

100TH NUMBER: FREE BOOKLET

and MAGNIFICENT ISSUE

Wireless Magazine

MAY 1933

THE BEST

SHILLINGS WORTH IN RADIO



ALL ABOUT CLASS B



SUPER-QUALITY A.C. FIVE

HOW TO USE THE WESTECTOR

SUPER-HET PORTABLE WITH MOVING-COIL LOUD-SPEAKER

IRON-CORED COILS

D.C. SUPER-HET

CATHODE-RAY TELEVISION

32-page "Practical Guide to Components" *Inside*

REVOLUTIONARY DESIGNS

for W.M.'s LATEST RECEIVER



Full-wave centre-tapped Westector (actual size); may be used to replace a duo-diode detector in any suitable circuit.

The design of radio receivers has gone through many changes; but one element—the detector—has remained common to all.

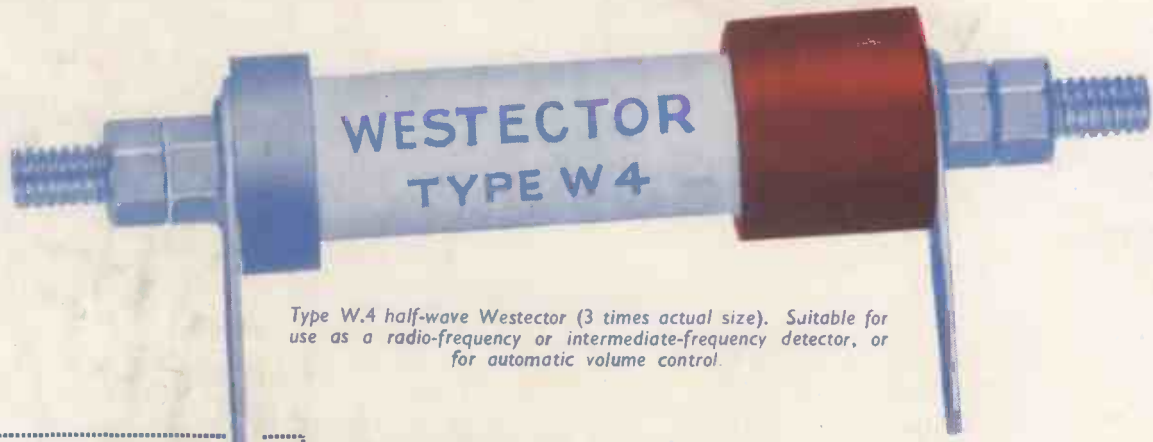
Now comes a revolution in detection methods. The new **WESTECTOR** enables the rectification of radio-frequency currents to be obtained by the use of a robust unit, which needs no anode or filament current, and which introduces no distortion into the circuit. The *Wireless Magazine* has taken advantage of these properties in presenting to you the D.C. Superhet. This fine receiver incorporates a **WESTECTOR**, thereby ensuring permanent and efficient detection.

You'll want to know more about the **WESTECTOR**. The coupon will bring you full particulars.

The Westinghouse

WESTECTOR

high-frequency metal detector



Type W.4 half-wave Westector (3 times actual size). Suitable for use as a radio-frequency or intermediate-frequency detector, or for automatic volume control.

GET FULL PARTICULARS NOW

Please send me full particulars of, and circuit diagrams for use with, the new WESTECTOR.

Name.....

Address.....

W.M.5

Model	Type	Input	Output	Price
W.4	Half-wave	24-v. peak carrier	0.25 mA	7/6
W.6	Half-wave	36-v. peak carrier	0.25 mA	7/6
WM.24	Full-wave	24-v. peak on each side of centre tap	0.5 mA	10/-
WM.26	Full-wave	36-v. peak on each side of centre tap	0.5 mA	10/-

THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82 York Road, King's Cross, London, N 1

Editor :

BERNARD E. JONES

Wireless Magazine

Assistant Editor :

D. SISSON RELPH

Technical Editor :

J. H. REYNER,
B.Sc. (Hons.), A.M.I.E.E.

The Best Shillingworth in Radio

Vol. XVI : MAY, 1933 : No. 100

Research Consultant :

W. JAMES

Published by BERNARD JONES PUBLICATIONS, LTD., publishers of "Wireless Magazine," and "Amateur Wireless." Editorial and Advertisement Offices : 58/61 Fetter Lane, London, E.C.4. Telephone : City 3733 (four lines). Telegrams : "Beejapee, Fleet, London." Subscription : Great Britain and abroad, 15s. 6d. a year, post paid (Canada only, 13s. 6d.). Next issue published on Wednesday, May 24

One Hundred Months!

ONE hundred months ago I passed the pages of the first number of "Wireless Magazine." It was quite a different magazine from the existing monthlies; it took a much wider view of radio, was more human and more generally interesting; its first cover design was startlingly different and provoked much discussion—and still more criticism.

One hundred months after the event, I am free to say that I think my first cover design was all wrong, but at any rate it did one thing—it did suggest to the public that here was a magazine with a new note; a magazine that was not only going to give the home-constructor everything he could possibly ask for, but would bear in mind all the time that wireless was not entirely a thing of bits of wire and pieces.

One hundred months ago! What a happy career the magazine has had and how remarkable its success, particularly in the second half of its life! If I were being interviewed in the accustomed fashion, the interviewer would ask of me, "To what, sir, do you attribute the success of 'Wireless Magazine'?", to which, swelling with pride, I should answer: "The fact that first and foremost it tries to meet its readers' needs; secondly, it always tries to make its subjects interesting and readable; thirdly, its contributors are men who know what they are writing about; and fourthly, it ever strives to be up-to-date in fact and in presentation."

Let me sample some of the ingredients of my 100th number. You will note that there is a side dish this month—an illustrated booklet of thirty-two pages, giving practical information about the chief radio components. All readers, I think, will like it, and beginners will be particularly glad to have it.

We reproduce in this issue a page of items from our first number, and just a glance will give you the impression

that radio has moved, and moved far, since January, 1925. On other pages we give you in tabloid fashion the more important radio developments of the last ten years. Whitaker-Wilson reviews programme progress, and naturally takes an opportunity of suggesting what ought to be done about it!

We find radio a very live thing at the moment—particularly for the home-constructor. New developments are thick upon us, and the year gives promise of more technical progress than in any period since the coming of the screen-grid valve.

There is a new form of detector—it actually is a true valve although not so called—the Westector, and in a special article W. James is explaining its advantages and its uses, and is illustrating his remarks with typical circuits to enable the amateur to try out the new device in his own set.

"Class B" amplification is the biggest thing in technical developments at the moment. S. Rutherford Wilkins of our constructional staff has done much experimental work with class B valves during the last month or two, and he contributes to our 100th issue an article explaining the points of the new system.

There are many television developments in the offing. For a long time now we have been hearing about television by cathode-ray tube. An extremely well-written article by G. S. Scott in this issue explains in great detail how this system of television is carried out.

We are improving this month the feature in which we give test reports of representative receivers. There are no less than three hundred or more sets on the market at the moment, and we felt that by restricting ourselves to five test reports per month we were not providing a sufficiently representative selection. Starting with this issue we are giving test reports of ten sets. B. E. J.

FOR THE CONSTRUCTOR

THE WELCOME PORTABLE. By the "W.M." Technical Staff ..	360
FINE QUALITY AND PLENTY OF STATIONS	365
THE SUPER-QUALITY FIVE By the "W.M." Technical Staff ..	374
REMARKABLE RESULTS ON TEST	379
DISTANT SWITCHING. By the "W.M." Technical Staff ..	390
THE "W.M." D.C. SUPER-HET. By the "W.M." Technical Staff ..	416
Q.P.P. AND THE SUPER 60 ..	440

TECHNICAL FEATURES

VALVES TO USE IN YOUR SET ..	340
RESISTANCE VALUES ..	364
THE LOW-TENSION BATTERY. By Percy W. Harris, M.Inst.Rad.E. ..	366
NEW VALVES THAT WILL REVOLUTIONISE RADIO By L. S. Kaysie ..	369
HOW TO USE THE WESTECTOR. By W. James ..	380
VOLTAGE-DROPPING RESISTANCES ..	382
TELEVISION BY CATHODE-RAY TUBE. By G. S. Scott ..	384
ADDING ANOTHER LOUD-SPEAKER. By J. H. Reyner, B.Sc., A.M.I.E.E. ..	388
ALL ABOUT CLASS B. By S. R. Wilkins ..	396

Contents

A NEW-SEASON'S SET. By W. James ..	406
WE TEST BEFORE YOU BUY. By the "W.M." Set Selection Bureau ..	407
COLUMBIA SUPER-HET SEVEN ..	408
FOX SYNCHRO-DYNAMIC FIVE ..	408
PYE MODEL G/B ..	409
REGENTONE QUADRADYNE ..	409
PORTADYNE MC4 ..	410
SIX-SIXTY SUPER FIVE ..	410
AERODYNE HAWK ..	411
H.M.V. RADIOGRAM SEVEN ..	411
GECOPHONE MODEL BC3340 ..	412
BEETHOVEN PORTABLE ..	412
SCREEN-GRID DETECTORS ..	419
IRON CORES IN TUNING COILS. By Alfred Schneider ..	421
TESTS OF NEW APPARATUS ..	430

GENERAL ARTICLES

FROM HERE AND THERE ..	339
GUIDE TO THE WORLD'S BROADCASTERS ..	344
WORLD'S BROADCAST WAVELENGTHS ..	346

IN TUNE WITH THE TRADE. By Fetter Lane ..	350
FROM OUR FIRST ISSUE I ..	355
MILESTONES IN THE RADIO DECADE ..	356
WELL PLAYED I ..	359
NEW ELECTRIC CLOCKS ..	371
RADIO MEDLEY. By BM/PRESS ..	372
STORIES OF THE OPERAS: WILLIAM TELL ..	382
SHORT-WAVE NOTES. By K. Jowers ..	383
SET REPORTS FROM OUR READERS ..	392
PROGRAMME PROGRESS. By Whitaker-Wilson ..	393
"PLAN DE LUCERNE." By Alan Hunter ..	398
UP THE (AERIAL) POLE! Cartoon ..	403
SHIPS THAT TALK BY RADIO. By K. Jowers ..	404
BETTER PROGRAMMES! By T. F. Henn ..	413
A SHORT CUT TO MUSICAL UNDERSTANDING ..	420
EIGHTY STATIONS ON THE Q.P.P. SUPER 60. By Captain E. H. Robinson ..	424
ON THE CREST OF THE WAVES. By Jay Coote ..	426
NOTES AND JOTTINGS ..	436
BLUEPRINT AND INFORMATION COUPONS ..	440
INDEX TO ADVERTISERS ..	440

GRAMO-RADIO SECTION

MODERNISING AN OLD GRAMOPHONE. By Captain E. H. Robinson ..	399
CHOOSING YOUR RECORDS. By Whitaker-Wilson and Chopstick ..	401

THE WESTECTOR—See page 380 :: CLASS B—See page 396

Registered at the General Post Office for transmission by Canadian Magazine Post

Postage on this issue, 3d. (Inland and abroad)

"WE THINK THIS IS ONE OF THE BEST THREE-VALVE SET DESIGNS YET PRODUCED!"

(Wireless Magazine).

"A REALLY BEAUTIFUL TONE"
(Evening Standard).



THE
The Set which has won an enviable reputation for itself on the grounds of technical efficiency representing, as it does, BRITISH CRAFTSMANSHIP AT ITS BEST Individually constructed — not mass-produced — by highly qualified technicians. Supplied with the identical valves used in final test, and unconditionally guaranteed for two years.
PRICE, in Walnut or Mahogany, 17 Guineas



THE "C.A.C." PLAYING DESK

Incorporating "Collaro" induction motor, pick-up and volume control. Automatic starting and stopping device. Universal voltage 100—240 volts A.C. Necessary leads, plugs, etc.
Price, Walnut or Mahogany **£10 : 10 : 0**
Cabinet only, **£6 : 10 : 0**
Cheaper models also supplied.

All those interested in a really high-grade Receiver, the best that money can buy, are invited to write for full details of this excellent set.

DEMONSTRATIONS ARRANGED ANYWHERE IN U.K. DEFERRED TERMS IF DESIRED.

A CORDIAL INVITATION IS EXTENDED TO ALL "W.M." READERS TO VISIT OUR SHOWROOMS AT—

Telephone: **4 SURREY STREET, STRAND, W.C.2**
Temple Bar 8620.

Advt. of The City Accumulator Co., Ltd. Head Office : 7 Angel Court, Strand, W.C.2

The Designer of the Six Valve
"D.C." SUPERHET described in this issue
exclusively specifies the



Were it possible to find a reproducer better fitted to take its place in the "D.C." Superhet, such instrument would certainly have been specified. The R. & A. "Victor" by reason of its amazing performance and absence of objectionable resonances has been judged by the designer of this Superhet the ideal reproducer.

The "Victor" re-creates the original performance in all its truth and beauty, and in this it is without equal.

Your dealer can supply. Insist on getting a "VICTOR." No other loud speaker at any price can give VICTOR performance.

70/-

Including 6-ratio Transformer.



Photograph of the complete "D.C." Superhet, with VICTOR REPRODUCER, taken in the Laboratories.

REPRODUCERS & AMPLIFIERS, LTD., WOLVERHAMPTON.

R & A VICTOR
PERM. MAG. M.C. REPRODUCER DE LUXE

When replying to advertisements, please mention "Wireless Magazine"

From Here and There

A NEW five-valve battery set with Q.P.P. output has recently been marketed by Bush Radio, Ltd., of Woodger Road, Shepherd's Bush, W.12. Leaflets containing full details of the set, which costs £14 19s. 6d., can be obtained.

In the April issue of "Wireless Magazine" the price of the new Cossor Model 495 moving-coil loud-speaker was incorrectly given; it should have read £2 9s. 6d.

The directors of the Gramophone Co., Ltd., have presented to the British Museum the matrix of the King's Empire speech broadcast last Christmas Day. This matrix is made of nickelled copper and has been placed in a hermetically-sealed brass container. The Gramophone Co., Ltd., believe that there will be no difficulty in obtaining records from these metal negatives five thousand years hence.

An interesting leaflet describing the construction of the Block plateless accumulator has been received from Block Batteries, Ltd., of Abbey Road, Barking, Essex. Copies can be obtained free.

From the Leslie-Dixon Switchgear Co. we have received a leaflet describing A.C. and D.C. chargers for all purposes. The address of the manufacturers is 218 Upper Thames Street, E.C.4.

From Homeaids, of 56 Victoria Street, London, S.W.1, we have received a leaflet describing the Kadette midget four-valve set for A.C. and D.C. supplies. With built-in loud-speaker it measures only 8 3/4 in. by 6 1/2 in. by 3 1/4 in.

FERRANTI TRANSFORMERS

FOR QUIESCENT P.P.

This system enables much greater power to be obtained from Battery operated receivers and amplifiers for a given expenditure of High Tension Current than has hitherto been possible. In fact, by its use, Power Output and Volume comparable to that given by the average Mains set are obtainable, even when employing the small H.T. Batteries in common use.

Ferranti Ltd. have produced these five transformers to enable the experimenter to obtain the best possible results from the Quiescent Push-Pull system. It will be noted that the inductances and ratios of these new Ferranti Transformers are unusually high.

- 1 Type AF11c. Ratio 1/10. Inductance 50/25 hys. 0/10 m/A. Good amplification curve, giving approximately double the amplification at 50 cycles hitherto obtainable. Price 34/-
- 2 Type AF12c. Ratio 1/9. Inductance 30/15 hys. 0/6 m/A. A lower priced transformer which yet has a good performance and a higher step-up than others in this price class. Price 15/-
- 3 Type OPM11c. P.P. Output Transformer. Ratio 35, 56 and 100/1. Specially suitable for use with AF11c. will carry a current, if necessary, up to a maximum of 100 m/A in Q.P.P. (200 m/A in ordinary P.P.). For operating low resistance M.C. Speakers. Primary Res. approx. 230 ohms. Price 26/6
- 4 Type OPM12c. Ratios 1.7 and 40/1. To correspond in quality with the AF12c. Carries D.C. Primary Current up to 75 m/A in Q.P.P. (150 m/A in ordinary P.P.). For use with high resistance Speakers or low resistance M.C. types with or without built-in Transformers. Primary Res. approx. 210 ohms. Price 15/-
- 5 Type OPM13c. Ratios 1.7, 2.7 and 4.5/1. Also specially suitable for use with the AF11c, but for operating high resistance Speakers with built-in Transformers. Max. D.C. Primary Current 100 m/A in Q.P.P. (200 m/A in ordinary P.P.). Primary Res. approx. 230 ohms. Price 26/6

ALL PRICES INCLUDE PUSH-PULL ROYALTY
 NOTE.—Either of these Quiescent Push-Pull A.F. Transformers may be used with any of the three Output Transformers mentioned above. Both the AF11c and AF12c types may be used in ordinary Push-Pull circuits, or as straight A.F. Transformers.



FERRANTI LTD.
 HOLLINWOOD
 LANCASHIRE

London: Bush House,
 Aldwych, W.C.2

BRITISH MADE

Get a HET for your set

HET

PROV. PAT. NO. 9145/33

AMALGAMATED METAL INDOOR AERIAL

Get more stations, more volume, and greater selectivity with this efficient and convenient indoor aerial fixed neatly round the room. No unsightly wires. The "Het" adhesive aerial gives a finishing touch to the walls, and improves reception. In gold or silver finish, with special brass terminal plate. It looks as good as it is—better than any other aerial.

From all radio dealers or direct from
UNIVOLT ELECTRIC, LTD.,
 Balfour House, Finsbury Pavement, London, E.C.2.

STENIBAC

SPECIFIED FOR Wireless Magazine "D.C. SUPER-HET"

MODEL No. 19. A Radio-Gram Cabinet, 3 ft. 3 in. high, 2 ft. 2 in. wide, 1 ft. 4 in. deep. Takes base-board 24 in. by 15 in. or smaller. The top panel above fret we will cut to your specification, should you be using an ebonite panel; a paper pattern must be forwarded. Accommodates any type of gramophone motor. Hand-polished Oak, Mahogany and Walnut.

Write for Catalogue of Latest Models, sent Post Free.

OAK - - - - - £4 10 0
 MAHOGANY - - - £4 15 0
 WALNUT - - - - - £5 0 0

STENIBAC Ltd. (Dept. W.M.)
 303, Essex Road, Islington, London, N. 1.
 Telephone: Clissold 5634.

Radio-Gram CABINET

MODEL No. 19



★ As you must expect

FOR THE ESSENTIAL SAFETY OF A BETTER SET

ERIE RESISTORS for the "SUPER QUALITY 5"

Seven of them specified and essential! Erie Resistors are indispensable for safety and stability. Positively GUARANTEED against breakdown, they are used and recommended by all the leading radio engineers. You need them for YOUR set. They save money too!

1/- PER WATT IN ALL VALUES
50 ohms to 5 megohms. One to five watts. Tag identified and colour coded.

Write for leaflet and colour code chart.

THE RADIO RESISTOR CO.
1, Golden Square, Piccadilly Circus, London, W.1

BULGIN HETERODYNE WHISTLE FILTERS

In a Class alone.

