recent Products.

PRECISION UNIVERSAL D.C. TEST SET.

This test set has been developed by the Central Manufacturing Company, Crown Works, Birmingham Road, Walsall, for the purpose of measuring the D.C. currents and voltages generally met with in ordinary electrical test work. The nucleus of the set consists of three high-grade moving coil instruments reading 0.05 amp., 0.1 volt, and 0.25 mA., the first being the left-hand meter and the others following in the order mentioned.



Precision Universal D.C. test set with shunts and series resistance for the voltmeter, in position.

Multipliers, in the form of shunts for the current meters and series resistances for the voltmeter, are available to extend the range in each case. The set is, therefore, admirably suited to deal with the currents and voltages ordinarily encountered in wireless test and experimental work.

One advantage of separate meters is that simultaneous observations can be made of the currents and voltage in different parts of a circuit or receiver. This is not possible with a single-scale multi-range instrument.

The makers claim that these instruments are accurate to within plus or minus 1 per cent., but in view of the rather short scale and taking into consideration the thickness of the pointer we believe that, under normal conditions, a greater accuracy than 5 per cent. cannot

be expected on the lower parts of the scale, but it is just possible to read within 1.5 per cent. on the upper portion. Tests made with standard laboratory instruments showed that, without multipliers, the maximum error did not exceed 2.5 per cent. This was recorded on the lower range of the voltmeter, and decreased as the voltage was raised. The milliammeter exhibited the same characteristic, but in this case the greatest error was 2 per cent. only. The ammeter showed its greatest error at full scale, viz., 1.6 per cent., and this decreased towards the lower end.

The same high order of accuracy was not maintained when the shunts and series resistances were fitted, in some cases an error as high as -8 per cent. being recorded. At most parts of the scales the average error was of the order of 4 per cent.

The price of the test set without multipliers is £5 5s. Shunts cost from 7s. 6d. to 15s., and voltmeter resistances from 7s. 6d. to 39s.

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MODIFICATION TO MULLARD RECTIFYING VALVES.

The increasing popularity of super-power output valves demanding a relatively heavy anode current has induced the Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2, to redesign the DU.2 and DU.10 rectifying valves. Hitherto the maximum output was 40 milliamps., and to meet the present demand this has now been raised to 75 mA. for the full- and half-wave models. The filament voltage and current remain the same, viz., 4 volts at 1.1 amp. The price is unchanged; 20s. for the DU.2 (full-wave) and 15s. for the DU.10 (half-wave).

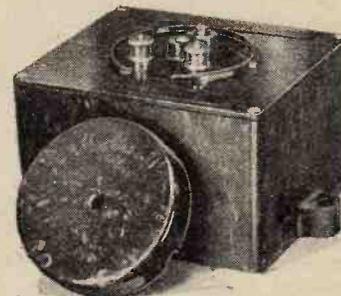
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DUBILIER WAVE-TRAP. Type BRI.

This unit has been designed especially for use in the London area, its function being to reduce interference from the

358-metre regional transmitter and enable alternative programmes to be received on a set not sufficiently selective to achieve this under present conditions. It consists of an absorption rejector circuit which is connected between the aerial lead and the set, no alteration to the receiver being required.

A practical test was made using a simple receiver which normally would not separate the transmission from 2LO and 5GB within eight miles of Brookmans



Dubilier anti-interference unit Type BRI, an absorption rejector designed to reduce interference from 2LO.

Park. With the rejector connected interference from the local station was restricted to a narrow band of from 340 to 370 metres, and below and above these two limits signals from various sources could be tuned in without a whisper of interference from 2LO.

The rejector is housed in a neat case moulded in bakelite, the terminals and condenser adjustment being protected by a circular cover. It is supplied adjusted to reject the 358-metre transmission, but a small correction will probably be found necessary owing to the effect of aerial capacity on the tuning of the rejector circuit. An adjusting screw, with a small slot for insertion of a screwdriver, is provided for this purpose.

The makers are the Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3, and the price has been fixed at 15s. 6d.

BURNDIPT NEEDLE ARMATURE PICK-UP.

In designing a gramophone pick-up the principal difficulties are associated with mechanical resonances in the vibrating system. As explained in a recent article,¹ the most satisfactory way of overcoming these difficulties is to reduce to a minimum the inertia of the armature. In the latest Burndipt pick-up this policy is carried to its logical conclusion; the needle itself forms the armature, and the vibrating mass is consequently brought down to the irreducible minimum. Actually, there is a



Burndipt pick-up and tone arm.

small boss N embedded in rubber which acts as the needle-holder, but as the axis of motion passes through the centre of the mass the moment of inertia about the axis is small. The needle-holder is of square section and fits, with its rubber packing, into a parallel-sided slot in the needle housing H, so that the movement of the needle is controlled and so prevented from falling on the pole pieces P. The latter are attached to the pick-up coil former C, through the centre of which passes the needle armature. The permanent magnet is of generous cross-section and is insulated acoustically from the metal shell by a rubber packing strip and washers R.

The pick-up unit is mounted on the curved tone arm at a predetermined angle which gives a maximum tracking

error of not more than $2\frac{1}{2}$ degrees. A swivel joint enables the pick-up to be inverted for inserting or withdrawing the needle.

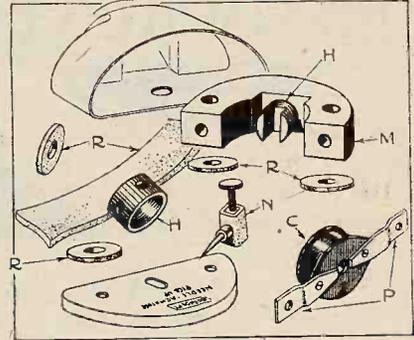
The characteristic of the specimen submitted for test is given below, and it will be seen that the output is remarkably constant from 50 to 4,500 cycles. Between 4,500 and 6,000 cycles there is an irregular increase which is useful in giving brilliance and timbre to the higher fundamental frequencies used in music. At the other end of the scale the output rises from 50 cycles downwards. In practice this may be ignored as the lowest frequency at present recorded is 50 cycles. A more definite rise in the characteristic from 250 cycles downwards would be an advantage, and this was actually obtained in the specimen tested by using an H.M.V. extra loud Tungstyle needle. Some difficulty is experienced, however, in fitting this needle, and for general use the Columbia De Luxe needle is recommended.

Apart from the unprecedented uniformity of the output, the most striking feature of the performance of this pick-up is the absence of any sign of record wear. While the average pick-up commences to chatter and jump the groove at about 100 cycles on the standard frequency records (in which the amplitude at low frequencies is, of course, much greater in an ordinary record), the Burndipt needle armature pick-up follows the groove with perfect silence down to 25.5 cycles the lowest frequency recorded. At this frequency the double amplitude (total width) of the groove is no less than $\frac{3}{8}$ in.

The increased response in the region of 5,000-6,000 cycles provides the harmonics necessary to impart characteristic timbre to fundamental frequencies below 3,000 cycles, and when listening to orchestral records it is possible to distinguish between instruments even when played near their upper limit of frequency. The reproduction of transients is also very good, and such effects as cymbals and bells are unusually well reproduced.

The general level of voltage output is considerably below the average and the usual two-stage amplifier does not give sufficient magnification for normal loud

speaker volume. In general a three-stage amplifier with volume control is recommended. A 10,000-ohm potentiometer is specified by the makers, and the pick-up was shunted by a resistance of this value when taking the characteristic. An appreciable reduction of high frequencies



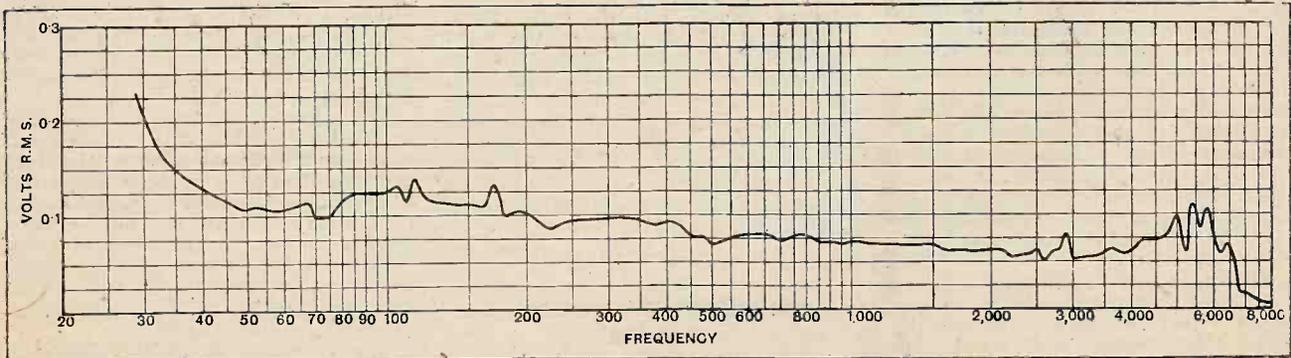
Component parts of the Burndipt needle armature pick-up.

results from the use of this comparatively low resistance. The high-frequency response of the Burndipt pick-up, however, is such that without it surface scratch would obtrude. In arriving at a value of 10,000 ohms a satisfactory compromise has been effected between these conflicting factors.