BULGIN SPECIFIED—

in all the following sets because of their sterling qualities

"SUPER QUALITY FIVE"

List No. L.F.27. Heterodyne Whistle Filter (type B) Price 10/6

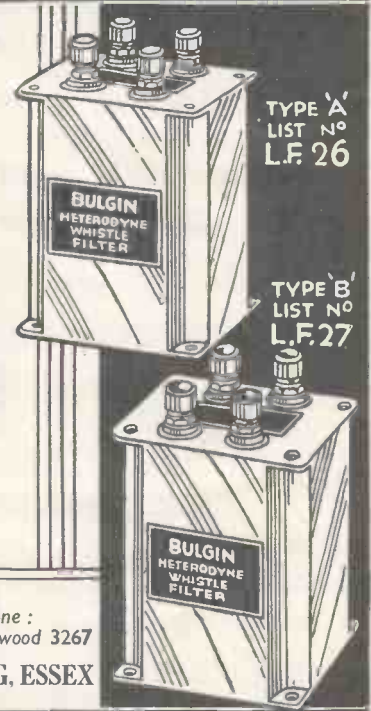
"WELCOME PORTABLE"

V.S.36. One Compact Volume Control (50,000 ohms), with switch 5/6

"W.M. D.C. SUPER-HET"

V.H.4. Two 4-pin Valve Holders each 9d.
V.H.5. Six 5-pin Valve Holders each 10½d.
M.R.11. One Skeleton type Resistance 5/6
S.91. One Rotary "On-off" Switch 1/9
S.86. One Rotary Change-over Switch 1/9
N.C.1. One Duplex Needle Cup 2/6

Send for Latest 80-PAGE CATALOGUE "B"
Enclose 2d. postage.



TYPE 'A'
LIST NO
L.F.26

TYPE 'B'
LIST NO
L.F.27

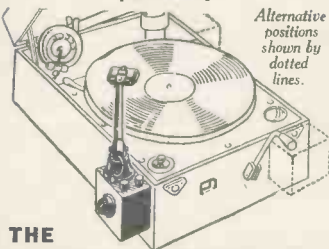


Telephone :
Grangewood 3266

Telephone :
Grangewood 3267

A. F. BULGIN & CO. LTD., ABBEY RD., BARKING, ESSEX

ELECTRIC REPRODUCTION FROM YOUR PORTABLE Gramophone without loss of portability



Alternative positions shown by dotted lines.

THE BELLING-LEE "CLIP-ON" UNIT PICK-UP, clips on and off in an instant, with self-contained volume control.
Price 35/-. Write for Booklet.

BELLING-LEE FOR EVERY RADIO CONNECTION

Cambridge Arterial Road, Enfield, Md.

RADIO SUPPLIES

Send your list of Radio needs for our quotation. Kits, Parts, Sets, etc. Everything in Radio stocked. Prompt delivery; seven days' approval. Catalogue free. Taylex and Standard Wet H.T. replacements stocked.
B. TAYLOR, 57 Studley Road, STOCKWELL, LONDON

10,000 GRAMO-MOTORS FROM STOCK. MAKE A GRAMOPHONE OR RADIOGRAM AT BIG CASH DISCOUNT. Order loose kits and assemble them at home. Get for 3d. our new 64-page catalogue with scale drawings and instructions how to make them. We sell motors from 7/6; Pick-ups, Big Volume Horns, Loud Speakers, Radio Kits, Gramophones, Radiograms. Buy your Radio Set through us. 1933 All brands List FREE. Trade Supplied. Estab. 1903. The REGENT FITTINGS Co. (W.M.) 120 OLD St., LONDON, E.C.1



A Great NEW Valve

NEW principles of construction have made possible the HIVAC Valves at specially low prices.

There is a HIVAC Valve for every wireless requirement which will save you money and give you longer service.

Write to us for our Comparative Valve Guide and state the set you have or the set you propose to make.



HIVAC THE SCIENTIFIC VALVE

Telephone — Clerkenwell 7587

The HIGH VACUUM VALVE CO. LTD.

113-117, FARRINGTON RD.
LONDON, E.C.



HERE
are the Wearite Coils
Specified

3 OT2 Coils ... Each 10/6
1 O2 Coil 18/6
1 set Band-Pass
Coils (WL3) ... 17/6
Complete

WEARITE
Reg. Trade Mark

are again
**EXCLUSIVELY
SPECIFIED**
for a SUPER

NOW for the
**Q.P.P. SUPER
60**

“Super 60”—“Century Super”—“Simple Super”—each a “star” in its own sphere and Wearite Coils are specified. Development moves apace — now the “Q.P.P Super 60”, and again the designer has chosen Wearite. Band-Pass coils, Intermediates and Oscillator all Wearite. Yet again tribute is paid by leading set designers to the unqualified reliability of Wearite.

Before you start shopping get your copy of the Wearite Book, M.11. You'll find in it a wealth of information. Write NOW!

WRIGHT AND WEAIRE LTD.

740 HIGH ROAD, TOTTENHAM, N.17.

Telephone: TOTTENHAM 3847-8-9.

It helps us if you mention “Wireless Magazine”

♡ 2730

Guide to the World's Broadcasters

Specially Compiled for "Wireless Magazine" by JAY COOTE

Metres : **WIXAZ, SPRINGFIELD (N.J.)** **Kilocycles :**
31.35
Power : (New Jersey, United States) **9,570**
10 kw.

Distance from London: Approximately 3,055 miles.

Standard Time: Eastern Standard Time (G.M.T. less 5 hours).

Announcer: Man.

Call: "These are the New England stations of the Westinghouse Company, WBZ, WEZA, and WIXAZ" (the Z is pronounced zee).

Interval Signal: One blast of a whistle when own programme from WBZA Boston; when relaying N.B.C. broadcasts, three xylophone notes.

Daily Transmissions: G.M.T. 17.30 onwards.

Metres : **W2XE, WAYNE TOWNSHIP** **Kilocycles :**
49.02
Power : (New Jersey, United States) **6,120**
5 kw.

Distance from London: Approximately 3,060 miles.

Standard Time: Eastern Standard Time (G.M.T. less 5 hours).

Announcer: Man.

Call: "W2XE, New Jersey, operating on 6,120 kilocycles." (Also incorporates WABC call.)

Standard Daily Transmissions: Relays WABC, New York, Columbia Broadcasting System, G.M.T. 22.00-05.00.

(Revised)
Metres : **MARACAIBO, YVIBMO** **Kilocycles :**
48.95
Power : (Venezuela) **6,127**
.25 kw.

Distance from London: Approximately 4,250 miles.

Standard Time: Greenwich Mean Time less 4 hours.

Announcer: Man.

Call: "Estacion radiotelefonica de Maracaibo, La Voz de Lago"; when relaying YVIBC, "Aqui Broadcasting Caracas."

Interval Signal: Four chimes on clock gong (G, F).

Daily Transmissions: Mostly relays YVIBC, Caracas (312.2 metres, 960 kilocycles, 5 kilowatts), G.M.T. 01.00-04.00, gramophone records, news, and entertainments from studio.

Metres : **BERLIN, D4AGE** **Kilocycles :**
84.5
Power : (Germany) **3,550**

Distance from London: Approximately 585 miles.

Standard Time: Central European (coincides with B.S.T.).

Announcer: Man.

Call: "Achtung! Hier Hochschule fuer Musik" (Berlin-Charlottenburg).

Transmits short concert every Tuesday between G.M.T. 20.45-21.45. All announcements are made in German, English, Danish, and Spanish.

Closes down with the German National Anthem.

Metres : **WKAQ, SAN JUAN** **Kilocycles :**
241.8
Power : (Porto Rico) **1,240**
1 kw.

Distance from London: Approximately 4,000 miles.

Standard Time: Greenwich Mean Time less 4 hours.

Announcer: Man.

Interval Signal: Chimes.

Call: "This is station double-o, kay-ay-coo of San Juan, Porto Rico." Announcements are made both in Spanish and English.

Daily Transmissions: G.M.T. 00.45-04.00. Programmes are sometimes relayed by the National Broadcasting Company, New York. (The call is given regularly every half hour, namely, at 01.00-01.30, etc.)

Metres : **RADIO AGEN** **Kilocycles :**
453
Power : (France) **1 kw.**
660

Distance from London: Approximately 500 miles.

Standard Time: Greenwich Mean Time. (France adopts B.S.T.)

Announcer: Man.

Call: "Ici poste départemental de Radio Agenen Lot et Garenne" (abbreviated to "Ici Radio Agen" between items).

Daily Transmissions: G.M.T. 12.30-13.30 and from 19.30-20.30, news bulletins, gramophone records, and studio concerts. Closes down with the usual French formula "Bonsoir Mesdames, Bonsoir Mesdemoiselles, Bonsoir Messieurs."

Metres : **TARTU, Dorpat** **Kilocycles :**
585.7
Power : (Esthonia) **512.1**
.5 kw.

Distance from London: Approximately 1,125 miles.

Standard Time: Eastern European (G.M.T. plus 2 hours).

Announcers: Man and woman.

Opening Signal: Bell.

Call: (when own local programmes) "Hallo, hallo, Tartu lainedel-isada kuuskumman wiis 585.7 metrit"; when relaying Tallinn (q.v.), "Hallo Siin Tallinja Tartu."

Daily Programme: Mainly relays entertainments from Tallinn. G.M.T. 16.30, news, gramophone records; 17.05, concert; 18.05, play or concert; 21.00, dance music (Sunday, Wednesday, Saturday), relayed from Restaurant "Meriklub" or Gloria Palace at Tallinn.

Good-night Greetings: "Hääd ööd Koigile."

Associated Transmitter: Tallinn, 298.8 metres (1,004 kilocycles), 11 kilowatts.

Metres : **BLAJ** **Kilocycles :**
1,920
Power : (Romania) **.75 kw.**
156

Distance from London: Approximately 1,020 miles.

Standard Time: Eastern European (B.S.T. plus 1 hour).

Announcer: Woman.

Call: "Aici Radio Bucuresti si Blaj" (phon.: "Ah-eetch radio Book-oo-recht see Blash").

Interval Signal: Metronome (160 beats per minute).

Relays Bucharest as an experimental station.

Closes down with good-night greetings: "Buna seara tutoror," repeated in other European languages.

GARRARD QUALITY PRODUCTS



Garrard Record Changing Unit. Automatically changes any number of records up to eight.



Garrard Electric Gramophone Motor. Manufactured completely universal on all usual current supplies.



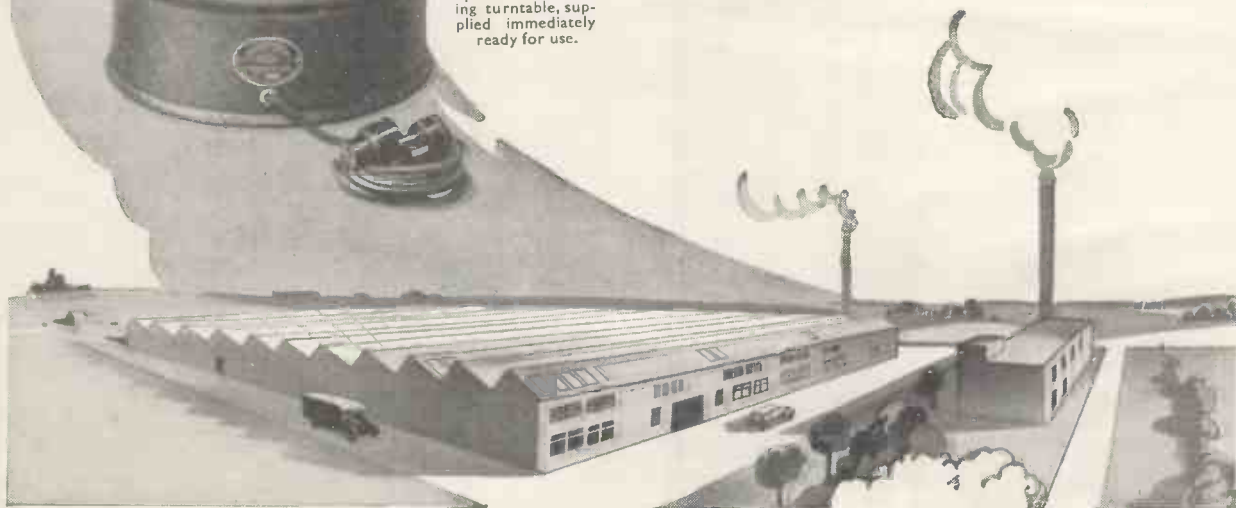
Garrard Double Spring Gramophone Motor. The silent motor with the silent wind.



Garrard Window Display Unit. The electrically operated advertising turntable, supplied immediately ready for use.

THE association of the name of Garrard with all that is best in gramophone motor construction is due to the high standard of craftsmanship consistently maintained and which has made the phrase "Motor by Garrard" in your specification to be the keynote of QUALITY. The public find that the smooth-running, trouble-free performance of Garrard motors adds to their comfort and convenience and manufacturers, jealous of their reputation, insist on their incorporation as standard fittings as matter of course. Illustrated literature of all types of Garrard products will gladly be sent on request.

GARRARD ENGINEERING & MANUFACTURING CO. LTD.
SWINDON, WILTS



Advertisers like to know you "saw it in the 'Wireless Magazine'"



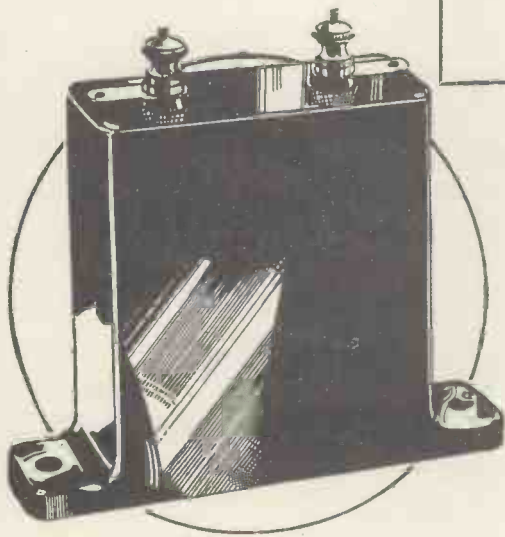
WORLD'S BROADCAST WAVELENGTHS

Stations best received in the British Isles are indicated in bold type.

Wave-length	Name of Station	Dial Readings	Country	Wave-length	Name of Station	Dial Readings	Country
13.93	Saxonburg W8XX		United States	28.83	Funchal CT3AQ		Madeira
14.04	Naven DIH		Germany	28.98	Buenos Aires LSX		Argentina
14.18	Buenos Aires LSL-LSM		Argentina	29.16	Königswusterhausen DIQ		Germany
14.25	Rocky Point WKA		United States	29.84	Abul Zabal (Cairo) SUV		Egypt
14.47	Buenos Aires LSY		Argentina	30.2	Leopoldville		Congo
14.60	Bandoeng PMB		Java	30.4	Lawrenceville (N.J.) WQN		United States
14.72	Rugby GAA		Great Britain	30.43	Madrid EAQ		Spain
15.03	Buenos Aires LSG		Argentina	30.8	Rome		Italy
15.20	Ruysselede ORA		Belgium	30.89	Rugby GCA		Great Britain
15.44	Elisabethville ORH		Congo	31.08	Nauen DGN		Germany
15.5	Ste Assise FTM		France	31.14	Prangins HBQ		Switzerland
15.576	Kootwijk PCP		Holland	31.25	Lisbon CTIAA		Portugal
15.58	Rio de Janeiro PPU		Brazil	31.28	Philadelphia W3XAU		United States
15.61	Nauen DFA		Germany	31.297	Sydney VK2ME		New South Wales
15.625	Lawrenceville (N.J.) WKF		United States	31.31	Daventry (Empire) GSC		Great Britain
15.63	Ruysselede (Bruges) ORG		Belgium	31.31	Radio Nations HBL		Switzerland
15.82	Cairo SUY		Egypt	31.35	Springfield W1XAZ		United States
15.86	Buenos Aires LSR		Argentina	31.35	Poznan SRI		Poland
15.90	Rocky Point (N.J.) WQE		United States	31.38	Zeesen DJA		Germany
15.93	Klipheuvell ZSB		South Africa	31.48	Schenectady W2XAF		United States
16.10	Bandoeng PLE		Java	31.545	Daventry (Empire) GSB		Great Britain
16.26	Rugby GBJ		Great Britain	31.55	Melbourne VK3ME		Victoria
16.3	Bogota HKD		Columbia	31.58	Rio de Janeiro PRBA		Brazil
16.38	Kootwijk PCK		Holland	31.61	Rocky Point WEF		United States
16.39	Lawrenceville (N.J.) WLA		United States	31.68	Rocky Point (N.Y.) WET		United States
16.57	Rugby GBS		Great Britain	31.7	Rio de Janeiro PPU		Brazil
16.57	Maracaibo YVQ		Venezuela	31.71	Rocky Point WKJ		United States
16.66	Chicago W9XAA		United States	31.86	Bandoeng PLV		Java
16.72	Rocky Point WAJ		United States	32.20	Rabat		Morocco
16.76	Rocky Point WLL		United States	32.71	Lawrenceville LWND		United States
16.81	Bandoeng PLF		Java	32.93	Buenos Aires LST		Argentina
16.85	Kootwijk PCV		Holland	33.59	Rocky Point (N.J.) WEC		United States
16.878	Boundbrook W3XAL		United States	34.06	Drummondville VE9AP		Canada
16.88	Eindhoven PHOHI		Holland	34.68	Long Island W2XV		United States
16.89	Königswusterhausen DJE		Germany	35.55	Rio de Janeiro PRCA		Argentina
17.24	Kirkee VWZ		India	36	Norddeich		Germany
17.38	Norddeich DAN		Germany	36.88	Bagdad YID		Iraq
18.37	Sydney VLR		N.S.W.	36.92	Bandoeng PLW		Java
18.44	Lawrenceville WLO-WLK		United States	38.07	Tokio JIAA		Japan
18.75	New Brunswick (N.J.) WKO		United States	38.470	Radio Nations HBP		Switzerland
19.3	Leopoldville		Belgian Congo	38.56	Rio de Janeiro		Brazil
19.36	Kemikawa (Tokio) JIAA		Japan	38.65	Kootwijk PDM		Holland
19.53	Dixon KWY		United States	39.58	Shanghai XGD		China
19.56	Schenectady W2XAD		United States	39.74	Calgary (Alb.) CKS		Canada
19.64	New York W2XE		United States	40.3	Radio Nations HBQ		Switzerland
19.68	Radio Coloniale		France	40.54	New York WEM		United States
19.72	Saxonburg W8XX		United States	41.6	Las Palmas EAR58		Canary Isles
19.737	Zeesen DJB		Germany	41.7	Singapore VSIAB		Sts. Settlements
19.815	Daventry (Empire) GSF		Great Britain	43	Madrid EAR1000		Spain
19.84	Rome (Vatican) HVJ		Italy	43.11	Rocky Point (N.J.) WEO		United States
19.9	Heredia T14NRH		Costa Rica	44.51	Rocky Point (N.Y.) WEJ		United States
19.95	Leningrad		U.S.S.R.	44.61	Rocky Point WQO		United States
20.0	Drummondville CGA		Canada	45	San Sebastian EAR TBO		Spain
20.3	Rocky Point WQV		United States	45.38	Constantine FM8KR		Tunis
20.49	Deal (N.J.) WND		United States	45.5	Moscow REN		U.S.S.R.
20.5	Chapultepec XDA		Mexico	46.07	Bucharest		Roumania
20.7	Rocky Point WKJ		United States	46.69	London (Ont.) VE9BY		Canada
21.53	Rocky Point (N.J.) WIK		United States	46.73	Boundbrook W3XL		United States
21.62	Rocky Point WIY		United States	48	Minsk RW62		U.S.S.R.
21.83	Drummondville CGA		Canada	48	Casablanca CN8MC		Morocco
22.26	Rocky Point (N.Y.) WAJ		United States	48.35	Bogota HKC		Colombia
22.35	New York WHR		United States	48.54	Shanghai XGKO		China
22.4	Rocky Point WMA		United States	48.8	Winnipeg VE9CL		Canada
22.42	Nauen DGI		Germany	48.86	Saxonburg (Pa.) W8XK		United States
22.58	Drummondville CGA		Canada	48.9	Kuala Lumpur ZGE		F.M.S.
22.6	Maracay YVQ		Venezuela	48.95	Maracaibo VVIIIBMO		Venezuela
23.28	Radio Maroc (Rabat)		Morocco	49.02	Wayne W2XE		United States
23.45	Coltano IAC		Italy	49.1	Caracas YVIBC		Venezuela
23.7	Drummondville VE9AP		Canada	49.18	Calcutta VUC		Br. India
23.858	Rabat		Morocco	49.18	Boundbrook W3XAL		United States
24.1	Rugby GBV		Great Britain	49.2	Johannesburg ZTJ		Sth. Africa
24.9	Kootwijk PDV		Holland	49.22	Bowmanville VE9GW		Canada
25.20	Pontoise FYA		France	49.34	Chicago W9XAA		United States
25.26	Königswusterhausen DJH		Germany	49.4	Skamleback		Denmark
25.27	East Pittsburg (Pa.) W8XK		United States	49.43	Vancouver VE9CS		British Columbia
25.284	Daventry (Empire) GSE		Great Britain	49.5	Philadelphia W3XAU		United States
25.34	Chicago (Ill.) W9XAA		United States	49.5	Havana CMCI		Cuba
25.4	Bowmanville VE9GW		Canada	49.586	Nairobi VQ7LO		Kenya Colony
25.4	Rome 2RO		Italy	49.59	Daventry (Empire) GSA		Great Britain
25.5	Chapultepec XDA		Mexico	49.6	Halifax VE9GX		Nova Scotia
25.51	Zeesen DJD		Germany	49.6	Vienna UOR2		Austria
25.532	Daventry (Empire) GSD		Great Britain	49.67	Miami Beach W4XB		United States
25.57	Eindhoven (PHOHI)		Holland	49.67	Boston W1XAL		United States
25.6	Pontoise FYA		France	49.83	Chicago W9XF		United States
25.7	Winnipeg VE9JR		Canada	49.96	Königswusterhausen DJC		Germany
25.7	Rio de Janeiro PPO/PSN		Brazil	49.96	Drummondville VE9DR		Canada
26.83	Funchal CT3AQ		Madeira	50	Bucharest		Roumania
27.1	Brussels ORB		Belgium	50.26	Moscow RV59		U.S.S.R.
27.5	Kootwijk PCP		Holland	51	Rome (Vatican) HVJ		Italy
28.28	Rocky Point (N.J.) WEA		United States	52.7	St. Denis		Reunion
28.5	Sydney VK2ME		New South Wales	52.7	Tananarive FIUI		Madagascar
				54.52	New York W2XBH		United States

RADIOPHONE **FIXED** CONDENSERS *this time*

specified for the
**“SUPER QUALITY
 5”**



Send for catalogue giving complete range of British Radiophone Ganged and Fixed Condensers

BRITISH RADIOPHONE VARIABLE GANGED CONDENSERS have set a standard of excellence for accuracy and soundness of construction that is unequalled and world-wide.

The same meticulous attention to careful construction and accuracy is bestowed on RADIOPHONE FIXED CONDENSERS with the result that designers find it essential to use them for the best results.

In the manufacture of these RADIOPHONE FIXED CONDENSERS air and moisture, the arch enemies of condensers, are removed to the lowest obtainable values. The impregnation and sealing under vacuum is effected by carefully selected neutral waxes.

Capacity insulation and breakdown are tested independently in three stages of the production, and it is impossible for any faulty part to pass these searching tests. The breakdown voltages are usually three to four times above the stated test voltages and all types are very conservatively rated.

For the “Wireless Magazine” Super Quality 5”

TWO British Radiophone .0001-mfd. Type T.W.10

TWO British Radiophone .0003-mfd. Type T.W.30

TWO British Radiophone 2-mfd. Type B.T.200

THREE British Radiophone 1-mfd. Type B.T.100

as specified

15/8

**BRITISH
 RADIOPHONE LTD.,**

Aldwych House, Aldwych,
 London, W.C.2

Telephone: HOLBORN 6744

WORLD'S BROADCAST WAVELENGTHS

Continued from
page 346

Wave-length	Name of Station	Dial Readings	Country	Wave-length	Name of Station	Dial Readings	Country
56.9	Königswusterhausen DTG ...		Germany	358	Tivarpool ...		U.S.S.R.
57.03	Rocky Point WQN ...		United States	355.8	London Regional ...		Great Britain
58.3	Bandoeng PMY ...		Java	360.5	MChlacker ...		Germany
58.31	Prague ...		Czechoslovakia	363.6	Algiers ...		North Africa
62.5	Long Island (N.J.) W2XV ...		United States	365.5	Bergen ...		Norway
62.56	London (Ont.) VE9BY ...		Canada	367.2	Frederikstaad ...		Norway
66	Rocky Point WAW ...		United States		Helsinki ...		Finland
67.11	Bagdad YID ...		Iraq	308.1	Bolzano ...		Italy
67.65	Doerberitz DFK ...		Germany		Kharkov ...		U.S.S.R.
70.17	Rocky Point (N.J.) WIR ...		United States	369	Seville ...		Spain
70.2	Khabarovsk RV15 ...		U.S.S.R.	372	Hamburg ...		Germany
79.5	Salisbury ZEA ...		South Africa	376.4	Scottish Regional ...		Great Britain
84.5	Berlin D4AGE ...		Germany	378	Moscow Regional ...		U.S.S.R.
92.31	Doerberitz ...		Germany	381.7	Lvov ...		Poland
209.7	Magnarover ...		Hungary	385	Radio Toulouse ...		France
211.3	Newcastle ...		Great Britain	385	Stalino ...		U.S.S.R.
213.8	Antwerp ...		Belgium	389.6	Leipzig ...		Germany
214.3	Warsaw (No. 2) ...		Poland	394	Bucharest ...		Roumania
	Aberdeen ...		Great Britain	398.9	Midland Regional ...		Great Britain
	Brussels (Conference) ...		Belgium	403.8	Sottens ...		Switzerland
217	Königsberg ...		Germany	408.7	Katowice ...		Poland
218	Salzburg ...		Austria	413.8	Athlone ...		Irish Free State
218.5	Plymouth ...		Great Britain	416	Radio Maroc ...		North Africa
219.6	Beziere ...		Belgium	419.5	Berlin ...		Germany
220.4	Binche ...		France	424.2	Madrid (España) ...		Spain
224	Cork ...		Irish Free State		Madrid EAJ7 ...		Spain
226.1	Fécamp ...		France	424.3	Moscow ...		U.S.S.R.
227.4	Flensburg ...		Germany	430.4	Belgrade ...		Yugoslavia
230.6	Malmö ...		Sweden	435.4	Stockholm ...		Sweden
231.8	Kiel ...		Germany	441.2	Rome ...		Italy
232.9	Liege ...		Belgium	447.1	Paris PTT ...		France
233.4	Lodz ...		Poland	450	Dantzig ...		Dantzig
236	Kristiansand ...		Norway	450.3	Odessa ...		U.S.S.R.
236.4	Bordeaux-Sud-Ouest ...		France	453.2	Klagenfurt ...		Austria
237.2	Nimes ...		France		Porsgrund ...		Norway
239	Nurnberg ...		Germany	453.8	Milan Vigentino ...		Italy
240.7	Stavanger ...		Norway	455.9	San Sebastian ...		Spain
241.3	Liege Experimental ...		Belgium	459	Beromuenster ...		Switzerland
242	Belfast ...		Ireland	461.5	Archangel ...		U.S.S.R.
244.1	Basle ...		Switzerland	465.8	Lyons PTT ...		France
	Swansea ...		Great Britain	472	Tiraspoli ...		U.S.S.R.
245.9	Linz ...		Austria	472.4	Langenberg ...		Germany
	Berne ...		Switzerland	480	North Regional ...		Great Britain
247.7	Trieste ...		Italy	480.2	Ivanovo-Vosnesensk ...		U.S.S.R.
249.5	Juan-les-Pins ...		France	488.6	Prague ...		Czechoslovakia
250	Prague (No. 2) ...		Czechoslovakia	495.9	Trondheim ...		Norway
252.3	Radio Schaarbeeck ...		Belgium	501.7	Florence ...		Italy
253.4	Barcelona EAJ15 ...		Spain	502.4	Nini Novgorod ...		U.S.S.R.
255	Gleiwitz ...		Germany	503.5	Astrakhan ...		U.S.S.R.
256.7	Toulouse PTT ...		France	509.3	Brussels No. 1 ...		Belgium
259	Hörby ...		Sweden	518.5	Vienna ...		Austria
261.6	Frankfurt ...		Germany	525.4	Riga ...		Latvia
261.6	London National ...		Great Britain	533	Munich ...		Germany
263.8	Moravska Ostrava ...		Czechoslovakia	537.6	Palermo ...		Italy
265.7	Lille ...		France	540	Prague (testing) ...		Czechoslovakia
267.1	Valencia ...		Spain	541.5	Sundsvall ...		Sweden
268.3	Bremen ...		Germany	550	Budapest ...		Hungary
269.4	Bari ...		Italy	555.5	Tampere ...		Finland
271.2	Comte-Liége ...		Belgium		Kaiserslautern ...		Germany
271.4	Rennes ...		France	559.7	Augsberg ...		Germany
273.7	Turin ...		Italy	564.4	Wilno ...		Poland
276.5	Hellsberg ...		Germany	564.9	Freiburg ...		Germany
279.7	Bratislava ...		Czechoslovakia	566	Hanover ...		Germany
281	Copenhagen ...		Denmark	573	Grenoble ...		France
282.2	Lisbon CT1AA ...		Portugal	574.7	Ljubljana ...		Yugoslavia
	Berlin ...		Germany	680	Lausanne ...		Switzerland
	Innsbruck ...		Austria	720	Moscow PTT ...		U.S.S.R.
283	Magdeburg ...		Germany	746.2	Ostersund ...		Sweden
	Stettin ...		Germany	759.5	Geneva ...		Switzerland
285.1	Radio Lyons ...		France	833	Heston Airport ...		Great Britain
286	Montpellier ...		France	835.4	Leningrad ...		U.S.S.R.
288.5	Bournemouth ...		Great Britain	845	Budapest (2) ...		Hungary
	Scottish National ...		Great Britain	937.5	Kharkov ...		U.S.S.R.
291	Viiipuri ...		Finland		Moscow ...		U.S.S.R.
293	Kosice ...		Czechoslovakia	1,000	Scheveningen-Haven ...		Holland
293.7	Limoges PTT ...		France	1,061	Tiflis ...		U.S.S.R.
296.1	Hilversum ...		Holland	1,079	Oslo ...		Norway
298.8	Tallinn ...		Esthonia	1,107	Minsk ...		U.S.S.R.
301.5	North National ...		Great Britain	1,116	Moscow (Popoff) ...		U.S.S.R.
304.3	Bordeaux PTT ...		France	1,158.8	Kalundborg ...		Denmark
307	Zagreb ...		Yugoslavia	1,190	Luxemborg ...		Luxemborg
307.5	Falun ...		Sweden	1,200	Reykjavik ...		Iceland
308.5	Vitus-Paris ...		France		Istanbul ...		Turkey
309.9	Cardiff ...		Great Britain	1,234.5	Boden ...		Sweden
312.8	Cracow ...		Poland	1,250	Vienna (tests) ...		Austria
313.9	Genoa ...		Italy	1,304	Moscow ...		U.S.S.R.
315.8	Marselilies ...		France	1,354	Motala ...		Sweden
318.8	Naples ...		Italy	1,411.8	Warsaw ...		Poland
	Sofia ...		Bulgaria	1,445.7	Paris (Eiffel Tower) ...		France
319.7	Dresden ...		Germany	1,481	Moscow (RV1) ...		U.S.S.R.
321.9	Goteborg ...		Sweden	1,538	Ankara ...		Turkey
325	Breslau ...		Germany	1,554.4	Davenport National ...		Great Britain
328.2	Poste Parisien ...		France	1,620	Königswusterhausen ...		Germany
331.0	Milan ...		Italy	1,725	Radio Paris ...		France
332.2	Poznan ...		Poland	1,796	Lahti ...		Finland
333.2	Brussels (No. 2) ...		Belgium	1,875	Huizen ...		Holland
341.7	Brno ...		Czechoslovakia	1,935	Kaunas ...		Lithuania
345.2	Strasbourg ...		France	2,025	Königswusterhausen ...		Germany
348.6	Barcelona EAJ1 ...		Spain	2,650	Eiffel Tower ...		France
351.8	Moscow ...		U.S.S.R.	2,900	Königswusterhausen ...		Germany
352.1	Graz ...		Austria				

RECOMMENDED FOR USE WITH THE 'Q.P.P. SUPER 60'

● The remarkable seven-valve set described in this issue is capable of receiving—in a single evening—well over sixty stations. For such delicacy of tuning, a strong, even flow of unwavering power is the first essential. That is why the designer recommends you to use the 120-volt EVER READY Type PPI20 battery—a battery you can always rely on—a battery that powers your set without waste or distortion.

SEND FOR THIS FREE CHART

● There is a special EVER READY battery for every set, portable, low-powered or multi-valve. The Ever Ready Charts, which will be sent you free on request, show you at a glance the battery best suited to your own particular requirements. And remember, whatever EVER READY you use, it is Britain's Best Battery, made and guaranteed to give satisfactory service by specialists in dry battery manufacture for the past 30 years.

EVER

READY

BATTERIES

THE POWER FOR YOUR SET

THE EVER READY CO. (GT. BRITAIN) LTD.,
HERCULES PLACE, HOLLOWAY, LONDON, N.7.

The Ever Ready Batteries specially recommended for use with the Q.P.P. Super 60 are a 120-volt Type PPI20 and a 16-volt Winner.

Mention of the "Wireless Magazine" will ensure prompt attention

In Tune with the Trade

FETTER LANE'S Review of Catalogues

SEND TO US FOR THESE CATALOGUES!

Here we review the newest booklets and folders issued by six manufacturers. If you want copies of any or all of them just cut out this coupon and send it to us. We will see that you get all the literature you desire.

Just indicate the numbers (seen at the end of each paragraph) of the catalogues you want below:—

My name and address are:—

Send this coupon in an unsealed envelope, bearing ½ d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. Valid till May 31

AN A.B.C. OF CLASS B AND Q.P.P.!

IF you met Diogenes just coming out of his tub and he said to you: "Tell me, what's the meaning of this class B and Q.P.P. that everybody's talking about," what would you say?

Take my tip and advise Diogenes to write through my free catalogue service for a copy of the Multitone handbooks on push-push amplification. Then he'd go back to his barrel *au fait* with radio's latest output-stage developments!

The Multitone people really have done a thorough job in the handbook of the Multitone transformer and the book called "*The Multitone Guide to Push-push Amplification.*"

Practical details are given in both these for converting existing receivers and you may be interested to know that the Multitone components can be used in our Q.P.P. Super 60.

314

A GRAMOPHONE UNIT

"I'M sure of everything but you" (in the words of the popular song) is what many a set-user has said to the gramophone section of his radiogram.

If your set is O.K. for radio, but is K.O. when it comes to gramophone amplification, then why not have a special gramophone amplifier distinct from the radio set?

Parmeko make just the amplifier

for the job. In fact, it is suitable for gramophone public-address work. This unit consists of a strong angle-iron frame, covered with sheet-steel panels and finished in cellulose enamel. There is an induction-type motor, pick-up, and a two-stage amplifier giving a speech output of approximately 6 watts.

The price of this outfit compares with that of many complete radiograms, but, of course, you are getting a real quality job, capable of doing justice to your records. Technical details are obtainable free.

315

EIGHTY—AND SOME!

THE genial Mr. Bulgin has sent me a copy of his latest catalogue which, with its eighty pages, surely breaks all records for this kind of thing. It is brightly illustrated with pictures of all the popular Bulgin gadgets and the catalogue part proper of this all-embracing book finishes at page 52.

From page 53 on to the end there are pages crammed full with technical hints, wiring diagrams, and so on for the use of all kinds of handy components.

The Bulgin book is certainly above the ordinary run of catalogue productions, and I am pleased to announce that free copies of it are available to all readers who write to me through "W.M."

316

FOR YOUR RADIOGRAM

COLLARO have just brought out a pick-up and combined motor unit which you will find very useful if you are bringing your radiogram up to date. Or you could have the pick-up separately with or without a built-in volume control. The motor unit alone costs only 50s. and is fitted with an automatic stopping-and-starting arrangement. The complete outfit—motor, pick-up and volume control—costs £4.

All the other details you will want to know about the Collaro pick-up and motor are given in a new folder, which you can have free.

317

LOW PRICE—HIVAC

EVERYBODY is telling me how satisfactory are these new Hivac valves. They combine excellent working characteristics with a very low selling price, and so undoubtedly meet the needs of a very wide public.

In the main these valves are entirely conventional in spite of the surprisingly low price (4s. 6d. for an L210 type valve and 5s. 6d. for a P220), and the usual long rectangular electrode construction has been adopted.

If you want to save money when buying valves, and at the same time want to be sure of getting a set of "toobs" which won't let you down, then get first of all (through my free catalogue service) an informative folder, giving you all the details you want to know about Hivacs.

318

GRAHAM FARISH

Las Piezas Componentes de . . .
Les pieces detachées . . .

DEAR, dear! These new Graham Farish radio catalogues in English, French, German, and Spanish have sent me all multilingual!

But it's a good idea, all the same. The enterprising Graham Farish has brought out a pocket edition of all the well-known parts—Gard lightning arrestor, Filt percolative earth, Lit-los condensers, Ohmite resistances, Snap chokes, and all the rest.

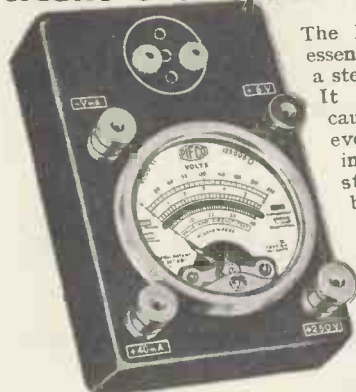
And then the English edition of this handy little catalogue has been handed over to continental radio experts who have produced an Edition Française, Edición Española, and Deutsche Ausgabe for the benefit of overseas listeners.