TRADE NOTE.

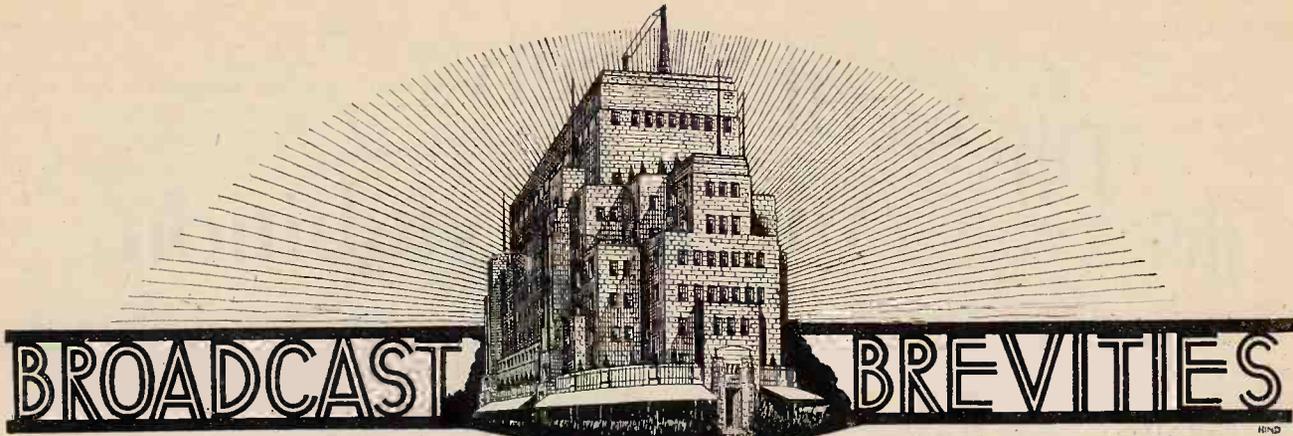
Messrs. James McQueen, Ltd., Moab Road, Leicester, have forwarded us a specimen copy of their "Kwik-an-Eeze" Account-Book, which should prove invaluable to the small trader whose business does not warrant a staff of book-keepers or an elaborate system of book-keeping.

The book comprises 52 pages for analysing the various receipts and payments, and a "Private Ledger," with pages ruled for summarising the weekly totals and with skeleton trading accounts and balance-sheet in which the correct position for the various summarised totals is clearly shown. A detachable sheet is provided for a certified copy of the year's profit and loss account, and much useful information is given in the supplementary notes. The price is 4s. 6d.



Output characteristic of the Burndipt needle armature pick-up taken with Columbia De Luxe needle and 10,000 ohms shunt resistance.

¹ "Gramophone Pick-Ups," *The Wireless World*, October 30th, 1929, page 483.



By Our Special Correspondent.

Trouble with the Post Office.—B.B.C. and Foreign Listeners.—Radio Week Surprise.

The Height of Tactlessness.

Radio Week—the one week in the year when the Post Office detector van might have been veiled in decent obscurity—was chosen for a special “war” against the wireless pirates of Manchester.

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Nature and the Land-line Listener.

All is not well between the Post Office and the B.B.C. This time Nature herself has upset the apple cart, and many listeners will rise up and call her blessed. The trouble has arisen over the recent gale which wrecked the overhead lines between London and Daventry.

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It's an Ill Wind . . .

The catastrophe has suddenly caused Savoy Hill to reflect that there are such things as underground cables, and the question is being asked: Why can't the Post Office emulate the German Postal Administration by giving broadcasting the best form of line available, i.e., underground? Experience in Germany, as revealed by the recent Cologne relays, has shown that a well-shielded underground cable gives far better results than an overhead line.

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Weather Permitting.

At present the only underground cable used by the B.B.C. is the short stretch between Savoy Hill and Brookmans Park. The results on this line are nearly perfect, as the fortunate listeners who can tune in direct are ready to testify, but this is small consolation to the vast majority who have to rely on the network of exposed wires which carry the mangled remains from Land's End to John o' Groat's.

In view of the gale experience the B.B.C. is thinking of announcing programmes with the proviso “weather permitting.”

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The Swing of the Pendulum.

Not long ago it seemed as if the pessimistic advice from certain quarters was taking effect, and that listeners were abandoning the glories of the chase for distant stations in order to concentrate

on local reception. Happily this parish pump attitude is losing what prestige it ever possessed. Listeners are reaching out and are finding that the Prague Plan, with all its failings, still enables one to obtain real pleasure from Continental programmes.

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Support for the B.B.C.

A B.B.C. official tells me that many foreign listeners are concentrating on the reception of Brookmans Park. Apparently the Corporation need not worry too much over complaints from British listeners, as it can always count on staunch supporters in Poland and Czechoslovakia.

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Radio Week Surprise.

“Every Week is National Radio Week” is a newly suggested slogan for the B.B.C., arising out of the exciting discovery that this week's programmes are even better than those of last week. The B.B.C. has done well to realise the futility of enticing new listeners with a programme standard which was not to be maintained.

More Stunts Required.

At the same time, I think that during Radio Week the Programme Department might have relaxed their apparently iron rule to avoid “stunts.” An occasional stimulant is good for the system. More recruits would have been enrolled if the programmes had been invested with a continuity interest. A problem could have been propounded on Monday, growing increasingly complicated from night to night, until the final unravelling on Saturday. There is still time to develop such an idea before the winter is out.

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The Plea of a Mortician.

Queer requests blow into Savoy Hill at times, but I am glad to think that nobody in this country has gone so far as Mr. John S. Martin, of New Jersey, described as a “mortician,” who asks the U.S. broadcasting authorities to set aside a fixed hour daily for the nationwide broadcasting of funeral music.

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Discouraging the Individual.

Four years ago the old B.B. Company obliged a young couple by broadcasting Mendelssohn's Wedding March, but the present Corporation refuses to encourage the individual at the expense of the multitude. It would certainly concede nothing to Mr. John S. Martin.

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Broadcasting House.

One more stage is reached in the progress of Broadcasting House by the signing of the building contract between the owning syndicate and Messrs. Ford and Walton, Ltd. The erection of the superstructure is to begin early next month when the spade work below street level is completed.

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G.B.S. at the Microphone.

Mr. G. Bernard Shaw's speech at a public meeting at the Kingsway Hall, London, convened for January 31 by the British Drama League in support of the National Theatre, will be relayed to 5GB.

FUTURE FEATURES.

London and Daventry (5XX).

JANUARY 26TH.—Service relayed from Chester Cathedral.

JANUARY 29TH.—“La Bohème,” an opera by Puccini.

JANUARY 30TH.—“Huntingtower; or, The Adventurous Holiday of Mr. Dickson McCunn,” John Buchan's novel adapted for broadcasting.

FEBRUARY 1ST.—Running Commentary on the International Rugby Football Match, Scotland v. Wales.

Daventry Experimental (5GB).

JANUARY 27TH.—“La Bohème.”

JANUARY 28TH.—Liverpool Philharmonic Society Concert relayed from the Philharmonic Hall, Liverpool.

Manchester.

JANUARY 28TH.—Liverpool Philharmonic Society Concert, relayed from Philharmonic Hall, Liverpool.

Glasgow.

JANUARY 28TH.—“What's Right With Scotland?” a revue.

JANUARY 30TH.—“Huntingtower.”

Belfast.

FEBRUARY 1ST.—“Baghdad on the Subway,” a New York Phantasmagoria.

The Physical Society's Annual Exhibition

Features of Interest to the Wireless Experimenter.

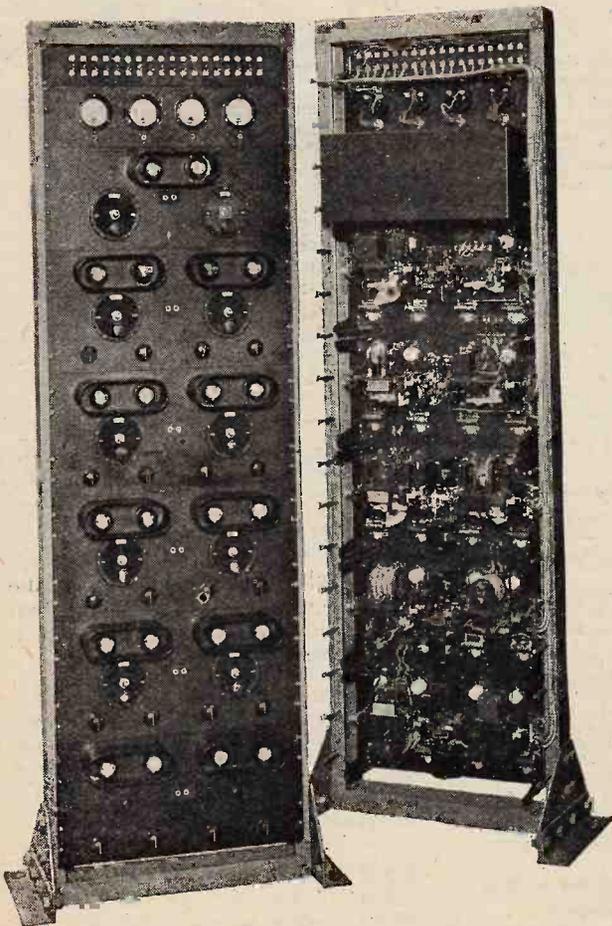
APPARATUS of interest to wireless students always occupies an honoured place at the Annual Exhibition of the Physical and Optical Societies, and this year's event, held at the Imperial College of Science and Technology on January 7th, 8th, and 9th, was no exception to the rule.

In the Research and Experimental section of the Exhibition the exhibit of the National Physical Laboratory (Wireless Division) aroused considerable interest,

much attention being paid to an automatic recorder of bearings from a rotating beacon transmitter, similar to that now in operation at Orfordness. The bearings are recorded on a circular drum, which is rotated synchronously with the transmitter by means of a phonic motor and tuning fork.

Of more immediate interest to the experimenter was the N.P.L. apparatus for the measurement of the overall performance of radio receivers. A radio frequency oscillator, operating a wide range of frequencies, is used for the supply of small input voltages on the receiver under test. The R.F. oscillations are modulated to any desired degree with the aid of a separate audio-frequency source. The current output from these generators is passed through a resistance of special design, and a suitable tapping point is provided in order that a known radio-frequency potential difference may be applied to the input terminals of the receiver under test. The audio-frequency output from the receiver is then measured with the aid of a valve voltmeter connected across a small resistance in series with the output or loud speaker load. In the N.P.L. exhibit the oscillators were contained in a metallicly shielded cabin, and the receiver in a separate room screened with wire netting.

The study of acoustics is becoming more and more necessary to radio research workers, and in this connection the research laboratories of the Gramophone Co., Ltd., and the Marconiphone Co., Ltd., exhibited several models of unusual interest. One of these, showing a rapid visual method of measuring reverberation in a hall, included a loud speaker, which, after setting up a steady sound at a given frequency, is switched off. The sound of the reverberation in the hall is picked up by a microphone



Front and back views of the frequency doubling circuit panel for the Marconi tuning fork drive. This system is employed by all the B.B.C. relay stations.

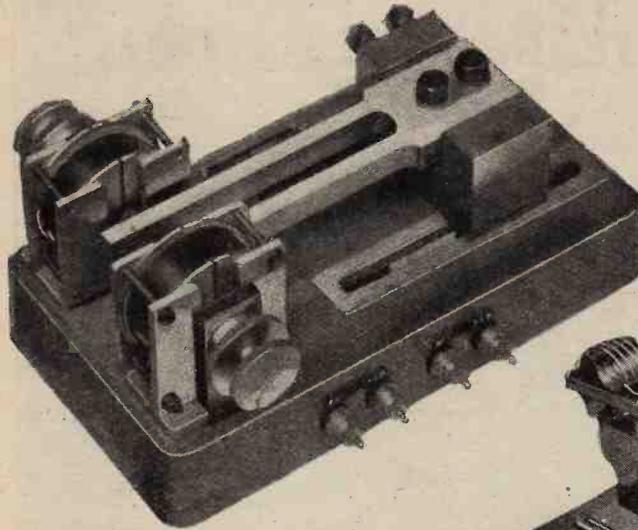


The "Kerr" cell shown by Messrs. Isenthal and Co., Ltd. This device is complementary to the ordinary photo-electric cell, its use being to reconvert electric impulses into variations of light density.

The Physical Society's Annual Exhibition.—

and recorded on a cathode ray oscillograph with linear time base, so that the dying away effect can be observed and a visual estimate made of the time.

Another fascinating exhibit was a model of a photographic sound-recording system, comprising a glow

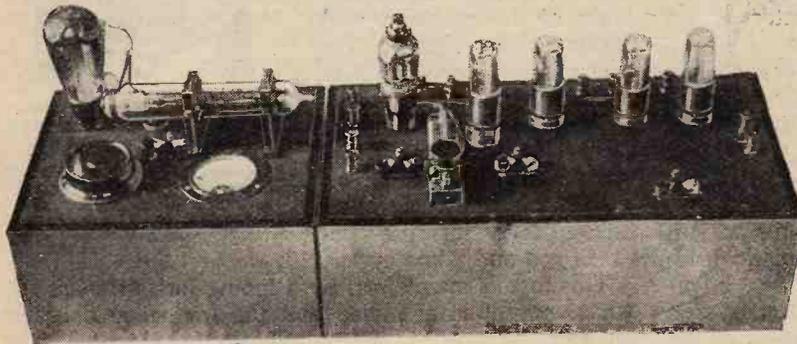


The Marconi tuning fork used in the frequency control of radio transmitters.

lamp, the brilliance of which is modulated by speech current from a pick-up. A slit of light after traversing an optical system impinges on the film and makes a record of the variable density type.

Elsewhere in this issue is an article describing a demonstration of the methods employed for reproducing physically the conditions in a gramophone record groove and of examining the behaviour of different types of needles.

The two companies also showed a filament-maintained mercury vapour tube in which the conductivity can be greatly increased when a magnetic field is applied in a direction parallel to the filament. Over a certain range this increase is proportional to the strength of the magnetic field, and can, therefore, be continuously varied by means of a permanent magnet which, for example, can be suspended from a pendulum.



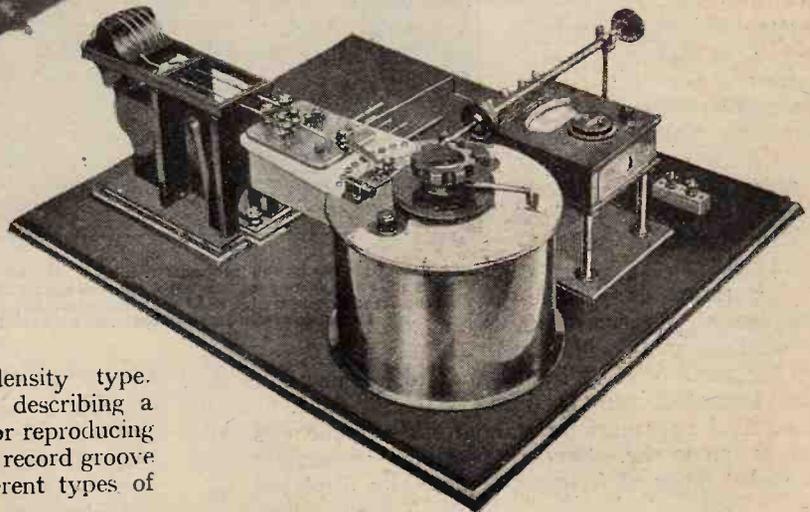
The new Lucas-Sullivan quartz frequency standardising apparatus (H. W. Sullivan, Ltd.), for frequencies between 50 and 3,000 k.c.

Mr. E. B. Moullin exhibited a new form of small-capacity variable condenser, suitable for precision measurements at very high frequencies, and an absorption wavemeter for use on short waves. A new directional short-wave transmitter operating on wavelengths between 6.04 and 8.65 metres was shown by Messrs. L. S. Palmer and L. L. Honeyball.

A New Loud Speaker Demonstration.

An interesting acoustic exhibit was that of Capt. B. S. Cohen and Mr. Robt. W. Paul. This was a new moving-coil loud speaker using pistons of Balsa wood, which combines an extremely low density with considerable elasticity.

The measurement of sound pressure was demonstrated by the research laboratories of the General Electric Co., Ltd., employing a condenser, transmitter, and amplifying system for dealing with frequencies from



A short-wave precision sub-standard wavemeter exhibited by Messrs. H. W. Sullivan, Ltd. The wavelength range is from 5 to 100 metres.

50 to 5,000 cycles per second. The Mercury Vapour Triode Thyration is the term applied to an interesting exhibit of the British Thomson-Houston Co., Ltd., showing the principle of grid control applied to a hot-cathode mercury vapour rectifier. With a given potential applied between the anode and cathode no current flows providing that the grid potential exceeds a critical value. Once the anode current is started, however, the grid loses all control due to the presence of ionised vapour, and to stop the anode current the circuit must be opened, if on D.C. supply. When A.C. voltage is used, the current stops at the zero of the cycle.