Graham Farish, Ltd., of course, have a London export office, and if you have a foreign friend who is a radio enthusiast and likely to be interested in an Edición or Ausgabe in his own tongue then drop a note through my free service.

319

DON'T HAVE RADIO TROUBLES

**The DOCTOR
OF RADIO**
*will solve
them for you*



The PIFCO Radiometer is as essential to the radio owner as a stethoscope is to the doctor. It diagnoses instantly the cause of any trouble, however abstruse. This amazing instrument ensures a new standard of radio reception by locating trouble in all its stages. Ask to see it demonstrated at your radio dealers or electricians. If any difficulty, send P.O. direct to PIFCO LTD., HIGH ST., MANCHESTER or 150 Charing Cross Rd., LONDON, W.C.2

De Luxe Mode for Electric Receivers, Mains Units and Battery Sets. Shown here
Standard Mode "All-in-One" Radiometer for Battery Sets
Only 12/6

PIFCO
ALL IN ONE
RADIOMETER

An Exclusive PREH Product
**COMBINED RADIO VOLUME CONTROL,
GRAM CHANGE-OVER SWITCH,
AND GRAM VOLUME CONTROL**
Single Knob Operation!

The Preh combined dual potentiometer and radio-gram change-over switch is so arranged that the 5,000-ohm potentiometer used for controlling radio volume actuates only over the first 160 degrees of the 360 degrees rotation of the control knob.

The radio-gram change-over switch then comes into use; this operation taking about 40-60 degrees of the control. For the remaining 150 degrees or so, the 100,000-ohm gramophone volume control is in operation. Retail price, 8s. 6d.

Preh



**POTENTIOMETERS
AND RHEOSTATS**

PREH MANUFACTURING CO. LTD.,
Broadwater Road, WELWYN GARDEN CITY
Manufacturers and Wholesalers only supplied

Sole Sales Organization:
Harwell Ltd., The Sessions House, Clerkenwell Green,
'Phone: Clerk. 6905-6 E.C.1.

ESSENTIAL
FOR
battery operated
Q.P.P.



the new day

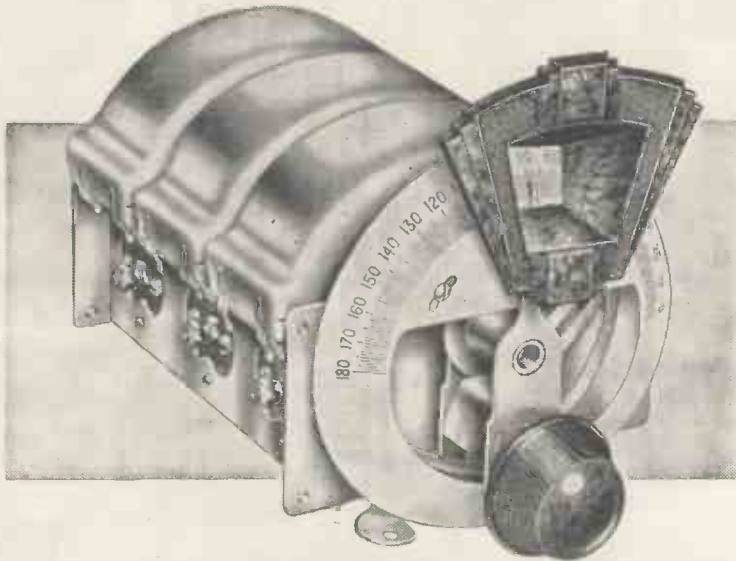
**DOUBLE CAPACITY
ACCUMULATOR**

● Revolution! A new accumulator no bigger than the standard 40 a.h. type, yet each charge lasts you twice as long (its capacity is 80 a.hs.)! Isn't such a performance essential for Q.P.P.?
● The secret? Elimination of the weight-and-space wasting accumulator "plates" idea. John Fuller, friend of Faraday and battery pioneer, dreamt of it, though perfection has taken two generations more. ● The new accumulator is almost unbreakable and has an amazingly longer life. Beautiful Bakelite case. Thousands in use. Get the BLOCK booklet to-day.

80 AMP. 2. 11/6
HRS. V.

BLOCK
Plate-less Accumulators

BLOCK BATTERIES LTD., ABBEY RD., BARKING. TEL. GRA 3346



Quality is the keynote of this five-valve A.C. receiver—and only quality components are specified. The Polar Star 3 Gang Condenser by reason of its many unique features, and of its reputation for unquestioned reliability is naturally included in that specification. For satisfactory results, follow the designer—use Polar.

POLAR STAR 3 GANG CONDENSER with BEVEL DISC DRIVE **30/6**
(3 x .0005)

for the "SUPER-QUALITY FIVE" the designer says **POLAR**  **condensers**

WINGROVE & ROGERS Limited

188-9 STRAND, W.C.2

WORKS: OLD SWAN, LIVERPOOL

Telephone: TEMPLE BAR 2244

2699



"We're Fluxite and Solder—the reliable pair; Famous for soldering—known everywhere!"

Carry US with you—as well as your SET. If things go wrong—no cause for regret!"

See that Fluxite and Solder are always by you—in the house—garage—workshop—anywhere where simple, speedy soldering is needed.

ALL MECHANICS WILL HAVE
FLUXITE
IT SIMPLIFIES ALL SOLDERING

All Ironmongers sell Fluxite in tins: 4d., 8d., 1s. 4d. and 2s. 8d. Ask to see the **FLUXITE POCKET SOLDERING SET**—complete with full instructions—7s. 6d. Ask also for our leaflet on **HARDENING STEEL** with Fluxite.
FLUXITE LTD. (Dept. 332), **ROTHERHITHE, S.E. 16.**

FOR ALL REPAIRS!



The Most Suitable
Coil for the
£6.6.0 Radiogram

Specially
Chosen . . .

The designers of the £6 6s. Radiogram used and specified the Pressland Coil exclusively. Their exhaustive tests proved its carefully balanced design to give greater selectivity and maximum magnification without instability. Without break-through from short to long waves. A screening box is supplied with each coil and terminals are clearly marked for connection. Suitable for aerial or anode tuning. Write for Free leaflet. Price at all radio dealers or from the manufacturers, post free.



PRESSLAND
COIL

CLIFFORD PRESSLAND SALES, LTD.,
84 Eden Street, Kingston-on-Thames

Scientific

DOUBLE CONGRATULATIONS !

The "WIRELESS MAGAZINE" has always been a Pioneer Journal. For 100 months it has represented all that is best in up-to-date Radio Literature. It has justly always been the "vade mecum" of the keen experimenter and the enthusiast.

CLAUDE LYONS LIMITED (Liverpool and London) have the very greatest pleasure in most heartily congratulating "WIRELESS MAGAZINE" on attaining their "Century."

We have been established at 76 Old Hall Street, Liverpool, since May, 1918.

Although getting so "old," we are not suffering in the slightest degree from any suspicion of senile decay. "NEW AND BETTER" has remained our motto always, and our "B.A.T."—"BEST-AFTER-TEST" Registered Trademark is now more popular and more widely appreciated than ever.



- GANGED CONDENSERS
- FIXED RESISTORS, ½-5 WATTS
- "ELIMINATOR" VOLTAGE CONTROLS
- VOLUME AND "TONE" CONTROLS
- SUPERIOR MICROPHONES
- GRAMOPHONE PICKUPS
- INDUCTION MOTORS
- "Q.M.B." RADIO SWITCHES
- HUM-SUPPRESSOR ("HUM-DINGER")

SEND TO-DAY FOR FREE AND POST FREE,
48-PAGE ART SPECIALITY CATALOGUES.

ADVT. OF CLAUDE LYONS, LIMITED.
76 OLD HALL ST., LIVERPOOL, & LONDON, S.W.1



SIEMENS FULL O'POWER RADIO BATTERIES

WERE SELECTED FOR USE ON
YACHT VIGILANT DURING ITS
TREASURE SEEKING EXPEDITION
IN WEST INDIES AND
CENTRAL AMERICA

*Chosen . . .
by reason
of the proved
reliability of
these batteries
under severe*



Tropical Conditions of Service

**YOU CAN OBTAIN THE SAME
REMARKABLE SERVICE IF YOU**

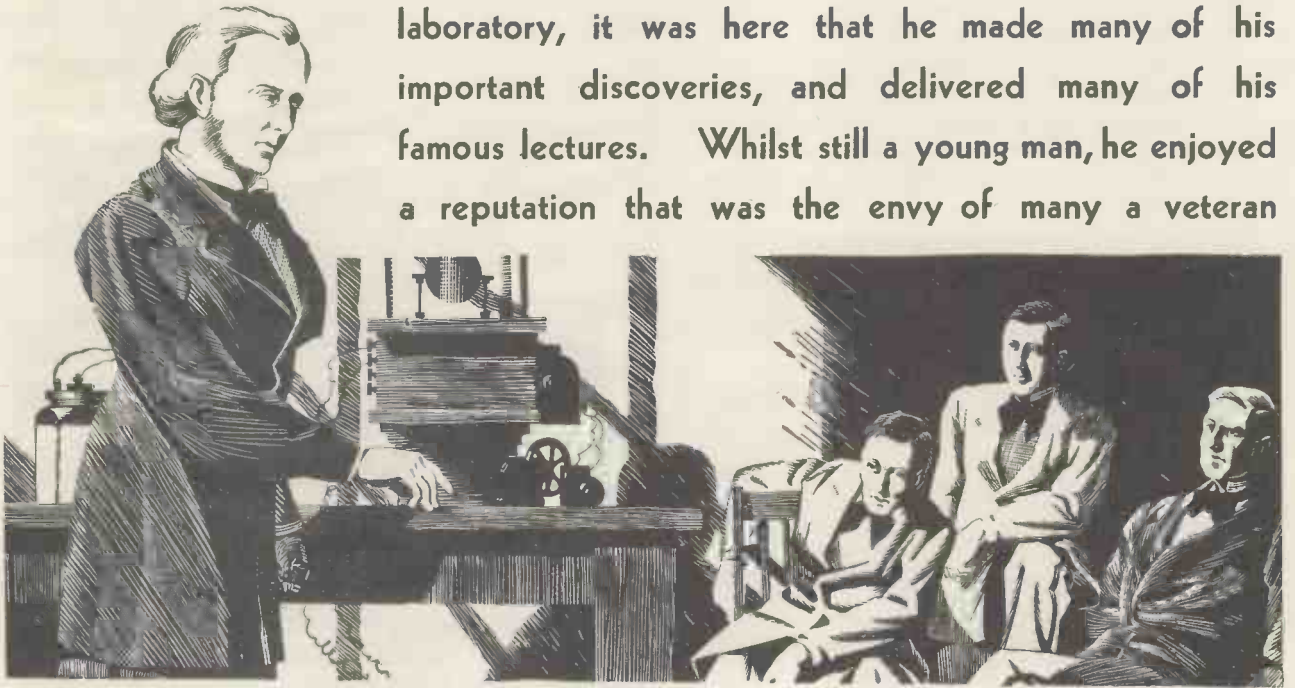
BUY
Full O'Power
by **SIEMENS**

THEY COST NO MORE THAN ORDINARY BATTERIES
Advt. of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED.
38/39 Upper Thames Street, London. E-C-4.

Parallels of History No. 1

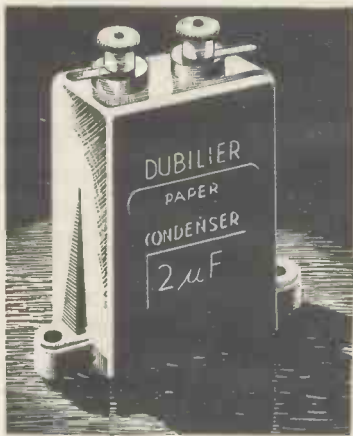
LORD KELVIN

It was in a badly lit, disused wine cellar that Kelvin first began his scientific research. Converted into a laboratory, it was here that he made many of his important discoveries, and delivered many of his famous lectures. Whilst still a young man, he enjoyed a reputation that was the envy of many a veteran



scientist, a reputation that was earned, not by reason of his intellectual gifts alone, but because of his amazing capacity for tireless research.

The same might also be said of the Dubilier Condenser Company. Their present prominent position is due not to resting on laurels won many years ago, but to consistent and untiring research through 21 years of successful trading. A research, the result of which is seen in the high standard of dependability for which Dubilier Condensers and Resistances are to-day famous the world over.



DUBILIER CONDENSER CO.
(1925) LTD.

DUCON WORKS, VICTORIA
RD., NORTH ACTON, W.3

DUBILIER CONDENSERS

T.8

FROM OUR FIRST ISSUE!

One of the sets described in the first issue of "Wireless Magazine" was called "As Good a Set as Money Can Buy." It quickly became popular for, at the time, it was one of the highest-quality sets that had been presented to the constructor. It was a straight four-valver with a plain tuned-anode stage of high-frequency amplification—long before the days even of the neutrodyne. Two-pin plug-in coils were used for tuning. As can be seen from the reproduction below there were many control knobs

As Good a Set as Money Can Buy

Building a Straight-Circuit Four-Valve Set

Designed by the Technical Staff of The Wireless Magazine



The B.B.C. Its Policy and Ideals

BBC

An Exclusive Article by Mr. J. C. W. REITH, Managing Director B.B.C.

On this page we reproduce several items of interest from the very first issue of "Wireless Magazine," which was published on January 25, 1925—just over eight years ago. In those days radio was quite different from what it is to-day; you thought yourself lucky if you could pick up half a dozen stations on a pair of headphones, and that with plenty of fiddling about.

Tremendous progress has been made since "Wireless Magazine" first attracted the attention of the radio public and it is safe to say that still more startling developments will make their appearance before the 200th number of "Wireless Magazine" is reached!



The Face of the Panel Mounted on a Cabinet

In the early days of radio it was usual for the constructor to make his own tuning coils, and in the first number of "Wireless Magazine" we started a very complete series of articles on this subject. There was no such thing as a dual-range coil in those days



Fig. 4 Fully-wound Coil

The very first article in No. 1 was entitled "The B.B.C.—Its Policy and Ideals." This was contributed by Mr. J. C. W. Reith, then Managing Director of the British Broadcasting Company, which comprised some hundreds of radio manufacturers. To-day, Sir John Reith still presides over the destinies of British broadcasting as Director-General of the British Broadcasting Corporation

It is also interesting to recall that Edgar Wallace contributed a radio short story to the first number of "Wireless Magazine" and William le Queux was represented by an article on the use of Wireless in crime detection

NOBODY KNOWS HOW THE CRYSTAL WORKS or Scarcely What it Does!



In 1925 the average receiver was still a crystal set, which brought in one or two transmissions at a strength that could just be heard on a pair of headphones. Listeners at the time complained of being chained to their sets like dogs on their leads!

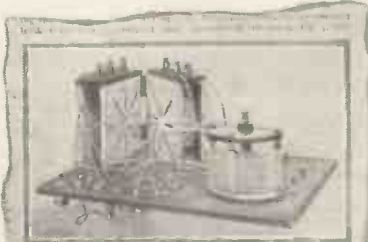
A Loud-Speaker—and a Fiddle, Too!

An Invention by the Editor of The Wireless Magazine



Many and ingenious were the first forms of loud-speaker. The Editor of "Wireless Magazine" himself put forward a suggestion for attaching a telephone unit to the back of a violin. The idea was that the sounding board of the violin would act as a diaphragm—as, indeed, it did. In this case the violin could still be used for its normal production of music.

In the first number of "Wireless Magazine" there was a description of a crystal set with air-spaced coils. How many readers remember it? The idea was to produce a very low-loss coil so that the maximum strength could be obtained. Claims of reception from great distances (100 miles or so!) were a feature of early listening days



Under View of Panel, showing the Air-spaced Coils

Milestones in the Radio Decade



In these brief notes of radio developments during the past ten years, no attempt has been made to cover the field completely. Rather we have tried to recall some of the more detailed and intimate happenings that affected the constructor rather than the radio world at large. For just over eight years "Wireless Magazine" has played its part in constructional development: we can promise readers that it will be even better in the next ten years!

1922

AUGUST

The Armstrong super-regenerative circuit described as "an epoch-making discovery."

1923

FEBRUARY

A forerunner of the present-day pre-set condenser was described in *Amateur Wireless*.

MAY

Opening of a new studio at 2LO. "The most remarkable broadcasting room in the country. It is 40 ft. by 20 ft. by 11 ft., and so far as its external appearance is concerned it presents a pleasing picture to the eye, being hung with golden net and relieved by blue panels. But it is what is not seen that constitutes the unusual feature of the studio. All echo has been eliminated, and

when talking or singing is engaged in the voices sound exactly as if one were in the open air."

JUNE

An Armstrong super-regenerative receiver was described in *Amateur Wireless*.

"The rise to fame of the tuned-anode circuit in this country was coincident with the banning by the P.M.G. of reaction coupled to the aerial circuit."

"It is likely that international action will be taken by the combined entertainment world against broadcasting."

Details of the first attempt at a

mains valve were described by Paul D. Tyers in *Amateur Wireless*. "A valve receiver which can be operated without the use of batteries has long been desired, and attempts to utilise the electric supply have not met with much success. A considerable advance has, however, been made with the advent of a new valve, which is best described as a combined two-electrode valve and three-electrode



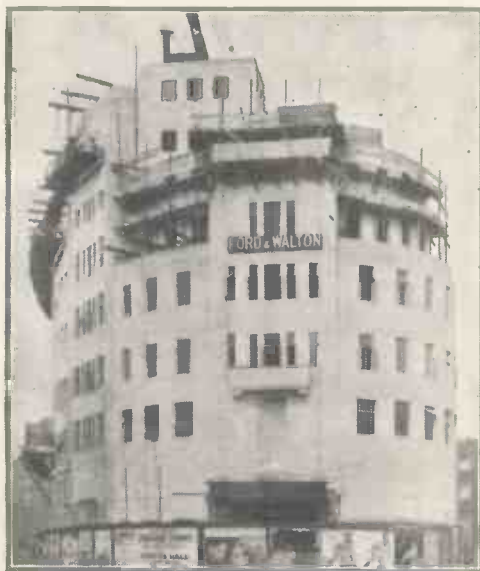
A MOVING-COIL LOUD-SPEAKER
One of the first moving-coil loud-speakers. It had a massive pot, enclosed in which was an electromagnetic winding

valve with a thimble-heated cathode."

"The first of the symphony concerts arranged at 2LO will be broadcast on June 18, and it is intended that these concerts shall be a monthly feature."

From an advertisement: "Spoken words can be heard with wonderful distinctness."

First details of the dull-emitter valve, "the new type of valve that obviates the need of an accumulator."



BROADCASTING HOUSE

A photograph taken during the building of Broadcasting House at the top of Regent Street, London. The first broadcast was made on March 15, 1932

JULY

English description of the neutrodyne high-frequency amplifier, invented by Professor L. A. Hazeltine, an American.

its reproduction of the higher notes on the pianoforte scale. The loud-speaker to be described is very easy to make and

The beginning of Empire broadcasting: "A summary of Empire news is to be broadcast once a fortnight from 2LO."