As might be expected, the Exhibition dealt generously with electrical measuring instruments. Many of the smaller instruments were of really practical interest to the amateur. A new galvanometer (of 2 mA. and 80 mV. full scale)

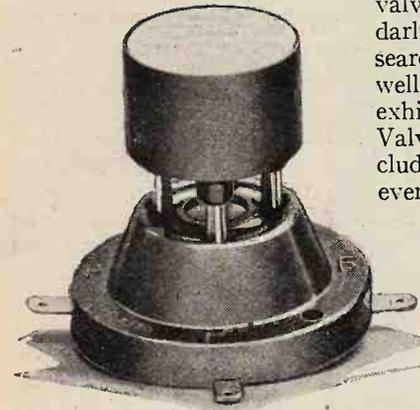
The Physical Society's Annual Exhibition.—

of considerable laboratory utility was shown in the trade section by Crompton Parkinson, Ltd. One pattern has even scale divisions, while the other has uneven divisions with wide calibration about zero.

Wireless workers are always attracted to the display of the Weston Electrical Instrument Co., Ltd. New features this year included a new multi-range D.C. testing set and a "valve checker" for testing any A.C. or D.C. valves having filament voltages of from 1.5 to 7.5 volts. The Cambridge Instrument Co., Ltd., also presented their wide range of laboratory apparatus, one of the most interesting items being the new Campbell Standard Mutual Inductometer, which has a wide range for the direct measurement of self-inductance.

Apparatus for radio-frequency measurements was the main feature on the stand of H. W. Sullivan, Ltd. A new item was the Lucas-Sullivan Quartz-Crystal Standard and its associated apparatus for standardising frequencies from 50 to 3,000 kc. Several precision wavemeters for a varied range of frequencies were also displayed.

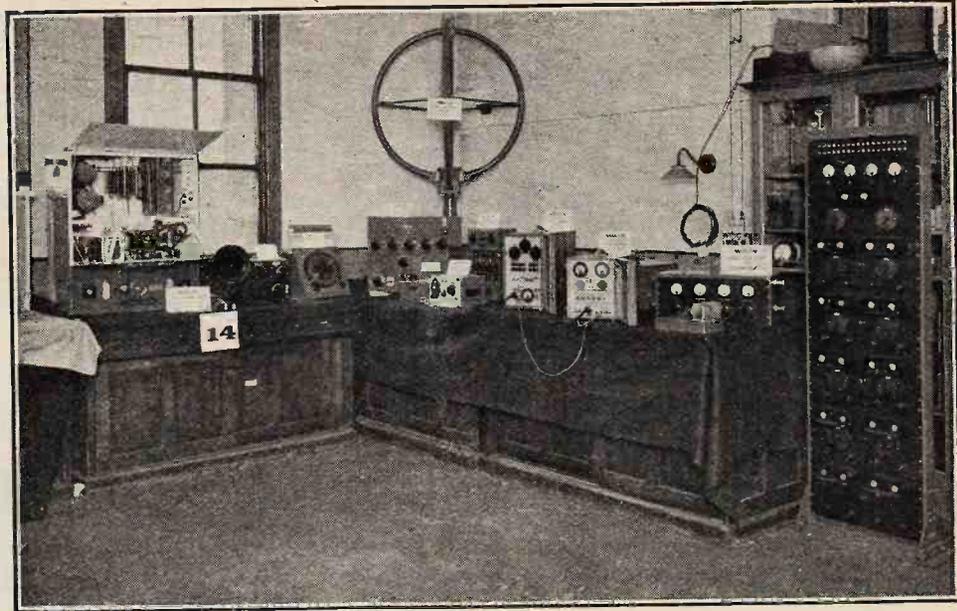
The thermionic valve, always the darling of the research engineer, was well represented. The exhibit of the M.O. Valve Co., Ltd., included valves for every purpose, from modest 2-volt detectors to the high-power cooled-anode transmitting types as used at G.P.O. and B.B.C. stations. An automatic grid-making machine was seen



A new vacuo-junction device by the Cambridge Instrument Co., Ltd., in which the thermo-junction and the heater are enclosed in a highly exhausted glass bulb to eliminate air current effects.

in action. Valves of all kinds were also displayed by the Mullard Wireless Service Co., Ltd., who showed in addition a working model demonstrating the opera-

tion of a low-frequency amplifier. A complete range of rectifiers was shown, ranging from 30 mA./250 v. to 2 amps./12,000 v. An extensive range of transmitting and receiving valves was also exhibited

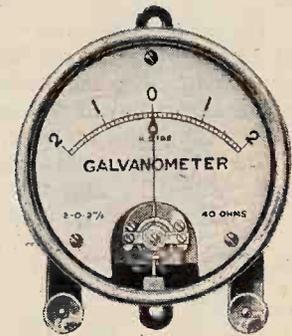


A general view of the Marconi exhibit. On the extreme left is a telephone set for ships, and next to it a marine receiver with a wavelength range of from 15 to 20,000 metres. In the corner is the fixed frame aerial used with the direction-finder seen on the right of the left-hand bench. Portable testing equipment can be seen in the centre of the right-hand bench.

by the Ediswan Co., whose stand included the products of their associated concerns, the Metropolitan Vickers and B.T.-H. companies. These included loud speakers, gramophone pick-ups, microphones, and several different eliminators.

The variety of exhibits on the stand of the Marconi Company gave it a special attraction. One exhibit was an aircraft direction-finder with a streamline frame aerial designed to enable the loops to be supported in a rigid position as far as convenient from the body of the machine with minimum air resistance. The ever-growing necessity of maintaining the frequency of broadcasting stations at a constant pitch lent special interest to the exhibit of a thermostatically controlled tuning fork for use between 700 and 1,400 cycles.

This fork is maintained by a tuning fork drive circuit whose output is amplified and the frequency doubled ten times by a series of push-pull selecting circuits. This form of control is used at the B.B.C. relay stations. Among many other exhibits was a telephony set for



A useful laboratory instrument. A new moving-coil calibrated pointer galvanometer, shown by Messrs. Crompton Parkinson, Ltd., with centre zero and giving full scale deflection at 2 mA. and 80 mV.

SHOULD MANUFACTURERS CONTRIBUTE TOWARDS PROGRAMMES?

Sir,—Most certainly they should.

Your only reason for stating they should not is that in your opinion the price of receivers would be increased.

If the manufacturers did contribute we should undoubtedly obtain better programmes, with better talent, which the B.B.C. cannot at present afford. The B.B.C. would have more money to spare for station erection, including an Empire service which we could feel was adequate.

But the most important effect would be a doubling of the listening public, leading to genuine mass production by our manufacturers, and definitely cheaper and more efficient receivers for the public.

Our programme service has time and again been compared with the American service by English writers, but have any of your readers read any reliable criticism of our service by American writers? I have, and in several instances it has been described as inadequate and puny.

Compare our licence statistics with those of America; there are half the receivers per head of population here.

My qualifications for writing this letter: I have been in the radio trade for six years and have made a special study of our own broadcasting service and those of other countries, and I am firmly convinced that unless more money than that accruing from licence fees is made available for the use of the B.B.C. our radio industry will never be in the same position as those of other countries, to the serious detriment of our export trade.

Gt. Yarmouth.

S. WEST.

IN SEARCH OF QUALITY.

Sir,—It is a painful business when one's idols are shattered, and so with sadness I read Mr. Bertram Munn's disturbing article in your recent issue.

So the great Mr. Munn uses nothing more convincing than a trumpet, and does not even tell us that he at least actuates the diaphragm with a moving-coil unit. Really, sir, he will next be confessing that his receiver is a simple affair with a leaky grid detector (with, of course, just a touch of reaction to ginger up the selectivity) and a brace of transformer-coupled L.F. stages. He will doubtless conclude by cheerfully admitting that his output is devoid of a filter-choke circuit, and that he does not believe in such abominations.

And now, sir, may I as a moving-coil enthusiast take up the challenge—but let me add that for my part the conflict will not be the gruesome affair anticipated by Mr. Munn; I would not shoot my great-grandfather, old-fashioned though he be, so why should I harm the venerable hairs of Mr. Munn (for, of course, he rejoices in the possession of a long, flowing white beard).

First, may I ask if Mr. Munn has carefully examined the receivers coupled to the moving-coil speakers to which he takes exception, because long before I made up my moving-coil unit two years ago I had been repeatedly warned that no speaker shows up a receiving set so ruthlessly—and I have since confirmed this too often to be good for sellers of these units. If his experience is based on the groans and boomy thuds which emanate from most "demonstration sets," then am I almost tempted to sympathise with him. Such results are, however, but a travesty of what a moving coil can do when properly fed and adjusted.

As regards my own outfit, the receiver is quite straightforward and consists of four valves only, but it has been carefully put together and is based on the best wireless practice as advocated in *The Wireless World*. The single H.F. stage is an ordinary neutralised triode, and the detector a diode. This latter feature I consider indispensable. The first L.F. is a medium power valve, and is coupled via a first-class transformer to the output—a single P.X.650 working under its maximum conditions. The transformer primary is isolated from the H.T. fed to the first L.F. valve, and the output to the speaker is via a heavy-duty choke and filter circuit. All stages are, of course, carefully decoupled. The loud speaker was assembled from standard parts and the coil itself specially wound to suit the impedance of the output valve. (I must thank *The Wireless World* for help in such technical matters.) The pot is wound for twelve volts one amp., but is frequently fed with eighteen volts.

Mr. Munn will please note that I do not use batteries of L.S.5 valves, and that my H.T. maximum is of the order of 250 volts; but I can assure him that the one watt, or thereabouts, of undistorted power at my service gives loud speaker reception of the highest quality and, I am prepared to assert, superior to anything he can do with his trumpet. Transients such as the clash of cymbals are amazingly good; a violin sounds like a violin and not like a piccolo; and even the much-maligned studio piano is pleasing. Ah! but I can hear Mr. Munn scratching away with his quill pen: "What about the announcer's voice?" Alas! I must admit that, when the set is adjusted correctly for a musical item, it is too loud. It does not, however, boom at one through a tunnel lined with cotton wool as Mr. Munn would have us believe. But it certainly is too loud. That defect in the balance of different items is noticeable with any sensitive speaker, and has already been the cause of much correspondence and complaint. It can, however, be easily remedied by the addition of an efficient volume control on the output valve. By means of such a control any item can be varied from a whisper to full strength to suit requirements, and the announcer's voice can be made a pleasure to listen to without the slightest trace of boominess, hissing or hissing.

May I conclude my defence of the moving coil with a repetition: use a diode rectifier and eliminate all reaction, back-coupling, and overloading of individual components.

And now, sir, if it is to come to cracking heads open after all, let the weapons be loud speakers, for I will back my 16 lb. pot any day against all the cardboard trumpets in Bedlam.

Ilford.

E. H. PALM.

THE MACCALLUM SCHEME.

Sir,—I have looked up Mr. G. B. Bennett's earlier letter, July 20th, 1927, and am very interested to find that a scheme so similar to my own should have been put forward nearly 2½ years ago. I imagine that a good many of us have been thinking along the same lines during the last few years, and in my own case I held my hand until I was quite sure that the synchronisation idea was entirely practicable, i.e., until Eckersley published his paper on the subject in April, 1929. Perhaps I ought to say I consider the essence of my scheme to lie in the grouping of programmes into classes and that I do not mind very much how the ideal is arrived at. The kind of alternative at present offered by the B.B.C. would not satisfy me at all.

Mr. Warren says that our land-lines are not good enough and indicates that it will take "at least five years" to put this right. I believe that the excellent engineers of the Post Office can give us the quality we desire, provided the money is forthcoming, and that the more important circuits at any rate could be brought up to the desired standard by the time the rest of the scheme is ready. I put it at about two years.

There is, of course, the alternative of the wireless link, and the possibilities of Dr. Robinson's new Stenode system should not be overlooked in this connection. It would seem possible by this means to feed the broadcasting stations from central high power stations, using fairly long waves, *without interfering with existing services*.

Mr. Warren's statement *re* the superiority of the B.B.C. regional scheme is somewhat dogmatic to say the least. My own view is that the programme grouping suggested by me would be more acceptable to the public, and I have yet to be convinced that mine is not a perfectly feasible proposal.

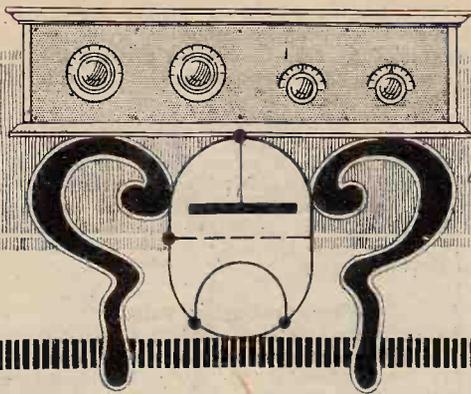
Mr. K. McCormack puts forward four propositions but, unlike Euclid, he does not prove them. The first two would appear to be true or untrue according to the meaning attached to the terms "restricted area" and "mutual interference," and, of course, everything depends upon the position, in reference to the mutually interfering stations, of the point at which the observations are made. The third is a corollary to the first two as is, very probably, the fourth, but as the meaning of the latter is not clear to me, I may be quite wrong in regarding it as such.

Mr. McCormack is an "anti-landliner" and an "anti-common-waveite," who demands good programmes and direct transmissions for "the provinces" on "an independent wavelength." Is there any practicable way of satisfying his requirements?

London, W.1.

H. MACCALLUM.

READERS



PROBLEMS

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

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

Incidental Rectification.

By accident, the grid bias battery supplying voltage to my anode bend detector was completely short-circuited, with the result that the grid circuit was connected to the negative filament terminal. What puzzles me is the fact that the set still gave signals, though at reduced strength. How can a valve, connected in this way, work as a detector?

L. L.
As a matter of fact, it is rather difficult to connect a valve, particularly if it be of the comparatively high-impedance type, with fairly low anode voltage, in such a way that it will not rectify slightly. Possibly the effect you have noticed is due to lack of complete "straightness" in the characteristic curve, or to asymmetrical conditions brought about by the flow of grid current: this will tend to restrict the development of voltage (across the tuned input circuit) due to impressed positive half-cycles as compared with that due to negative half-cycles.

RULES.

- (1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."
- (2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.
- (3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.
- (4.) Practical wiring plans cannot be supplied or considered.
- (5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.
- (6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

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

A 37

Repairing Condenser Blocks.

For smoothing purposes in my eliminator I am using a multiple condenser, with a number of separate elements. Unfortunately, one of the units (of 2 mfd.) has broken down, and I am wondering whether it would be possible for me to repair it myself. Will you give me a word of advice?

N. M.
The internal connections of these multiple condensers are not always readily accessible, and it is sometimes rather difficult to remove a unit without doing damage. Further, you may not be able to get a replacement unit of suitable size. If you have any doubts as to your ability to do the repair, we advise you to get into touch with the makers.

Grid Circuit Loading.

In the description of the "1930 Everyman Four" mention is made of the fact that a certain value of detector anode by-pass condenser is chosen in order to minimise reduction of H.F. input due in grid circuit loading. This set has anode bend detection, and I was under the impression that, properly adjusted and operated, this method of rectification does not allow the flow of grid current and does not impose any loading on the circuit immediately preceding it. Will you please give me a word or two of explanation.

A. H. H.
Unfortunately, it is incorrect to assume that an anode bend detector does not damp its tuned grid circuit. It has been appreciated for some time that there is a "reversed reaction" effect, via the valve capacity, that, under certain circumstances, may exercise a very serious influence in restricting signal voltage on the grid. This trouble is overcome to a great extent by a judicious choice of anode load values.

The whole subject was discussed at length in articles published in our issues of March 27th and May 22nd, 1929.

H.F. Filament Switching.

Will you please show me how a gramophone pick-up jack may be connected to the "New Kilo-Mag Four" in such a way that the H.F. valve filament will be automatically switched off when the plug is inserted?

C. N. R.
The method of connection you require is given in Fig. 1. For this arrangement a "single closed filament" jack will be required.

It will be realised that the pick-up is connected across the contacts of the plug, and that insertion of this plug will automatically break the positive feed lead of the H.F. valve filaments as you require, and at the same time will make the necessary change in bias for converting the detector into an amplifying valve.

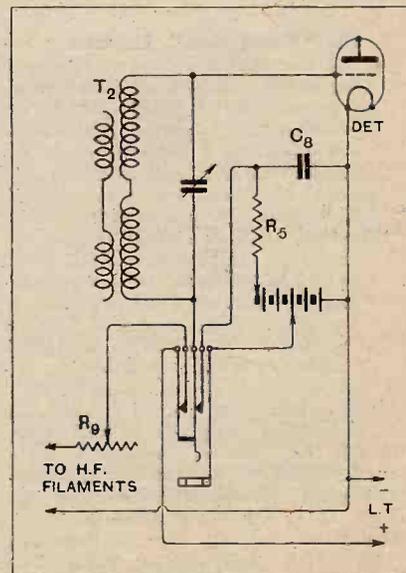


Fig. 1.—A pick-up jack arranged for automatic control of H.F. filament circuits.

The Right Rheostat.

My "Kilo-Mag Four" is working quite satisfactorily except for the fact that the rheostat controlling the H.F. valve filaments does not seem to function properly as a volume control; a very slight movement from the "full on" position has the effect of cutting out signals altogether. Can you suggest how this may be remedied?

A. D. G.

We expect that you are using two-volt valves (with a two-volt L.T. battery) and that the resistance of the rheostat is excessive. These valves consume considerably more current than those with four- or six-volt filaments, and consequently the voltage absorbed by a given series resistance is commensurately increased. We suggest the fitting of a rheostat with a maximum value of some 10 ohms.