"The Anode Converter: Exit the H.T. Battery!—The M.L. Magneto Syndicate of Coventry have designed one of the most remarkable appliances yet brought out for the benefit of the amateur wireless enthusiast. Briefly, it consists of a generator of the magneto type, which can be worked from the ordinary 6-volt accumulator of the set. Its consumption at 6 volts is only 1.15 amperes." The converter described gave 70 volts at 6 milliamperes.



AN EARLY VALVE
This valve with a hooded anode was made by Cossor's. It was one of the original dull-emitters

1924

JANUARY

"The First Electric-light Aerial.—All that is required is a strip of tinfoil to which a length of wire has been attached. The tinfoil should be wrapped round the electric globe and held in place by one or two rubber bands. When the current is switched on it will be found that this contrivance will work quite as well as an ordinary aerial."

MAY

The Baird television system. "Mr. Baird has achieved some remarkable results which go a long way towards proving that television is practicable."

A set was described in *Amateur Wireless* by 5GF which tuned down to 60 metres—a great feat in those days.

The first hornless loud-speaker. "The volume of sound obtained from the writer's instrument is that obtained from loud-speakers of the ordinary type and the quality is also quite good. It is particularly faithful in

cartridge paper, some three-ply wood, and an oak frame."

JUNE

"A Full-volume Crystal Loud-speaker at Last!—I describe in this issue a very simple method by which loud-speaker effects can be obtained from the crystal and without using valves. The principle is old. The nerve centre of the arrangement is a tiny microphone button."



MAKING GRAMOPHONE RECORDS AT HOME
A feature of the 1931 Radio Exhibition was a number of home-recording arrangements, one of which is shown in this photograph. This system was purely acoustic



THE RADIO EXHIBITION IN 1929
A corner of Olympia in 1929. Listeners will soon be looking forward to the 1933 exhibition, which will be held early in August, again at Olympia

the cost is low, the only materials necessary being a Brown A-type reed ear piece (2,000 ohms), a length of

From an *Amateur Wireless* editorial.

"A uniform 10s. licence at last."

B.B.C. statistics in 1924: Up to March 31 the B.B.C. spent £148,961 on programmes. The erection and equipment of stations had cost £55,083. Licence fees up to March 31 this year yielded £105,484. Programmes were compiled five weeks in advance. Approximately 1,400 firms belonged to the B.B.C. Licences to the end of May numbered 804,000.

JULY

5XX, situated at Chelmsford, was opened on July 9. Dame Clara Butt broadcast for the first time at the opening ceremony.

AUGUST

A unit for charging batteries from A.C. mains was described in *Amateur Wireless*. The apparatus consisted of a step-down transformer and a simple vibrating-type rectifier.

OCTOBER

The first pleated-paper loud-speaker was described in *Amateur Wireless*.

1925

JANUARY

The first number of "Wireless Magazine" was published on January 25. It contained 124 pages, fifty-two features and 170 illustrations.



THE DIRECTOR-GENERAL
The man behind British Broadcasting—
Sir John Reith, Director-General of the
British Broadcasting Corporation

MARCH

M. Paderewski broadcast for the first time from 2LO on March 15 for an hour and a half.

APRIL

"The modern loud-speaker is constructed as to give as far as possible an even balance of tone throughout the musical scale, but nevertheless some types give prominence to the higher notes and others *vice versa*. However, if two instruments are used, one may have a relatively large, thick diaphragm, or may be of the pleated-paper type to give prominence to the lower notes, and the other may have a light diaphragm to give prominence to the upper register." Undoubtedly the forerunner of the present-day dual loud-speaker system.

A four-valver with push-pull output was described in *Amateur Wireless*.

Multi-valve sets were gaining in popularity about this time. "Our Super-heterodyne Eight-valver" was considered the last word.

A new variometer by Marconiphone was the first sign of the dual-range coil. "A movement of the dial through

180 degrees places the windings in parallel (for the broadcast band), and through the remaining 180 degrees in series for the high-power station." This was considered a great advance.

JULY

Sir W. Mitchell Thompson opened the new high-power Daventry station on July 27. The power was



A HOME-WOUND COIL
In the early days of broadcasting most constructors made their own coils, of which this is a good example

25 kilowatts, the wavelength 1,600 metres and the call sign 5XX.

"Has television arrived?" This topic was debated in July, 1925.

1926

APRIL

The first four-valver with one-knob tuning was described in *Amateur Wireless*.

JULY

Details of the McLachlan loud-

speaker were published on July 24. It was described as a coil-driven cone-type loud-speaker—what we now call a moving-coil reproducer.

OCTOBER

"The first television licence was recently granted to Mr. J. L. Baird's stations. One is situated in St. Martin's Lane and the other at Harrow. At present the London station is a transmitter and, except for an interval of a fortnight, 'looking-in' has been in progress every night for some weeks on a wavelength of about 200 metres."

"The Postmaster-General communicated to the House of Commons on October 25 the Prime Minister's recommendations for the appointment by the Crown of four gentlemen and a lady as the original governors of the British Broadcasting Corporation, an authority which will replace the British Broadcasting Company and will be constituted by Royal Charter."

1927

JANUARY

The first announcement appeared in *Amateur Wireless* of the formation of Bernard Jones Publications, Ltd.

FEBRUARY

The Marconi-Osram KLI valve, a "somewhat revolutionary design," was announced. It had the following characteristics: Heater volts, 3.5; heater current, 2 amperes; anode volts, 100; amplification factor, 7.5; impedance, 5,500 ohms; and slope, 1.36.

MAY

Said J. L. Baird: "In ten years time, I prophesy, we shall be able to see on our wireless televisors topical events, such as the finish of the Derby or the finish of the Boat Race."

SEPTEMBER

First sketches and photographs of the four-electrode valve appeared in *Amateur Wireless*.

OCTOBER

The first explanatory article on the use of a gramophone pick-up appeared in *Amateur Wireless*.



YOUNG AND ENTHUSIASTIC RADIO CONSTRUCTORS
This photograph was taken some years ago in the workshop at Harrow School. Note the old-fashioned components being used

1928

JANUARY

Constructional details of the first A.C. mains unit with a rectifying valve were published.

MARCH

Several suggestions for a dual-range coil were made in the first two months of 1928. This month J. H. Reyner's Q-coil Three was published.

Jack Payne and the B.B.C. Dance Orchestra made their first broadcast on March 12.

JUNE

"This week we are able to reveal some advance details of a five-



A HORN LOUD-SPEAKER
In its day this B.T.H. horn type loud-speaker was considered to be a very fine reproducer

electrode valve of considerable interest . . . the pentode . . . two or three months must elapse before its production." From *Amateur Wireless*.

The Editor and J. H. Reyner visited Chippenham to inspect the Westinghouse metal rectifier at the end of 1927. Details of construction and a test report appeared.

OCTOBER

An article was published explaining the construction of the electrolytic condenser.

1929

OCTOBER

First details of the inductor loud-speaker were published.

WELL PLAYED!

MARCH 22. As the news-agent handed me my April copy of the "Mag." I noticed the number on the "spine"—Vol. 17, No. 99. Then the May issue will mark the century!

One hundred monthly issues. That means that No. 1 appeared over eight years ago. It hardly seems possible.

I remember it quite well. An artist neighbour invited me to call in about midnight to hear America on his two-valver. I crept up the stairs to his glory-hole. He cleared a pile of "junk" off a chair and untangled a spare pair of headphones. (He had a tin-trumpet loud-speaker, but "We mustn't wake the kids" he said. Optimist!)

A drawing board was propped up in front of him. The illustration was nearly finished—a striking study of a negress wearing a large smile, several strings of beads and a pair of headphones.

"What's it for?" I asked, thinking it must be an advertisement for tooth-paste.

"The cover of a new wireless magazine," he told me.

"Wireless?" I asked in surprise. Wireless was a serious subject for serious people. A grinning negress seemed quite out of place on a wireless magazine. Altogether revolutionary.

When No. 1 appeared it proved to be revolutionary. It met with a very mixed reception amongst people connected with the wireless industry. It was so different. It combined wireless with "human interest"—a thing that had never been done. Early failure was predicted.

It did not fail. It remained different, and prospered. It has been different ever since. And it's not an easy matter to be different every month for over eight years.

It is such an achievement that, as one who has read and admired every one of the ninety-nine issues, I cannot let the occasion pass without writing to say—"Well played."

And, in the words of Henry Hall—"Here's to the next time."

R. H. BRADLEY

NOVEMBER

Test transmissions from Brookman's Park were started in October and November. The station was officially opened, as was the B.B.C. experimental receiving station at Tatsfield, this month.

DECEMBER

The Stenode receiver was demonstrated to representatives of "Wireless Magazine."

1930

MAY

A minor development was the introduction of the Marconi and Osram P2 battery power valve. Up to this time 6-volt power valves had to be used by those wanting full volume from a loud-speaker. One of the best 2-volt power valves at the time was the Marconi or Osram P240, which took about 17 milliamperes at 150 volts. The new P2 had an amplification factor 50 per cent. better than that of the P240.

Home recording made its debut about this time.

1931

FEBRUARY

"Wireless Magazine" published an article on the variable-mu valve, nine months or so before its actual production.

MARCH

Original publication in "Wireless Magazine" of W. James' Super 60, the forerunner of the modern superhet with screen-grid intermediate-frequency amplifying stages.

JULY

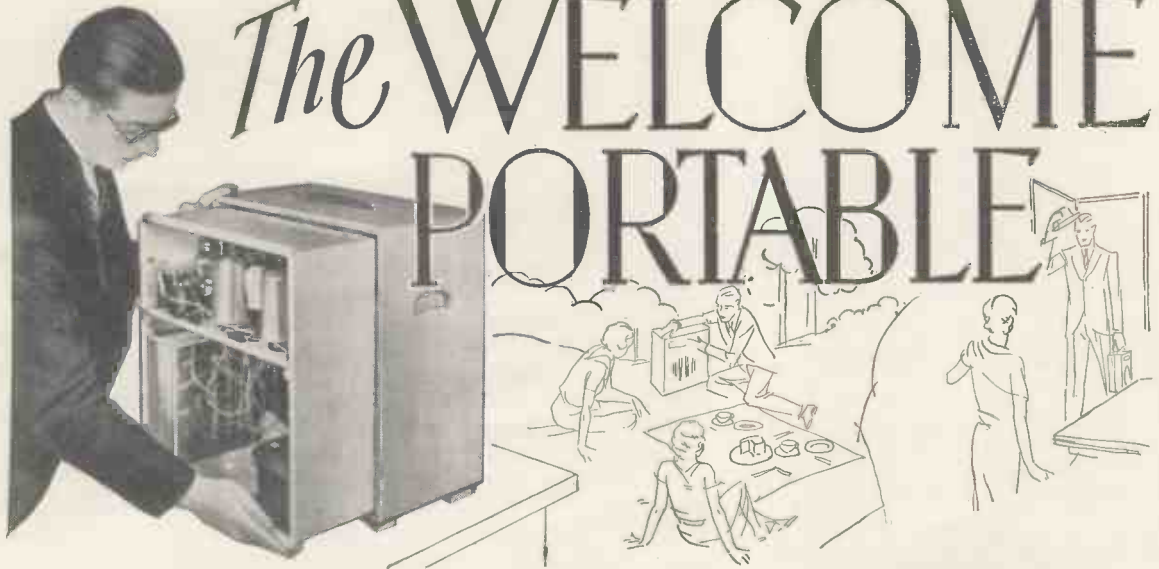
The vogue for band-pass tuning began with this issue of "Wireless Magazine." The Band-pass Inceptor-dyne was published, and both W. James and J. H. Reyner wrote articles on the subject.

1932

MARCH

The first programme from Broadcasting House, dance music by the B.B.C. Dance Orchestra under the direction of Henry Hall, was heard on March 15.

The WELCOME PORTABLE



Specially Designed by the "W.M." Technical Staff

ALTHOUGH this issue of "Wireless Magazine" is published at a time of the year when readers may reasonably be expected to be taking some interest in the possibilities of outdoor radio the Welcome Portable is not put forward as a receiver exclusively for summer use.

The fact is that quite apart from this purpose there are many people who feel the need for a completely self-contained radio set that can be moved about at will—just as frequently inside the house as outside it.

Here, then, you have a design that will add immeasurably to the pleasures of your picnics and outings in the summer, but which at the same time will be particularly convenient in the home. With a set like the Welcome Portable you are not tied to one room of the house.

Widespread Success

Super-het portables are not new to "Wireless Magazine" readers; during the past few years a number of such receivers have been described and illustrated in our pages. Without exception they

have met with widespread success. Our last super-het portable was called Everybody's Portable, and when the issue in which it was originally described went right out of print a little while ago we began

to receive hosts of letters from readers asking for a similar but more up-to-date design.

Our aim in designing the Welcome Portable has been to produce a set that will live up to the super-het reputation for sensitivity and selectivity, and at the same time to ensure the greatest possible simplicity both in construction and in operation.



ONLY FOUR KNOBS TO BE MANIPULATED
There are only four control knobs on the Welcome Portable—two tuning condensers, volume control, and a combined wave-change and on-off switch

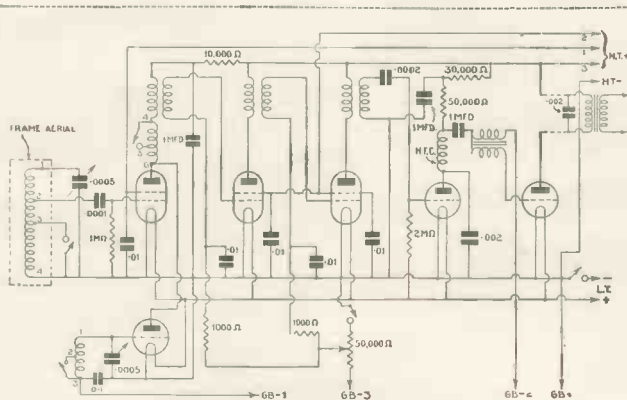
Simple Construction

That simplicity of construction has been achieved will be evident from a glance at the photographs reproduced in these pages; while, as for sensitivity, the test report on page 365 speaks for itself.

"How many valves are used to obtain this fine performance?" you will ask. The answer is "Six."

It will be remembered that our last super-het portable — Everybody's

Portable, described in the July, 1932, issue of "Wireless Magazine"—had only five valves. The sequence in that case was a combined detector-oscillator (a bi-grid valve was used for this purpose), two screen-grid intermediate stages, a second detector and a power valve.



CIRCUIT OF THE WELCOME PORTABLE

This circuit follows standard super-het practice, except that the first detector is of the screen-grid type

In the new set we have used a separate oscillator valve, because this way of working the circuit is always found to give the best results, the oscillations being much more even over the two wavebands. A pentode is used in place of the three-electrode power valve employed in Everybody's Portable; this is slightly more sensitive, of course, and tends to give better reception of foreign stations.

Variable-mu Valves

Moreover, in place of the two ordinary screen-grid valves for the intermediate stages we have used two valves of the variable-mu type, which will not be overloaded whatever the strength of signals.

The actual combination is therefore arranged as follows :

There is a screen-grid first detector and a three-electrode oscillator; next we have two variable-mu intermediate stages, followed by the second detector; and after this comes a transformer-coupled three-electrode power stage.

It should be realised, of course, that although one more valve is used in the Welcome Portable than was employed in Everybody's Portable, it does not amplify; the only use of the separate oscillator is to feed oscillations into the first-detector circuit.

The details of the circuit will be clear from the diagram reproduced opposite. The dual-range frame aerial is tuned by a single .0005-microfarad variable condenser and is connected directly to the control grid of the first detector valve.

Dual-range Coil

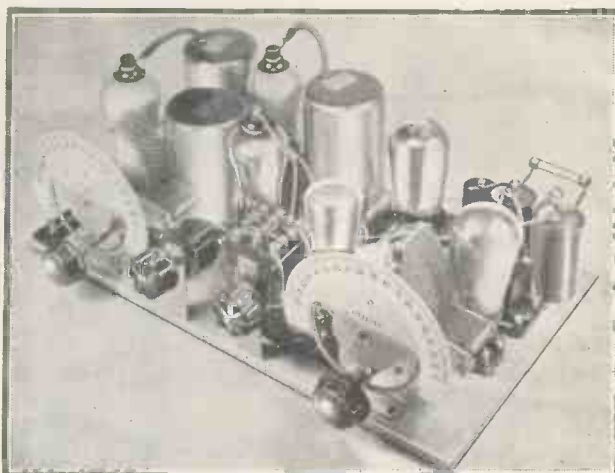
Feeding into the anode circuit of this valve is the separate oscillator, which is provided with a dual-range coil, also controlled by a standard .0005-microfarad variable condenser.

No attempt has been made to gang these tuning controls. We are certain that the majority of constructors will prefer to have separate tuning condensers for the

two circuits that have to be adjusted.

Not only is the operation of the set then much simpler (for there are no preliminary ganging adjustments to be made), but many amateurs will be able to use condensers they already have on hand.

The band-pass coupling transformers



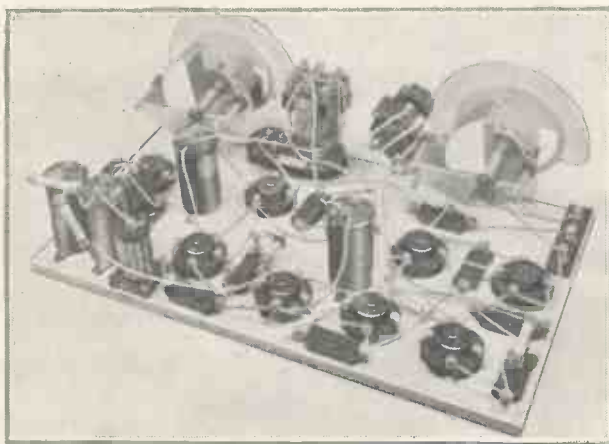
A SUPER-HET WITH SIX VALVES

Two variable-mu intermediate-frequency stages are used in the Welcome Portable, which also has a moving-coil loud-speaker



COMPLETELY ASSEMBLED AND READY FOR USE

Another view of the Welcome Portable completely wired and with the valves and coils in position ready for testing



SIMPLE ENOUGH FOR THE BEGINNER

This photograph of the Welcome Portable shows clearly how straightforward is the layout of the set. Any beginner can tackle it without difficulty—and with complete success

the makers, so there are no adjustments to be made here.

These band-pass intermediate filters will be well-known to "Wireless Magazine" readers by now.

Each coil is provided with four pins at the bottom, these being arranged like the pins on a valve. The coils are, therefore, mounted in ordinary four-pin valve-holders.