○○○○

Voltage Regulation.

I have bought a small power transformer, rated to give an output of 4 amps. at 4 volts. It is proposed to use this for feeding the heaters of three indirectly heated A.C. valves, consuming a total of 3 amps.

Will you tell me what value of resistance should be inserted to prevent a rise in voltage across the heaters under this reduced load?

H. L. C.

Without seeing a regulation curve of your transformer, or its specification, it is quite impossible to give a definite answer to your query, but it can generally be assumed that these components, if made specifically for feeding the heaters of A.C. valves, are designed on fairly generous lines. Consequently, no appreciable rise in voltage is to be anticipated when a load only 25 per cent. less than maximum is imposed; but if you are still in doubt, it would be as well to refer the matter to the manufacturers.

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The "Tuned Grid" Amplifier.

From the fact that designers of receivers described in your journal do not seem to favour the "tuned grid" or "parallel feed" type of H.F. inter-valve coupling, I suppose it can be assumed that this method cannot approach the transformer in general effectiveness. Do you consider that it is worth while to include it in a receiver from which a moderately good standard of performance is required? I ask this because I already have a spare H.F. choke, and also because it is desired to simplify waveband switching as much as possible.

B. T. F.

It is quite wrong to think that the parallel-fed H.F. amplifier is ineffective, although there was at one time a fairly general tendency, due to an imperfect appreciation of the considerations involved, to belittle its possibilities.

Generally speaking, this arrangement is but little inferior to transformer coupling, and has advantages of its own in the matter of easy wave-changing. The H.F. choke through which the valve

anode is fed should be of the highest possible efficiency; possibly the circuit has occasionally been condemned through the use of an indifferent component for this function.

It may be pointed out that the single tuned-grid H.F. stage of a receiver described in *The Wireless World* for May 1st and May 8th, 1929, gave a measured H.F. amplification averaging well over 200 times. The theoretical aspects of the question were discussed in our issue of July 10th, 1928.

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Where Decoupling Fails.

Since adding an H.T. battery eliminator (D.C. mains) to my receiver, I have been troubled by L.F. oscillation, and in an attempt to put matters right, have inserted decoupling resistances (of course with suitable by-pass condensers) in the anode circuits of the detector and first-stage L.F. valves. Much to my disappointment, this has not completely cured the fault, although it has effected an improvement. What do you suggest should be my next step?

B. B. W.

There is a tendency to forget that the decoupling scheme was first suggested as a remedy for L.F. oscillation brought about by battery resistance, and, as has been pointed out on several occasions in this journal, this scheme must not be expected to provide a perfect cure for self-oscillation produced by high impedances in an eliminator, unless special precautions are taken in its application.

If you will send us a circuit diagram of your receiver and eliminator, it is probable that we can make some helpful suggestion, and in the meantime we suggest that you would do well to divide up the various feed circuits, being guided by the design of the D.C. eliminator described in our issue of August 29th, 1929. Adoption of this plan avoids the inclusion of high impedances common to several anode circuits.

FOREIGN BROADCAST GUIDE.**STAMBOUL**

(Turkey).

Geographical Position: 28° 51' 48" E.
41° 11' 19" N.

Approximate air line from London: 1,550 miles.

Wavelength: 1,200 m. Frequency: 250 Kc. Power: 5 kW.

Standard Daily Transmissions.

15.30 G.M.T. Turkish music, news and agricultural report; 16.30 orchestral concert; 18.30-20.30 (except Mondays) music and news.

Male Announcer. Call (in Turkish): *Allo! Telsiztelegrafie Istanbul.* (In French): *Allo! Ici Radio Stamboul.*

Interval signal: metronome (120 beats per minute).

Closes down with the Turkish National Anthem.

A Megavox Modification.

Will you please tell me if a Mazda 215 S.G. valve would work satisfactorily as an H.F. amplifier in the Megavox III receiver? Would any alterations be necessary in the set itself?

C. L. G.

This valve will work excellently, and no alterations will be necessary beyond the addition of a voltage-absorbing resistance in series with its filament, if you are using 4-volt or 6-volt valves in the other positions.

○○○○

The Limit of Amplification.

My receiver, made nearly two years ago, comprises a screen grid H.F. amplifying valve, detector, and one L.F. stage; there is a plain vertical metal screen between the tuned grid and plate circuits. The set is hardly selective enough for my present needs, and in addition is somewhat lacking in sensitivity as compared with more modern receivers.

Do you consider that it would be possible to improve matters by using coils of lower H.F. resistance, or is it likely that this alteration would cause instability?

T. W. J.

Without full details of your present set, it is not possible to offer a definite expression of opinion, but in all probability your fears are well grounded, and we doubt if it would be possible greatly to improve the receiver in the way you suggest.

It should be added, however, that if the set does not show any marked tendency towards self-oscillation at the lower end of the tuning scale, at least some improvement can be effected by using better coils.

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Power Line Interference.

When my receiver was fed from H.T. batteries, power circuit interference was never heard, but since using an eliminator, I am troubled by periodic interference, which is clearly due to this cause. It should be made quite clear that the trouble is not due to imperfect smoothing in the eliminator, as the interference is sometimes absent for considerable periods, particularly at week-ends. Can you make a suggestion as to any means whereby it may be overcome?

C. H.

Your description would indicate that high-frequency interference, possibly generated by electrical machinery at a considerable distance, is being conveyed along the power lines to your set via the eliminator.

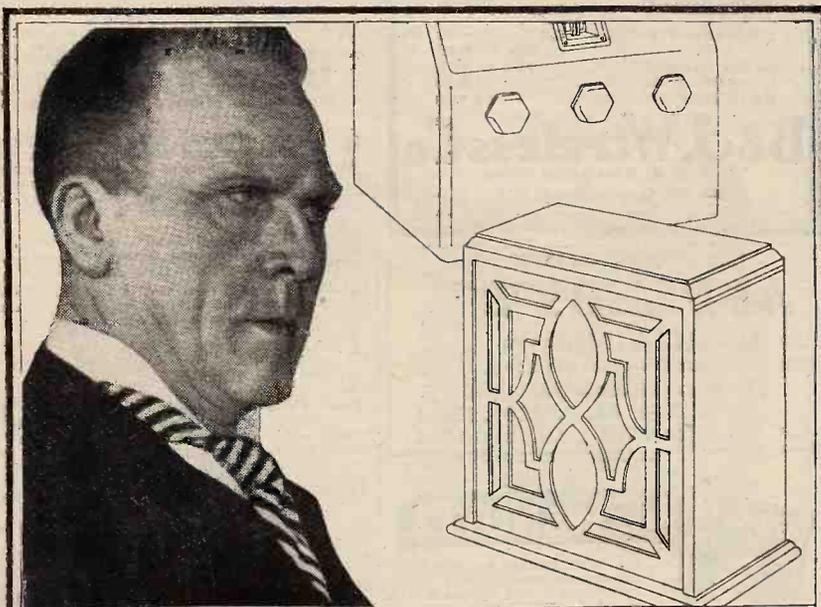
We think it would be worth while to connect H.F. chokes in the leads between eliminator and receiver, and also to make sure that adequate by-pass condensers are fitted.

It is also worth while to try the effect of using a counterpoise in place of an earth, and also of a loosely coupled and separately tuned aerial circuit, if this is not already included in your circuit.

A 38

CHALIAPINE

believes his ears!



Theodor Chaliapine, the great singer, says: *"They tell me there is no orchestra inside a Marconiphone. But my ears contradict! They say where there is such music, there are musicians. So I believe my ears, too; for the music from a Marconiphone is real to me."*

To hear every smallest detail of the programme, every note in the musical scale, every inflexion of the voice — radio as it really should be — a Marconiphone loud speaker!

Marconiphone engineers make these speakers. All the skill of thirty years' leadership in wireless is in their construction. Sir Edward Elgar, Albert Coates, Mischa Levitski, Peter Dawson, many other famous musicians delight in their clear tone, their unfailingly accurate reproduction. Any dealer will willingly demonstrate the Marconiphone speakers to you. If there is no dealer near you, write to The Marconiphone Company Limited, 210-212 Tottenham Court Road, London, W.1.

THE FIRST AND GREATEST
NAME IN WIRELESS

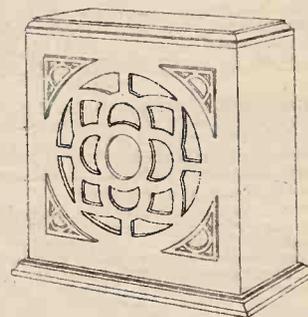


Listen with a

MARCONIPHONE LOUD SPEAKER

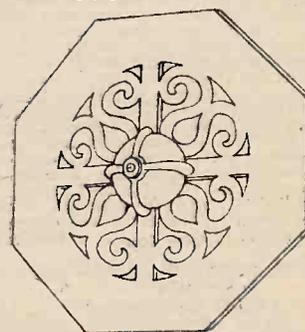
MARCONIPHONE MOVING COIL SPEAKER *(shown on left)*

The most sensitive speaker you can buy, the Marconiphone Moving Coil. Responding fully, evenly to all tone frequencies, it gives perfect results equally from a two- or a multi-valve receiver. Units from £4.10.0. Cabinet models: for 6-volt accumulator, £7; for D.C. mains, £7.10.0; for A.C. mains, £12.12.0.



MODEL 60 CABINET CONE

Obtainable at the very moderate price of £3, the Model 60 is an extremely efficient "all-purpose" speaker. Made on the latest lines and embodying the Marconiphone reed-system, its tone is outstandingly good.



A FIRST-CLASS CONE SPEAKER ... FOR 30/- 1

The Octagon Cone is a well-established favourite, giving excellent reproduction from a 2- or a 5-valve receiver. Made in two different and pleasing designs, it can be placed on the table or hung from the wall.

MISCELLANEOUS ADVERTISEMENTS.

NOTICES.

THE CHARGE FOR ADVERTISEMENTS in these columns is:

12 words or less, 2/- and 2d. for every additional word.

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

SERIES DISCOUNTS are allowed to Trade Advertisers as follows on orders for consecutive insertions, provided a contract is placed in advance, and in the absence of fresh instructions the entire "copy" is repeated from the previous issue: 13 consecutive insertions 5%; 26 consecutive, 10%; 52 consecutive, 15%.

ADVERTISEMENTS for these columns are accepted up to **FIRST POST ON THURSDAY MORNING** (previous to date of issue) at the Head Offices of "The Wireless World," Dorset House, Tudor Street, London, E.C.4, or on **WEDNESDAY MORNING** at the Branch Offices 19, Hertford Street, Coventry; Guildhall Buildings, Navigation Street, Birmingham; 260, Deansgate, Manchester; 101, St. Vincent Street, Glasgow, G.2.

Advertisements that arrive too late for a particular issue will automatically be inserted in the following issue unless accompanied by instructions to the contrary. All advertisements in this section must be strictly prepaid.

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

Postal Orders and Cheques sent in payment for advertisements should be made payable to **ILLIFFE & SONS Ltd.**, and crossed **Notes** being untraceable if lost in transit should not be sent as remittances.

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

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

NUMBERED ADDRESSES.

For the convenience of private advertisers, letters may be addressed to numbers at "The Wireless World" Office. When this is desired, the sum of 6d. to defray the cost of registration and to cover postage on replies must be added to the advertisement charge, which must include the words Box 000, c/o "The Wireless World." Only the number will appear in the advertisement. All replies should be addressed No. 000, c/o "The Wireless World," Dorset House, Tudor Street, London, E.C.4. Readers who reply to Box No. advertisements are warned against sending remittance through the post except in registered envelopes; in all such cases the use of the Deposit System is recommended, and the envelope should be clearly marked "Deposit Department."

DEPOSIT SYSTEM.

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

The time allowed for decision is three days, counting from receipt of goods, after which period, if buyer decides not to retain goods, they must be returned to sender. If a sale is effected, buyer instructs us to return amount to seller, but if not, seller instructs us to remit amount to depositor. Carriage is paid by the buyer, but in the event of no sale, and subject to there being no different arrangement between buyer and seller, each pays carriage one way. The seller takes the risk of loss or damage in transit, for which we take no responsibility. For all transactions up to £10, a deposit fee of 1/- is charged; over transactions over £10 and under £50, the fee is 2/6; over £50, 5/-. All deposit matters are dealt with at Dorset House, Tudor Street, London, E.C.4, and cheques and money orders should be made payable to Illiffe & Sons Limited.

THE SALE OF HOME-CONSTRUCTED UNLICENSED APPARATUS.

A Service to our Readers.

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

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

If the purchaser is satisfied with his purchase, the sum realised will be forwarded to the seller, less the amount due in respect of royalties, which amount will be paid by "The Wireless World" to the owners of the patents concerned, and a certificate will be handed on to the purchaser of the set.

SPECIAL NOTE.—Readers who reply to advertisements and receive no answer to their enquiries are requested to regard the silence as an indication that the goods advertised have already been disposed of. Advertisers often receive so many enquiries that it is quite impossible to reply to each one by post.

ALL WIRELESS WORLD COILS

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

B&J. Wireless Co.

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

Archway 1695

"END OF YEAR CLEARING."

APPLEBY'S

FOR BARGAINS WATCH Phone: Paddington 8828 (3 lines)

THE MISCELLANEOUS COLUMNS THIS MONTH.

For Modern High-grade Material Only.

CHAPEL ST., LONDON, N.W.1

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

ASSEMBLED IN

3

MINUTES

NEW & NOVEL

The Patent "DORIC" Cabinet is really high-class and superbly finished. Unique sectional construction allowing it to be assembled in a few minutes without the aid of nails or screws. Perfectly rigid when assembled, forming a cabinet fit for the housing of the most costly radio set. Packs flat in card box when sent by post, thus minimising risk of damage. Cabinet to suit any circuit.

BUILD YOUR OWN CABINET FRENCH POLISHED MAHOAGNY OR OAK WITH HINGED LIDS

Prices—Loose Base Board included:		
Panel	Depth	Price
12" x 7" x 7"	21"-net	18" x 7" x 10" 30/- net
16" x 7" x 9"	27/6	21" x 7" x 9" 33/-
18" x 8" x 8"	Special for Music Magnet, 30/- net.	

Any size made to order at proportionate price.
Postage 1/- extra. Cash with order or O.O.D.

Trade enquiries welcomed. Quotations given for Special Cabinets.
Manufactured only by—
Thomas O'Brien Ltd., Slater St., Seel St., Liverpool.

MUCH IMITATED

CLAROSTAT

NEVER EQUALLED

REDUCED PRICES!

STANDARD. WAS 10/6 NOW 9/6

VOLUME. " 8/6 " 7/6

POWER TYPES. WERE 15/- " 13/6

FREE

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

CLAUDE LYONS LTD.

76, OLDHALL ST., LIVERPOOL.

RECEIVERS FOR SALE.

SCOTT SESSIONS and Co., Great Britain's Radio Doctors.—Read advertisement under Miscellaneous. [0254]

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

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

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

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

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

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

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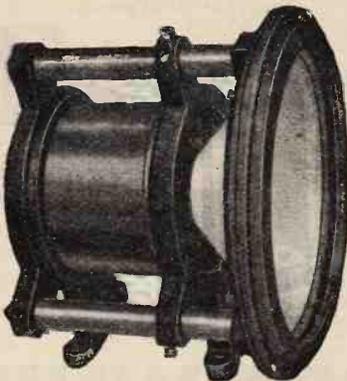
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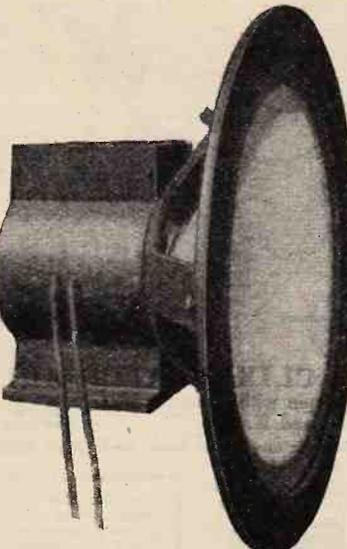
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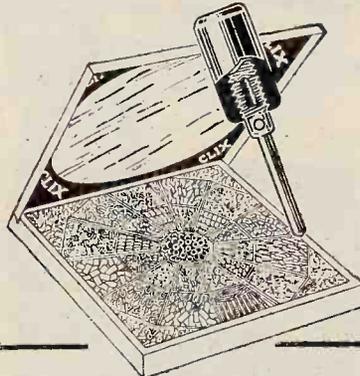
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BAKER'S SELHURST RADIO 36-page Booklet, "Sound Advice is Yours for the Asking"; write now for new edition; see displayed advertisement on page 19. [0231]