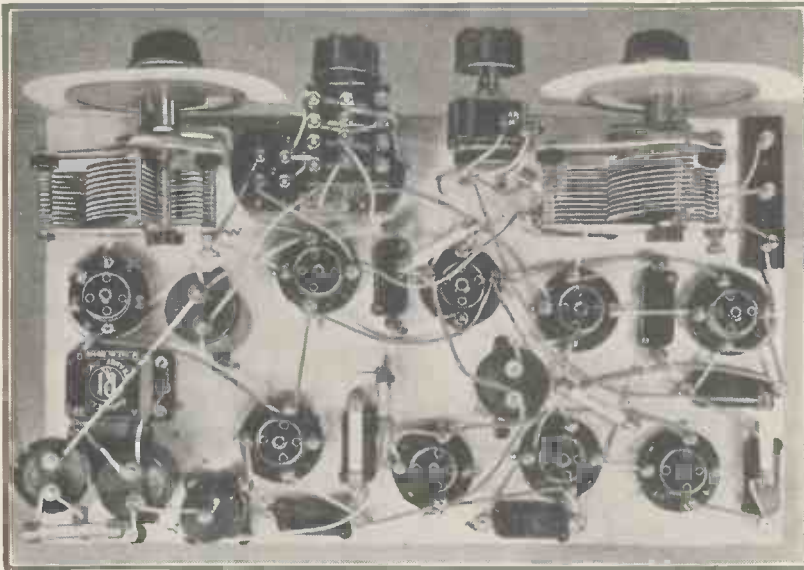
This makes the construction of the set very simple as all the wiring can be done before the coils are placed in their holders and every part is readily accessible.

The oscillator coil is of the small "portable" type and is not provided with its own switch. The actual switching arrangement used in the set will be discussed later.

Frequency

It is important to note that the frequency of these intermediate band-pass filters is 126 kilocycles, the standard frequency for super-hets adopted by "Wireless Magazine."

As the frame aerial and the oscillator coil have both to be switched for the long and medium waves we set out to see if the operation could be accomplished by means



PHOTOGRAPHIC PLAN VIEW OF THE BASEBOARD

This plan view of the baseboard of the Welcome Portable, consulted in conjunction with the quarter-scale layout and wiring guide reproduced below, will clear up any obscure points

of one switch. We found that it could; in fact, one switch is used for changing the wave range and also for switching the set on and off.

We shall not go into the remaining details of the circuit, which includes all the resistances and by-pass condensers needed to give complete stability in operation. On the other hand, money has not been wasted in decoupling unless it was found to be essential during our preliminary experimental work.

We had hoped, as a matter of fact, to provide this set with a class B output stage, but at the time of going to press it is still very uncertain when these new valves will be released. For the sake of those specially interested in class B we may say that as soon as the necessary valves and transformers are put on the market we will explain how to add them to this set.

Volume Control

Having solved the problem of wave-change and on-off switching, the next point to consider is the control of volume. Here we have done the obvious thing and used a potentiometer to control the bias on the variable-mu intermediate

valves. (Note that the first detector is of the ordinary screen-grid type; only the two intermediate stages are variable-mu's).

One other point of importance must be mentioned—that is the use of a moving-coil loud-speaker. The

a normal size of cabinet. Not only does this loud-speaker greatly enhance the results obtained, but it is by no means expensive.

Except for the somewhat restricted range occasioned by the frame aerial (restricted, that is, by comparison with a similar super-het working on an outdoor or indoor aerial of the normal variety) the Welcome Portable is in every way as good as the average battery-operated super-het: old readers of "Wireless Magazine" know very well what that means.

Constructional Points

Having discussed the general lines of the design at length, it is now time to look into some of the constructional and operating points.

In the first place we would remind readers that full-size blueprints of the set can be obtained at half price, that is 9d., post paid, if the coupon on the last page is used by May 31.

Address your application to "Wireless Magazine" Blueprint Department, 58/61 Fetter Lane, London, E.C.4, and quote the reference No. WM322. A copy will be sent by return of post.

It will be clear from the photographs and the diagram on page 364 that the cabinet is provided with an inner framework. This is a very great convenience, for it means that the set can be completely assembled and tested before being inserted into the case proper.

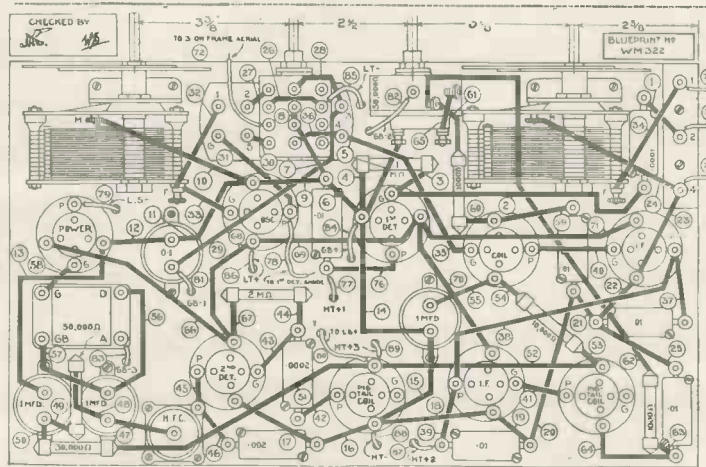
Moreover, should anything require attention at any time the parts can easily be got at.

Frame Aerial

The frame aerial is wound round the outside of the inner wooden framework in the manner indicated by the diagram on page

364 (and also by the photograph on the same page). It is not at all difficult to put these windings into position. The ends of the wire can be anchored by threading them through two or three small holes that have been drilled in the wood before the actual winding is started.

The baseboard components, which consist mostly of small fixed condensers and valve holders (apart from the



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM

If desired, a full-size blueprint can be obtained for half price, that is 9d., post paid, if the coupon on the last page is used by May 31. Ask for No. WM322 Wire up in the numerical order indicated

Welcome Portable is the first "Wireless Magazine" portable to have this type of reproducer; indeed, if we are not greatly mistaken, the very first home-constructor portable to incorporate such a reproducer.

Previous portable sets have been powerful enough, it is true, to drive a moving-coil reproducer, but until this year it has been impossible to obtain one that would fit into

tuning condensers and low-frequency transformer), can be fixed in position without difficulty if the board is removed from the framework.

The control components—that is the tuning condensers, volume-control potentiometer and switch—are held in position at the front edge of the baseboard by means of metal brackets. Holes are then drilled in the front of the cabinet to take the spindles.

Sizes and Positions of Holes

The sizes and positions of all these holes will be clear from the blueprint (or from the quarter-scale reproduction on page 362).

Wiring of the set should be done from the blueprint, on which each connecting lead is numbered separately in the best and most convenient order. Start off with wire No. 1 and then proceed in the proper numerical order until all the connections have been completed. It is a good plan to cross the numbers through on the blueprint as the corresponding connections are made.

A .002 microfarad is connected directly across the primary of the loud-speaker transformer.

Preliminary Tests

While the set is first being tested out (before being put in its cabinet) the knobs should be temporarily fixed to the control spindles, although they will have to be taken off again when the set is finally housed in the case.



THE FINISHED DESIGN

The Welcome Portable is a completely self-contained super-het portable, with frame aerial, batteries and moving-coil loud-speaker

COMPONENTS NEEDED FOR THE WELCOME PORTABLE

CHOKE, HIGH-FREQUENCY

- 1—Wearite, type HFS (or Goltone, Lewcos), 4s. 6d.

COILS:

- 1—Wearite dual-range portable oscillator, type O3, 4s. 6d.
1—Wearite intermediate-frequency transformer, without pigtail, type OT1, 10s. 6d.
2—Wearite intermediate-frequency transformers, with pigtails, type OT2, £1 1s.

CONDENSERS, FIXED

- 1—Dubilier .0001-microfarad, type 670, (or T.C.C., Telsen), 1s.
1—Dubilier .0002-microfarad, type 670, (or T.C.C., Telsen), 1s.
1—Dubilier .002-microfarad, type 670 (or T.C.C., Telsen), 1s. 3d.
5—Dubilier .01-microfarad, type 670 (or T.C.C., Telsen), 10s.
1—Dubilier .1-microfarad, type 9200 (or T.C.C., Telsen), 2s.
3—Dubilier 1-microfarad type 9200 (or T.C.C., Telsen), 8s. 3d.

CONDENSERS, VARIABLE

- 2—Utility .0005-microfarad with disc dials, type W318, 13s.

HOLDERS, VALVE

- 9—W.B. four-pin miniature type (or Benjamin, Graham-Farish), 4s. 6d.

PLUGS AND TERMINALS

- 8—Belling Lee wander plugs marked: H.T.—4, H.T.—3, H.T.—2, H.T.—1, H.T.—, G.B.—, G.B.—1, G.B.—2, G.B.—3 (or Climax, Ealex), 1s. 4d.
2—Belling Lee spade terminals, marked: L.T.—, L.T.— (or Clix, Ealex), 4d.
3—Small terminals for frame-aerial connections, say 3d.

RESISTANCES, FIXED

- 2—Dubilier 1,000-ohm metallised (or Erie, B.A.T.), 2s.
1—Dubilier 10,000-ohm metallised, (or Erie, B.A.T.), 1s.
1—Dubilier 30,000-ohm, metallised (or Erie, B.A.T.), 1s.
1—Dubilier 50,000-ohm, metallised (or Erie, B.A.T.), 1s.

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower.

- 1—Dubilier 1-megohm metallised (or Erie, B.A.T.), 1s.
1—Dubilier 2-megohm metallised (or Erie, B.A.T.), 1s.

RESISTANCES, VARIABLE

- 1—Bulgin 50,000-ohm potentiometer with on-off switch, type VS36 (or Wearite, Preh), 5s. 6d.

SUNDRIES

- Tinned-copper wire for connecting, say 1s.
Lengths of olled-cotton sleeving, say 2s.
2—Wearite small fixing brackets, 1s.
1—Bulgin small octagonal knob, $\frac{3}{8}$ in. bore, type K9, 4½d.
1—Bulgin small octagonal knob, $\frac{1}{4}$ in. bore, type K10, 4½d.
Length of rubber-covered flex for battery leads, say 1s.
1—Small piece of ebonite for aerial terminal strip, say 3d.
1—Box of Lewcos frame-aerial wire, type DMS, 9s.

SWITCH

- 1—Wearite rotary switch, type I24 with terminals, 4s. 6d.

TRANSFORMER, LOW-FREQUENCY

- 1—R.I. Parafeed, 8s. 6d.

ACCESSORIES

BATTERIES

- 1—Siemens 120-volt, standard type H3 (or Lissen, Ever Ready), 13s. 6d.
1—Siemens 16.5-volt grid-bias, type CG3, (or Lissen, Ever Ready), 1s. 9d.
1—Smith's 2-volt accumulator, jelly-acid type 2PJ11, 14s.

CABINET

- 1—Camco Transportable, £1 17s. 6d.

LOUD-SPEAKER

- 1—Rola permanent-magnet moving-coil, type F5, £1 12s. 6d.

VALVES

- 1—Osram S22 metallised, 10s.
2—Cossor 220VSG metallised, £1 18s.
1—Mazda HL210 metallised, 7s.
1—Mullard PM1HL metallised, 7s.
1—Mazda P220, 8s. 9d.

There are eight battery connections to be made, four for the high tension, two for the low tension, and four for the grid bias. They should be supplied with the following voltages:—

H.T.—1 (for the screening grid of the first detector), 60 to 80 volts; H.T.—2 (for the screening grids of the variable- μ 's), 70 to 90 volts; and H.T.—3 (for the anodes of all the valves), 120 volts.

G.B.—3 (for the control grids of the variable- μ valves), 15 volts; G.B.—1 (for the oscillator), 3 to 6 volts; and G.B.—2 (for the power valve), 6 to 9 volts, according to the makers' recommendation.

The operation of the Welcome Portable is extremely simple, there being only four knobs to manipulate. From left to right, across the front of the panel, they are arranged as follows:

- (1) Frame-aerial tuning condenser;
- (2) volume control; (3) combined wave-change and on-off switch; and
- (4) oscillator tuning condenser.

It will thus be seen that the operation is particularly simple.

As is usual, the volume is increased by turning the knob to the right. The switch on the right has three positions: when it is turned to *left* the set is *switched on for medium-wave reception*; in the *middle* position the whole set is *switched off*; while in the *right-hand* position the set is *switched on for long-wave reception*.

Potentiometer Switch

In order to prevent the grid-bias battery from discharging through the volume-control potentiometer when the set is not being used, this component is provided with an on-off switch. When the set is not being used, therefore, remember to turn the volume-control knob back to the left. No current will then be taken out of the grid-bias battery.

It will be found after a few min-



ARRANGEMENT OF THE BATTERIES

A rear view of the set showing how the batteries are placed in the new Camco cabinet, which is a little deeper than previous models

utes experimenting that there is no difficulty about bringing in a large number of stations; even in daylight the bag will be pretty considerable.

Beginners should note that the variable-mu valves are in their most sensitive condition when the volume control is turned to the right for full volume.

Directional Effects

Another point to be borne in mind when searching for stations is that a frame aerial has marked directional properties. One side of the cabinet (not the front or back) should be turned to face the station it is desired to pick up.

The position is fairly critical, for if the case is facing at right angles to the direction of the station it is desired to receive nothing will be heard unless the transmission is exceptionally powerful.

This frame directional effect is very useful when stations on neighbouring wavelengths are inclined to interfere with one another. Usually they will be in quite different directions with respect to the receiver, and it is a simple matter to turn the set round until the station that is not wanted fades right into the background.

For convenience the cabinet should be fitted with a small turntable, which can be screwed permanently to the bottom.

Constructors of last year's Everybody's Portable will see from a glance at the list of parts for the Welcome Portable that they will be able to use many of their existing parts in the assembly of the new design. Both the dual-range oscillator coil and the band-pass intermediate filters are of the same types.

There are some amateurs, no doubt, who will want to build an old balanced-armature loud-speaker into the set in place of the moving-coil reproducer specified. In that case it will be advisable to provide a choke-capacity output circuit for the power valve.

No special output arrangement has

been made in the original set because the moving-coil loud-speaker is provided with its own output transformer. A balanced-armature reproducer, however, will have no such transformer.

It will be desirable in most cases to add a low-frequency choke and a 2-microfarad by-pass condenser in the anode circuit of the power valve if any other loud-speaker (that is not a moving-coil model) is utilised.

Still, if the best quality is desired the constructor should try to stick to the particular moving-coil reproducer recommended in the list of parts. The set has been designed to give the best performance with that instrument and any substitution is likely to affect the results. We shall be glad to hear from readers as to the results of the "Welcome Portable."

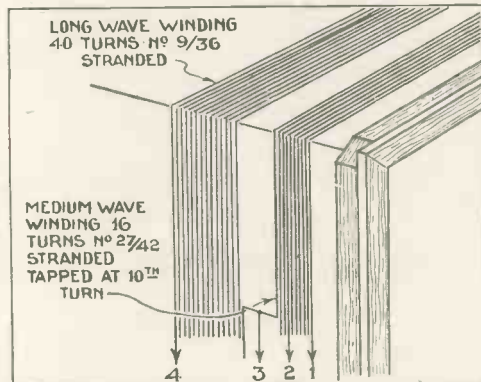
Resistance Values

MANY readers are very hazy as to the procedure for finding out the correct value of voltage-dropping resistance. The formula to calculate these values is very simple and can be readily memorised; it is merely

$$\text{Resistance in ohms} = \frac{\text{Voltage to be dropped}}{\text{Current in amperes.}}$$

If the current is in amperes, this figure should be expressed as a decimal fraction of an ampere. To impress the point the following example will be helpful:

Assuming we have a mains unit with an output of 150 volts and we wish to use a detector or low-frequency valve requiring only 100 volts, 50 volts will have to be dissi-



DETAILS OF THE FRAME AERIAL

This diagram shows clearly how the frame aerial is wound on the outside of the inner wooden framework supplied with the cabinet

pated. The average anode current we will assume to be about 5 milli-amperes and with 50 volts to drop this gives us

$$\frac{50}{.005 \text{ a (or } 5 \text{ m/a)}} = 10,000 \text{ ohms.}$$

If a resistance of this value is connected in series with the tap feeding the valve in question the voltage applied will be only 100 volts.

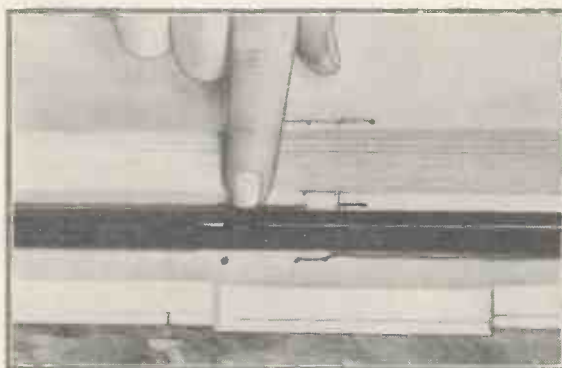
The same formula can be used to calculate the correct value for the bias resistance when using a receiver with automatic bias. Usually if a larger or different type of valve be used, a different value of bias resistance will be required.

With a small valve of the "P" type, the average anode current will be in the region of 5 milliamps., and the grid-bias voltage about 10 volts.

This gives us

$$\frac{10}{.005} = 2,000 \text{ ohms.}$$

K. J.



COMPLETED FRAME-AERIAL WINDING

The thick wire is the medium-wave winding, while the thinner winding is for long-wave reception

Fine Quality and Plenty of Stations!

Results of a Test of the Welcome Portable

DURING a fine week-end I tried this set in and out of doors. That the results are satisfactory is evident from the list of stations at the bottom of this page.

The performance is best described as being almost as good as an ordinary battery-operated super-het receiver, taking into consideration, of course, that here we have a self-contained frame aerial.

The only marked difference was that many of the low-power stations were not heard, but the big European stations—Leipzig, Rome, Breslau, Athlone, for example—came in at full strength on the moving-coil loud-speaker.

Moving-Coil Loud-Speaker

This is the first portable set with a permanent-magnet moving-coil loud-speaker that I have tested. Although most of us are familiar with the sound of moving-coil loud-speakers indoors not many listeners will have noted the effect of the same sound out-of-doors. I was frankly surprised.

It has always been a theory of mine that all music in the open air—radio especially—was a distressing noise. This theory has, to some extent, been modified after hearing this set in a quiet wood not far from London.

The quality is amazingly good;

indoors and out in the open I found it extremely pleasant to listen to. A certain amount of background noise noted with many of the foreign stations was not of sufficient intensity to interfere with reception.

No difficulty was experienced in bringing in any one of the stations on the log.

I have purposely only recorded the dial readings of the stations that are worth hearing. You will find these of great value when calibrating your own portable.

The oscillator-condenser readings should be almost the same as those given, but the aerial-condenser readings will vary because of the differences in home-constructed frame aerials.

As one would expect, the selectivity was of a high order. No difficulty was experienced in separating adjacent high-power stations; in many instances there was a "silent spot" between.

The directional properties of the frame aerial were, of course, of great help in separating stations. I found



ADJUSTING THE BATTERY VOLTAGES

To get the best results from the Welcome Portable it is as well to experiment a little with the battery voltages in order to get the very best performance

that in this set the directional effect was rather pronounced.

For stations like Budapest, Sundsvall, Hamburg, and Milan, for example, it was essential that the frame should point in the right direction; that is, one side of the cabinet must face the direction of the station.

On the long waveband it was easily possible to separate Zeesen from Daventry and Radio Paris with quite a margin to spare.

Easy Tuning

Tuning was delightfully easy, and no listener should find any difficulty in bringing in the stations once he has discovered the "knack." Provided the two dials are turned slowly and kept in step—indicated by a slight hissing noise in the loud-speaker—the stations will roll in one after another. *T. F. Henn*

List of Stations Received on the Welcome Portable

Station	Aerial	Oscil- lator	Station	Aerial	Oscil- lator	Station	Aerial	Oscil- lator
Long Waveband								
Warsaw	97	126	Scottish National....	50	66	Midland Regional...	105	117
Eiffel Tower	102	129	Hilversum	55	70	Söttens	110	120
Daventry National...	107	134	North National	58	73	Athlone	115	123
Zeesen	120	141	Breslau	72	86	Rome	120	130
Radio Paris	128	146	Poste Parisien	74	88	Beromuenster	128	136
Huizen	140	158	Milan	76	91	Langenberg	132	140
Medium Waveband								
Trieste	20	36	Brussels No. 2	80	95	North Regional	135	142
Juan-les-Pins	24	39	London Regional	87	100	Prague	138	145
Frankfurt	28	45	Mühlacker	90	102	Brussels No. 1	144	150
London National	30	47	Hamburg	95	105	Vienna	146	152
Heilsberg	40	58	Scottish Regional	97	108	Munich	150	155
			Toulouse	100	112	Sundsvall	152	157
			Leipzig	103	114	Budapest	155	159



AT THE RADIO EXHIBITION
Phyllis Konstam, the popular actress, inspecting
Exide batteries at the last Radio Exhibition. The
large cell on the right is one of those used in
submarines

The Low-tension Battery

By PERCY W. HARRIS, M.Inst.Rad.E.

a number of flat plates interleaved with one another, the alternate plates being the same colour, one set being brown and the other grey.

The container may be of clear celluloid, glass, or black composition, and inside there is a clear liquid which you call the acid.

There are two projecting terminals with some kind of screw attachment to hold the wire; there is a stopper with a vent hole and usually some form of marking to show which is the positive and which is the negative terminal.

Some accumulators are large and have lots of plates, others are small and have fewer. Some have but three plates, one a large flat chocolate-coloured one and two other grey ones, quite thin, placed one on each side.

When your receiver ceases to function properly or signals fall off, you disconnect this accumulator and get it "charged." When it comes back you connect it up again and all is generally well.

You know from experience just how long you can run the set without taking the accumulator to be re-charged, and if you find it wants re-charging more often than it used to do, you generally blame the charging station for not, as you probably term it, "putting enough into it"!

If ever there was a device which seems to have less of interest in it, you would like to know what it is, you probably say. What on earth can there be of interest in such a prosaic instrument?

Well, the first point about an accumulator which interests me is its name. I am, as you know, rather

fond of tracking out curious and erroneous names, and you might at first think that the accumulator is aptly termed.

If I asked you what it accumulates, you would probably answer "electricity, of course!" thereby provoking me to tell you at once that not only does an accumulator *not* accumulate electricity, but when it is fully charged there is exactly as much electricity in it as when it is fully discharged, and that is—just none!

Two Sheets of Lead

If you take two sheets of lead and immerse them in dilute sulphuric acid, connecting one sheet to the positive pole of a charging plant and the other to the negative, a chemical action will take place and one of the lead sheets will become discoloured, due to the formation of an oxide.

Part of the power put into this elementary cell will be absorbed in the production of gas from the liquid and part of it in the formation of this oxide. We can take the charging wires away and then, if we connect the two lead plates together, an electric current will flow for a short time, but don't jump to the conclusion that this is because any electricity has been stored in the device.

Simple Explanation

The simple explanation is that the effect of the electricity has been to change the chemical constitution of this cell and when the two plates are joined together a chemical action takes place, causing a current to flow. You remember that in last month's "Wireless Magazine," in discussing dry batteries, I showed you how a set of chemicals in a so-called dry battery acts and produces electric current.

THE most useful, the most neglected and the most abused part of the majority of receivers is the accumulator or low-tension battery.

I have known listeners spend many hours carefully studying all the information they can find about valves, trying to find out everything possible about transformers, studying wiring diagrams until they can recognise a circuit at sight, and all the time allowing their accumulator to be so neglected that before long they will have to buy a new one.

"Not Wireless"

What is the answer? Just that the accumulator is "not wireless," it is "uninteresting," so they think, and therefore it gets no more attention than it manages to force upon them.

Now, I have always found the accumulator a most interesting device (I know I am in a minority, but that's no matter) and I have particularly noticed that most of the neglect to which it is submitted comes from a lack of appreciation of what it does.

Take your accumulator and look at it. It consists, as you will see, of

In the case of the dry battery we got our chemicals together, made a paste with some of them, and as soon as the job was finished current could be taken from the cell. In the case of the wet cell or accumulator we take the lead plates and use electricity to produce the chemical change for us before we put the cell into use.

A particular feature about the accumulator is that when it is "used up" we can utilise electricity once more to effect the chemical change for us and restore the substances to their original condition.

Not "Filled Up"

We do *not* use our source of electricity simply to "fill up" something with electricity out of which it can be poured again when we want it. If you understand this fundamental fact you will have gone a long way to understanding the accumulator and its action.

The simple cell consisting of two plain lead plates in acid is of not much use, as the amount of chemical action that can take place (and therefore the amount of current it will generate when we need it) is strictly limited. What actually happens with the two lead plates is that a lead oxide is formed on one of the plates, the other lead plate remaining in its natural condition.

When the two plates are joined together and their own chemical action begins both gradually become covered with a lead sulphate (which, by the way, is invisible and must not be confused with the white insoluble lead sulphate which we find in a deteriorated cell).

When once again current is applied the two plates change once more, becoming plain lead and lead oxide respectively.

Quite early on in the history of accumulators it was found that a great deal more active surface or chemical conversion could be obtained if before the first charge the two plates were covered with a paste of sulphuric acid and red lead (which is a special form of lead oxide). When the first charge takes place one plate changes and becomes a mass of spongy pure

lead, while the other becomes converted into the kind of oxide we want.

The sponginess enables the acid to permeate through a large area of lead, and as it is only the surface we are converting the effect is the same as if we made the plate very much larger.

Remember, too, it is the active area in the cell which is important and, therefore, if we have groups of plates interleaved with one another we can get a large amount of active material in a comparatively small cell. A large amount of active material means a large amount of chemical change and a longer time in the production of an electric current when the two ends are joined.

Don't run away with the idea that the chemical changes in an accumulator are quite so simple as I have indicated. Generally speaking, you can say that one set of plates becomes covered with a special lead oxide and the other becomes reduced to spongy lead during the charging process, and during the discharging process the oxidised plate gradually changes its chemical composition, as does the lead plate, until, when the cell is fully discharged, both become covered with a lead sulphate.

The actual chemistry, however, and the actual compound forms are most complicated and even to-day experts still disagree on many of the fun-



A HEFTY BATTERY
An Exide accumulator in a strong glass container provided with a carrying handle

active material has been made. You can generally tell by inspection whether a cell is in good condition, for the oxide-covered plate has a chocolate colour, while the pure lead plate has the greyish colour characteristic of lead.

As the acid plays an important part in the process and as its active material changes, the condition of the acid when a cell is fully charged and when fully discharged is different. You can understand in a simple way that if both plates become covered with the lead sulphate this sulphate must come from somewhere, and actually it is withdrawn from the acid, which becomes weaker.

When a cell is fully charged a sulphuric portion goes back into it and, as you know, one plate becomes pure lead and the other lead oxide. This increases the strength of the acid, and that is why the acid is stronger in a fully-charged cell than in a discharged one.

Indeed, as the amount of charging and the strength of the acid are inter-connected, it is usual to test the amount charged by measuring the specific gravity of the acid. The stronger the acid, the denser it becomes, and if we have



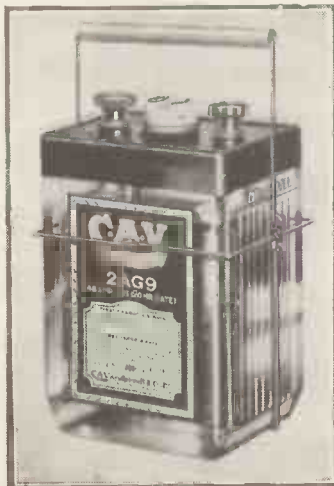
WITH BEAD INDICATOR
This Oldham accumulator is in a celluloid case. It has a capacity of 53 ampere-hours at the 20-hour rate

damental points.

When a cell is said to be "fully charged" we mean that the maximum chemical change for the particular

a little bead which just will not float in a weak acid and will float in strong, then whether or not the bead will rise can be taken as an indication of the strength of the acid.

This is the general principle of the bead type of acid measurer. A more refined type of measure has



STRONG CARRIER
A glass-cell battery with an ampere-hour capacity of 48 at the 20-hour rate—the C.A.V. type 2AG9

a float in it and the degree of rise or fall of this in the acid can be used for measuring strength and, therefore, degree of charge.

You will now see that strengthening the acid in an accumulator by adding more strong acid cannot possibly make any difference to the charge; indeed, it may ruin the cell, because the proper chemical changes only take place in the proper density of acid for the particular cell.

Changing the Acid

When a cell is fully charged it is sometimes advisable to empty out the acid and replace it with acid of the same specific gravity—or, rather, of the correct specific gravity for the fully-charged cell; but this is quite a different matter from adding, as I have known one or two people do, strong acid because they have the idea that if the acid is strong the cell will be in good working condition.

There are all kinds of modifications of accumulators and all kinds of manufacturers' secrets—these latter being largely concerned with the preparation of the active material.

In order that the active material may not fall to the bottom, most plates are made in a kind of grid form into which the paste is pressed, and sometimes the positive plate is made in a box form with active material both inside and out. None of these changes, however, affect the fundamental principles of the accumulator which has already been described.

Properly treated, an accumulator will last for a long time. The proper treatment consists in charging it when it has been discharged to a certain point, never leaving it in a discharged or partially discharged condition for a long period, and not taking too much or too strong a current at any time or charging it with too strong a current.

A certain amount of heat is generated during the chemical action of charging a cell and for a given amount of active material there is a maximum charging rate for safety.

If you try to charge a cell too rapidly you may cause the plates to swell, and therefore disintegrate, the active material falling to the bottom of the cell and

either short-circuiting the whole cell or else being irretrievably lost, thus reducing the capacity. A similar trouble arises when you discharge an accumulator at too high a rate.

Another important point is that if an accumulator is discharged below a certain point (the makers always indicate this point), roughly speaking, the chemical changes "go wrong." Remember, you are always dependent upon these chemical changes for your work and it is not a question of "getting more electricity out."

If an accumulator is left in a discharged or partially discharged condition for some time, the soluble and invisible lead sulphate which, as I have explained, forms upon the plates, turns into a white insoluble form which looks like chalk.

This form of sulphate is not only of no use whatever in our chemical actions, but is actually harmful by forming an insoluble and impervious skin over the surface of the active material we want to use.

If, for example, half of our positive plate is sulphated, then all of the work has to be done by the other half, meaning that that part of the plate is discharged at twice the rate it should be (if you are trying to take the maximum discharge rate from the accumulator) or, if you

dissolved with great trouble and difficulty by experts, but the cell can never be fully restored to its original state.

White Sulphate

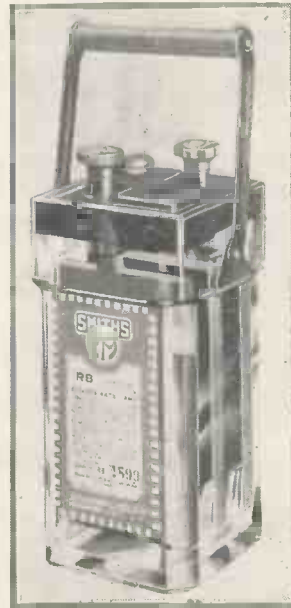
Visible white sulphate on the plates of an accumulator means only one thing—neglect. You can always avoid its formation if you never discharge the accumulator below the point indicated by the makers (specific gravity of the acid and the voltage of the cell will be indicated); if you get it charged *at once* when it has become discharged; and if you never leave the cell in a partially discharged condition for a long period.

Thousands of people ruin their accumulators each year by "running them down" just before the holidays and leaving them until the return before the re-charging is done.

This fortnight or three weeks in a discharged condition is a very fruitful source of trouble, and the correct thing to do is to have your accumulators charged *immediately* before you go away for your holidays, so that they can remain in a fully-charged condition while you are absent.

Occasionally, in cells which have celluloid containers, frothing may take place and cause rather a mess by working out through the vent aperture. This frothing is due to the chemical action of the acid and cell chemicals on the celluloid, and is almost entirely absent from glass cells.

You may not notice the trouble if you take your accumulators to be charged at a charging station, but if you do them at home it may give you some annoyance. Frothing can generally be stopped by taking out the stopper and inserting a small pinch of Hudson's soap powder. This may sound a very strange cure, but actually it is a very effective one, as I know



THREE-PLATE CELL
A glass-cell accumulator with two negative plates and one positive plate—a Smith production of 45 ampere-hours capacity



PLATELESS

The Block accumulator has a special form of electrode and is known as a "plateless" type.

are discharging at a lower rate than this, the capacity will only be half of that formerly had.

This white sulphate can be re-

from experience.

Always keep the tops of your cells quite clean and dry, and free from dirt. A covering of acid moisture on the top of the cell will afford a leakage surface between the positive and negative terminals, and you will lose some of your charge in this way.

New Valves That Will Revolutionise Radio

A Special Article by L. S. KAYSIE

THE first internal change in the structure of the three-electrode valve dates from the insertion of an extra grid designed to remove what is known as the space-charge effect—or tendency of the electrons to clog together around the filament

This later tetrode—known as the screen-grid valve—revolutionised the high-frequency side of reception. Those familiar with the complicated circuits used in the neutrodyne method of stabilising high-frequency amplifiers will certainly agree that the extra grid was well worth its place inside the valve—if only for the way it simplified the external wiring, particularly in sets with wave-band switching.

After the screen-grid came the pentode, in which yet another grid—this time “anchored” to the cathode—was added in order to reduce the internal resistance of the valve, and so adapt it for use as an output stage on the low-frequency side of the set.

Nowadays the pentode is finding a wider application, both as a high-frequency amplifier—or autodyne for super-het reception—and as a detector.

The introduction of the indirectly-heated valve naturally brought about further additions to the internal structure but, by way of compensation, led to a definitely higher standard of efficiency.

We are on the eve of a revolution in the valve field. We have already progressed from the diode to the screen-grid, pentode and multi-stage valve. Still greater possibilities are opened up by the double-diode rectifier, the duo-diode-triode, the single-bulb push-pull valve (either as a double-triode or a push-pull pentode) and the “twin-triple” amplifier. All these new valves are discussed in this article

One may also mention another interesting development, which so far seems to have been somewhat neglected. This is the so-called multi-stage where several distinct stages of amplification—each involving three, four, or even more electrodes—are all housed together inside the same glass bulb.

A “Come-back”

It is quite on the cards that the multi-stage valve, as well as the original space-charge tetrode, may stage a “come-back” some time in the future, since both types possess certain definite points of advantage.

In the meantime we have to consider one or two more recent arrivals. The double-diode rectifier and the duo-diode-triode—the latter a combined rectifier and low-frequency amplifier—have already made their appearance and seem likely to become standard features in modern set design.

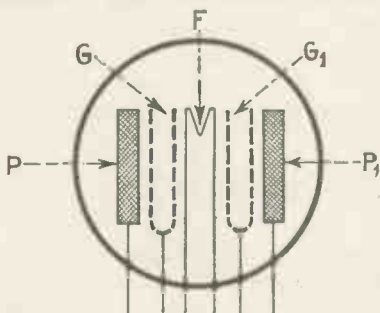


Fig. 1.—Arrangement of the electrodes in a single-bulb push-pull amplifier

instead of moving freely towards the plate.

The space-charge grid, by counteracting this tendency, serves to clear the way for the passage of the electron stream and so allows the valve to work with less than the normal plate voltage. One or two interesting circuits have been developed on these lines, but the innovation did not on the whole attract much attention.

It was soon followed by another type of double-grid valve, in which the extra grid was given a high positive potential and used for the definite purpose of shielding the control grid from the plate, so as to prevent undesirable capacity coupling between the two.

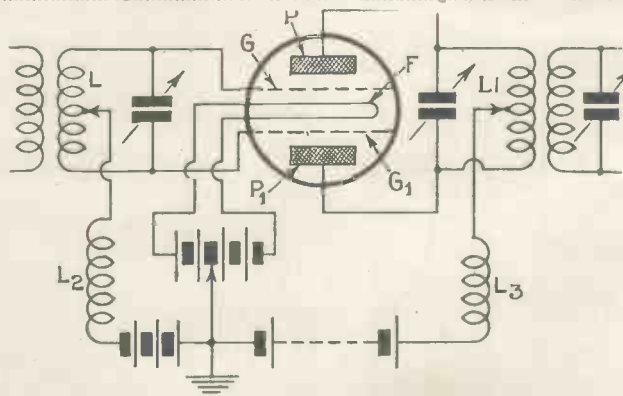
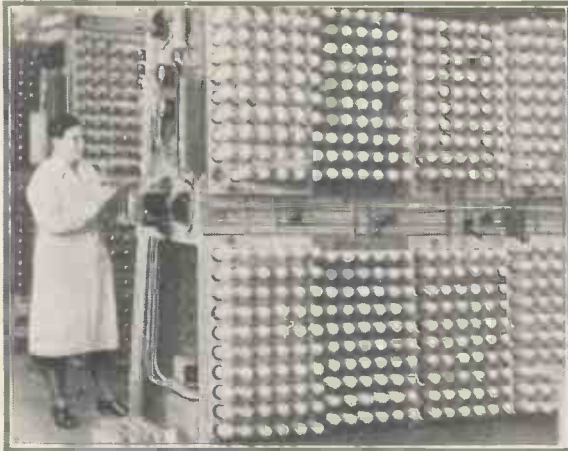
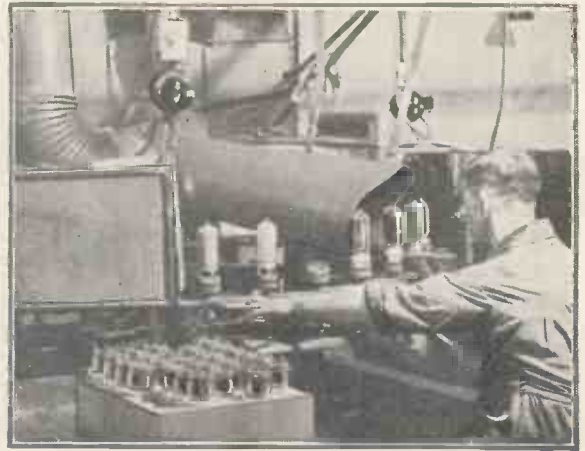


Fig. 2.—Single-bulb push-pull amplifier valve as used for high-frequency amplification



MULTIPLE VALVE ON THE AGEING RACKS

Loewe multiple-stage valves in a Berlin factory. The types include indirectly-heated stages and double-output valves



COATING VALVES WITH METAL SHIELDS

Another process in the Loewe factory. Here valves are being sprayed with molten metal to form the familiar screened bulb

There is another "multiple" valve—which is really long overdue—namely, the single-bulb push-pull amplifier. The idea of mounting two

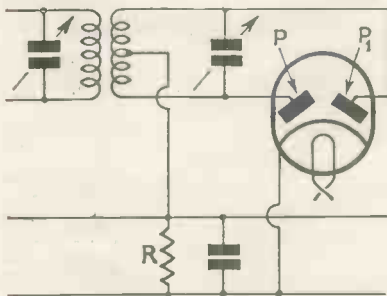


Fig. 3.—Circuit for use with a double-diode rectifier, as used in the five-valve A.C. set described in this issue

sets of grids and plates symmetrically about a common filament is nearly as old as push-pull amplification itself. It is almost certain, sooner or later, to come into use, both for high-frequency and low-frequency amplification, but more particularly for the latter.