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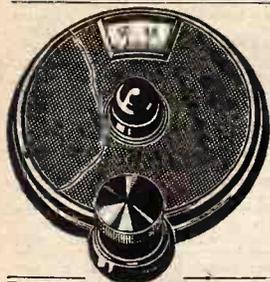
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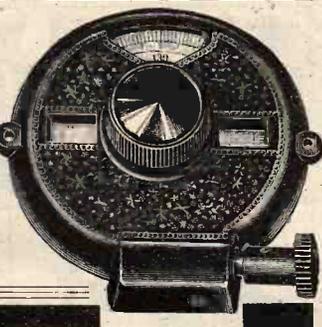
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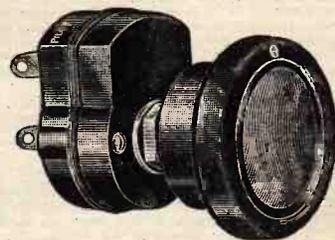
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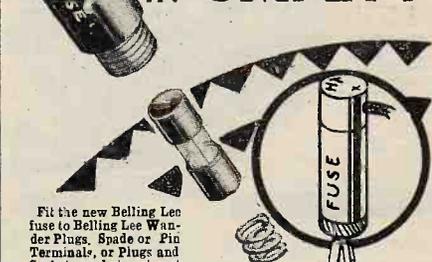
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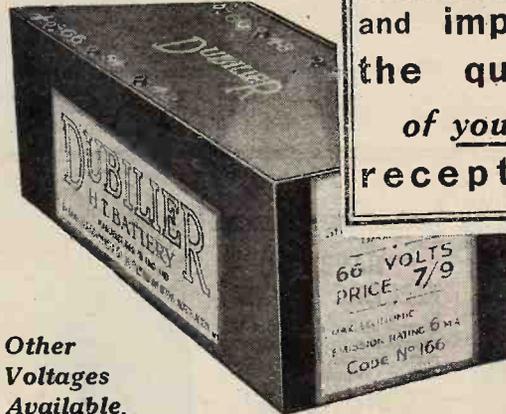
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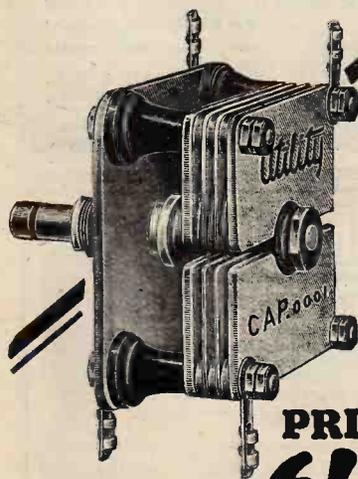
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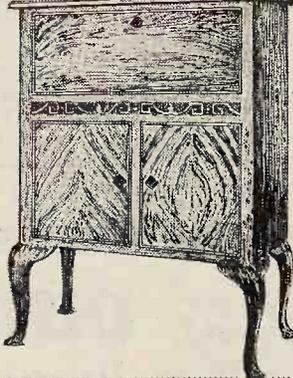
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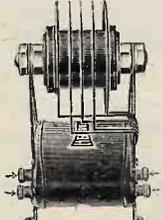
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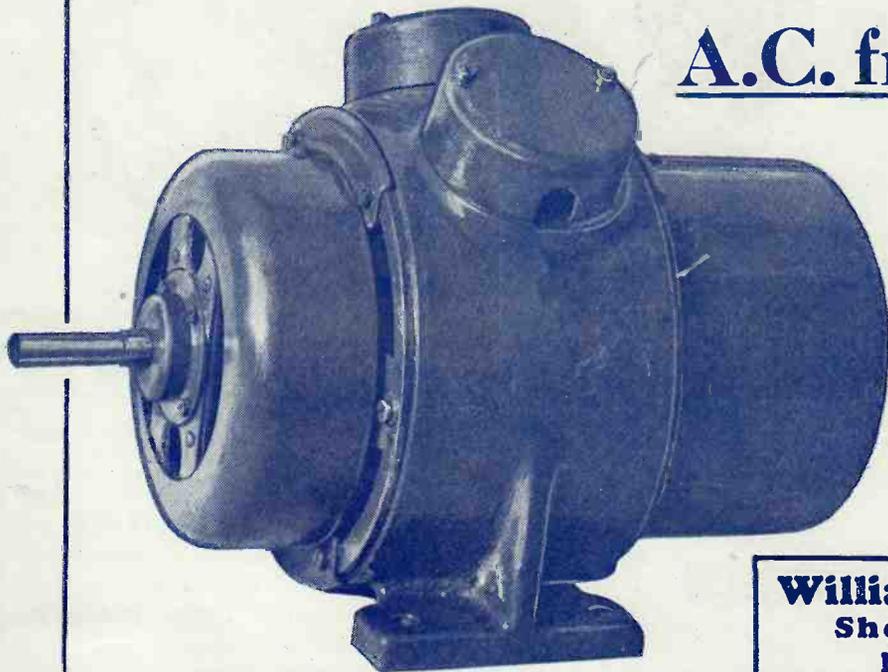
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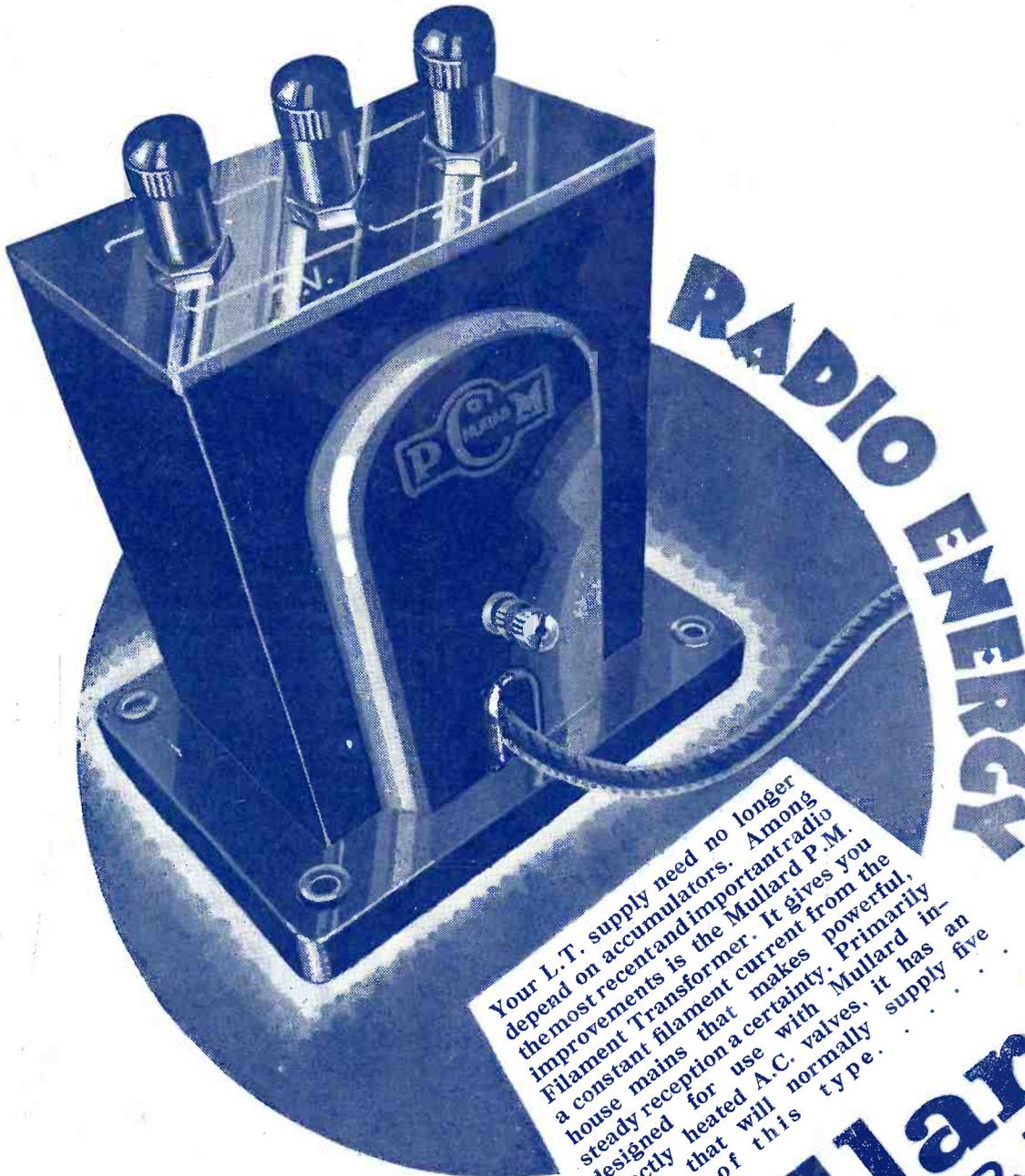
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Peter is going to school. He goes to school every day. Today it is cold and windy. Peter is walking through the park. The wind blows Peter's big bag. The bag blows away. Peter finds is looking for the bag. He finds the bag behind a bush.

In school the teacher says, "Today I want you to write a story. Peter writes a story about his toy boat. "I like to sail my boat on the pond in the park. My boat sails fast. I play with my boat all day. ^{When} I get hungry, I go home. My mother ~~has~~ ^{is} cooking. She cooks a tasty tea. After tea I am tired".

The teacher reads Peter's story. He is reading it quickly. "It is a very good story," he says. "Well done Peter."

Dear Nina,

If I say this to Artem, so he has to listen (I don't know how I can ~~check~~ that he understands?) it will be part of the lesson. I could get him to tell me what he does at school. What his friends do. What he likes and doesn't like at school

— A suggestion. with love,
Margaret.

And - I want to hear the poem from Fady!