Quiescent push-pull, which is now all the rage, must have caught the valve makers napping. Otherwise the single-bulb push-pull amplifier would already be on the market.

Double Triode

At first it is likely to be a double-triode combination of the kind shown in Fig. 1, but later on we shall, no doubt, have single-bulb push-pull pentodes. Low-frequency push-pull is now so commonplace that we may perhaps anticipate a little and show in Fig. 2 a single push-pull valve used as a high-frequency amplifier.

The two sets of grid and plate electrodes G, P and G₁, P₁ are

mounted symmetrically about the common cathode F, which can be heated from a battery as shown or indirectly through the mains.

The two grids are branched across the input coil L, which is centretapped to the filament so that when the signal voltage on one grid is positive that on the other is negative. The output coil L₁ is also centretapped to the high-tension supply so as to pass on the full load from the valve to the next high-frequency amplifier—or detector—as the case may be. Chokes L₂, L₃ keep the high-frequency currents away from the batteries.

Returning to the new rectifier valves, we find that they represent still another application of the push-pull principle. In the first place, push-pull rectification has the definite advantage of balancing out high-frequency currents and preventing them from getting into the low-frequency side of the set, where they are the source of much trouble.

In the second place, everybody nowadays is keen on automatic

volume control, and since the required control or biasing voltage must be derived from the carrier wave—so as not to interfere with modulation—we find another reason why full and efficient rectification is becoming the order of the day.

In the double-diode rectifier,

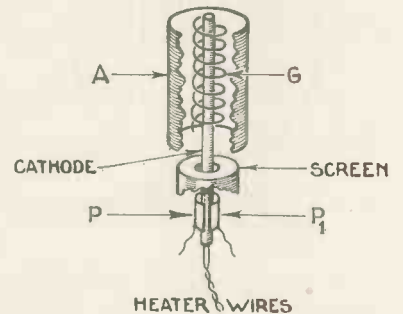


Fig. 5.—Structure of the duo-diode-triode, the electrode arrangement of which is shown in Fig. 4

shown in Fig. 3, the high-frequency input is applied in push-pull to the two plates P, P₁, so that full-wave rectification takes place, any residual "pulses" being fed in phase-opposition to the load resistance R, where they cancel themselves out.

The double-diode is a distinct improvement on the ordinary rectifying valve so far as automatic volume control is concerned, but the duo-diode-triode goes one better because it combines the process of rectification with a stage of low-frequency amplification, all in one valve.

The internal electrodes of the duo-diode-triode are shown diagrammatically in Fig. 4 and structurally in Fig. 5.

The two small plates, P, P₁, located near the indirectly-heated

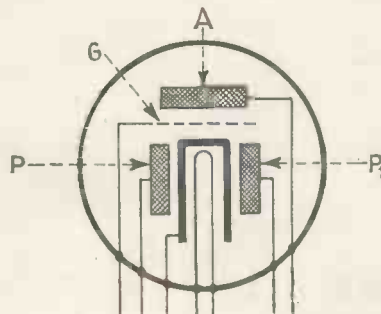


Fig. 4.—Electrode arrangement of the duo-diode-triode, a detector and low-frequency amplifier combined

cathode, act as a full-wave rectifier for the carrier wave, whilst the usual control grid G and plate P serve to amplify the rectified signal currents.

Fig. 6 shows the new valve in action. The two rectifier plates, P, P₁, are in push-pull across the centre-tapped input coil L, so that when one plate is positive the other is negative and vice versa. The rectified voltage due both to the carrier wave and the signals appears across the resistance R, the point

is inserted across the load resistance R to take care of any residual "ripple." The resistance R₄ provides "free" grid bias for the valve, whilst R₃ takes the place of the usual grid leak.

The double-diode-triode comes to us from America, where they seem to rejoice in adding to the number of electrodes that can be stowed away inside a single bulb.

For instance, their latest example is known as the "triple-twin" amplifier. This is in effect a two-stage single-bulb low-frequency amplifier which is designed to operate over the positive as well as the negative half of the voltage swing. Although grid current flows during the "positive" swing, its effect is automatically compensated, so that no distortion occurs.



IN HIS PRIVATE LABORATORY
Manfred von Ardenne, who is reputed to have the largest private laboratory in Berlin, discussing his cold-cathode valve with an assistant

A being positive and B negative. As the rectified C.W. current flows across R it creates a voltage which is directly proportional to the strength of the incoming carrier wave. This is applied through a resistance R₂, shunted by a smoothing condenser C, to the grid of the preceding high-frequency valve for automatic volume control.

Meanwhile, of course, there is also a fluctuating voltage across the resistance R, corresponding to the rectified signals. This A.C. component finds an easy passage through the condenser C₁ back to the grid G of the valve, where it is amplified and transferred to the first low-frequency amplifier on its way to the loud-speaker. The tapping point shown at T allows for an emergency "manual" volume control.

If the two rectifying plates are perfectly balanced there should be no out-of-phase high-frequency currents, but a small by-pass condenser

simply takes grid current during the positive swing of the input voltage leaving the other stage to do the useful work. During the succeeding half-cycle of the input, the position is reversed.

This, of course, is very similar to Q.P.P. The difference is, that the valve is specially designed to work at zero grid bias, whilst for Q.P.P. both valves are biased to the bottom bend of the characteristic curve.

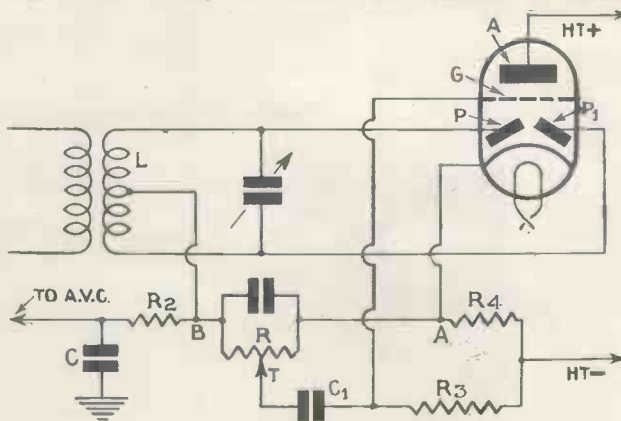


Fig. 6.—Automatic volume control circuit for use with the duo-diode-triode valve



FOR MAINS OPERATION

The new Timex electric clock made by Exide Services, Ltd., and sold at £1 10s. It is for use on synchronised mains

New Electric Clocks

ELECTRIC clocks for use on synchronised A.C. mains are steadily increasing in popularity and it is interesting to note that there is a newcomer in this field—Exide Services, Ltd., whose clocks will be sold under the name Timex.

Besides a model (No. AC303) for synchronised A.C. mains (illustrated above), there are two battery-operated models that sell at £2 5s. and upwards. The latter are freely portable from one place to another.

Every clock in the Timex range is guaranteed for three years; while the batteries in the battery-operated models are guaranteed for two years.

It should be emphasised, perhaps, that the A.C. mains model is only suitable for use on synchronised A.C. mains, which are controlled at the power station on a time basis.

A synchronised clock used on such mains can never be more than a few seconds off Greenwich time.

Moreover, it should be remembered that these electric clocks never need any winding.

The time will not be long in coming when no radio set will be complete unless it includes a built-in electric timepiece.



THE STAGE TAKES TO RADIO!

Enid Stamp Taylor, the well-known actress, is evidently very well satisfied with her Pye model Q portable, which is fitted with a moving-coil loud-speaker

Empire Broadcasts

IT is very difficult for us in England to judge of the success or otherwise of the B.B.C.'s Empire short-wave service from Daventry. I was therefore more than usually interested when a friend showed me a letter he had received from a naval wireless man stationed at Trincomali, Ceylon. He says:

"Re the Empire broadcast—out here I feel it isn't worth the trouble of playing about. In the northern end of the Persian Gulf (Basra, Abadan, Koweit, Bushire) the Canadian zone comes in grand on 49 metres. (Not quite so good as Moscow, about .5 metre away.)

In India and Ceylon

"In Indian and Ceylon waters, it is so insipid, so uncertain, weak, and fading severely, that it isn't worth the anguish of mind to bother. And that with tuned screen-grid high-frequency, detector, and umpteen low-frequency stages. Moscow on 49 metres (approximately) knocks spots off it!

"Furthermore, as this climate only permits restful sleep from local 11 p.m. onwards, couldn't the B.B.C. find a better time/wavelength combination?

RADIO MEDLEY

A Radio Fan's

Causerie :: By BM/PRESS

"The amazing thing is to read glowing accounts in the *English* papers re the success of the Indian zone. Perhaps—but not in most parts of India. I read and hear quite a lot of reliable amateurs' reports out here; and in general they confirm my comments."

These opinions, I would point out, are those of a man who is well experienced in naval short-wave working.

Mount Everest

As an almost complete contradiction to the above, however, I must draw

your attention to the fact that the Mount Everest expedition has been relying on Daventry for the transmission of its weather reports.

There is no station in India that is powerful enough, or reliable enough, perhaps, for this purpose. It was arranged that reports on the weather should be sent direct from Darjeeling, in India, to the B.B.C.'s Empire transmitter, whence they would be sent out on the usual short-wave service.

To pick up these messages, on which a great deal might depend, the expedition is equipped with specially cased models of the McMichael Colonial short-wave super-het. On the opposite page you will see a photograph of two members of the expedition looking over the equipment before leaving England.

"Station" Dials

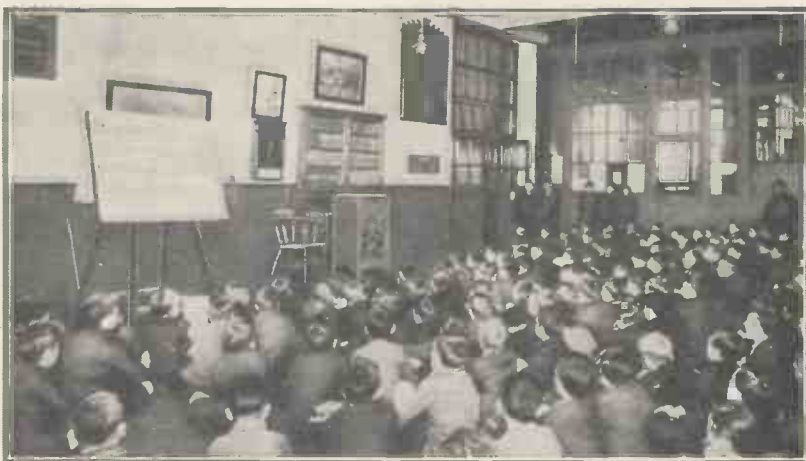
In the past I have had some hard things to say about station-calibrated dials in these pages. What is going to happen if the much-discussed Plan de Lucerne results in a complete reallocation of the European wavelengths?

Those listeners with name-calibrated dials will be in a nasty mess unless the manufacturers can quickly supply scales with revised engravings—a danger I have pointed out several times.

What the solution to the tuning-dial problem is, I don't know. I suppose the only way is to get a definite wavelength plan for the whole world; and for the whole world to stick to it—which is expecting something!

Rapid Development

Nobody can say just now that



SCHOOL IS MORE INTERESTING NOW

London schoolboys joining with the B.B.C. chorus in an English folk-song recital. The set is a Marconiphone model 330, approved by the Central Council for School Broadcasting

nothing new ever happens in wireless. Why, it is almost impossible to keep pace with all the latest developments—so many have come all at once. There is quiescent push-pull and "class B"; and there are any number of new valves as well.

And not only valves in the ordinary sense of the word, for we have now learnt something about the dry metal rectifier that will replace the usual detector valve in a multi-valve combination.

I don't know what else is in the offing; but I should like to suggest to the radio manufacturers that we have quite enough new things to digest for a few months before any more surprises are sprung on us!

Anyway, Q.P.P. and class B should do the high-tension battery makers some good; most people will want to push up the volume to its maximum—and then their battery consumption will go up as well!

High Tension for Q.P.P.

There seems to be some doubt among amateurs as to the essential features of a mains unit for supplying high tension to a set with quiescent push-pull or class B output. The position is really very simple, however.

What one has to contend with is a standing load of, say, 3 or 4 milliamperes and a peak load of perhaps 30 milliamperes. It is obvious that the mains unit must have extraordinarily good regulation if the voltage is to be kept anything like constant under these conditions.

Apparently the best way out of the difficulty is to use a mercury-vapour rectifier and mains transformers and smoothing chokes of very low resistance. I understand that the "Wireless Magazine" Technical Staff is looking into this problem; no doubt we shall hear of the solution shortly.

Super-het Popularity

There can be no question that the

super-het has come to stay for a long time. For some years it has been regarded as the best type of receiver for present-day conditions by the more ambitious listener.

Now I learn of at least two more manufacturers who will be putting a range of constructors' super-het coils on the market in the near future.

One of the greatest needs now is for some smaller intermediates; this is particularly the case if you want to build a transportable super-het. But I think that this problem may be solved for us in the near future—and from a somewhat unexpected quarter.

Moreover, I am surprised that those makers who some three years ago produced intermediate coils for

circles—for instance, has a most ambitious super-het supplied with 500 volts high tension from a valve rectifier.

When I met him the other morning he was bemoaning the fact that the night before his set would not work when he switched on. He investigated and found that an 8-microfarad fixed condenser, rated at 2,000 volts test and which had never had more than 800 volts across it, had completely given up the ghost.

What was worse still was the fact that the valve rectifier had completely lost its emission as a result of this breakdown.

The moral is that if you want really high power you must be prepared to pay for it!

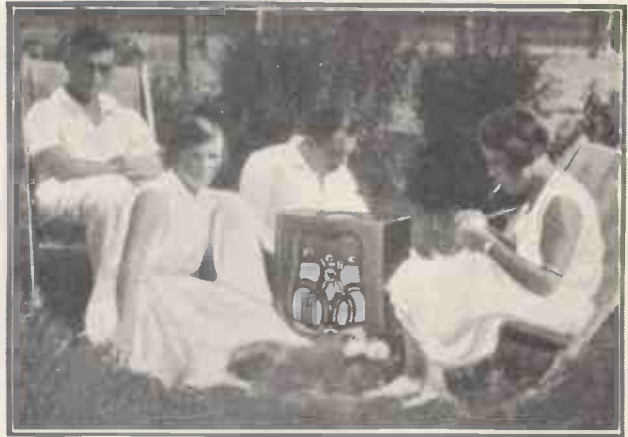
Radio for Motor Cars

I am surprised that so few British manufacturers—I believe that there is only one—have produced special receivers for use in motor cars. The problem is not an easy one to solve, of course, but I cannot help thinking that there would be a fair demand for a set at a reasonable price.

For some months I have been trying to make up my mind whether or not I want a radio set on my own car.

Several firms are now making resistances for putting in series with the sparking-plug leads to prevent interference with the set from that source.

The greatest difficulty, as I see it, is the loud-speaker. Where is it to be fixed? Modern cars are so compact that there is not much space to spare in any convenient position. London, W.C.1. BM/PRESS.



WHAT WE CAN LOOK FORWARD TO

This happy group is enjoying radio in the open air with the aid of a Marconiphone portable receiver



TESTING THE MOUNT EVEREST SET

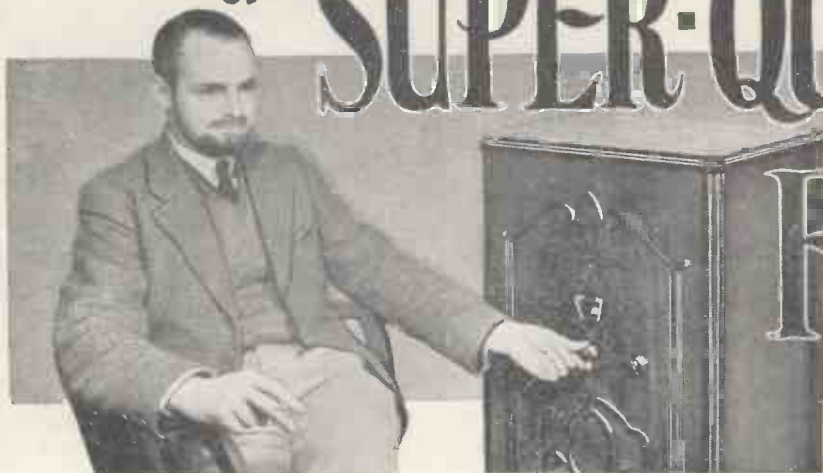
Two members of the latest Everest expedition testing the McMichael Colonial super-het receiver before setting out for India

plugging into valve holders have not changed the bases of their coils. With fixed-tuned intermediates there is no need for plugging in and out.

High-power Risks

Those of us who use high-power amplifiers have to face risks that are unknown to the ordinary listener. Mr. P. Wilson—"Gramophone" Wilson, as he is known in technical

The SUPER-QUALITY FIVE



The set in its Camco Gresham cabinet

In these pages the "Wireless Magazine" Technical Staff presents full constructional details of an ideal family radio gramophone with only three controls. It incorporates two variable- μ stages, a diode detector and a whistle filter—all in the interests of quality. All the power is taken from A.C. mains

SOME time ago the "Wireless Magazine" Technical Staff decided to produce an up-to-date design that would fulfil the following requirements:—

Three Special Features

(1) It was to be very simple to operate. This means one knob for tuning and one volume control, apart from the wave-change switch. In other words, there would be only three controls on the panel.

(2) It should give the very best quality it is possible to obtain from good but moderately-priced components. Moreover, it was desired that the quality should be equally satisfactory at all volume levels, and not drop off at low volume, as is so often the case.

(3) It should be made with parts that should stand up to hard usage without any troubles arising. It was also to be a complete radio gramophone operated from A.C. mains.

These requirements, it was felt, are those of many families, where good quality from a limited number of stations is preferred to a large

number of stations at somewhat inferior quality.

To avoid any misunderstanding over this point, let us emphasise the fact that however good a set may be it will not bring in some of the more distant, and therefore weaker, foreign stations at *really* good quality—because the quality is not in the

from the quality standpoint; that is extremely simple to operate; and that will at the same time give a selection of some thirty or forty foreign programmes of real entertainment value.

Simplicity of operation can easily be obtained by omitting a reaction control; that, more than anything else, is the stumbling block of the uninitiated. We wanted this set so arranged that it could be operated by any member of the family without any fumbling about.

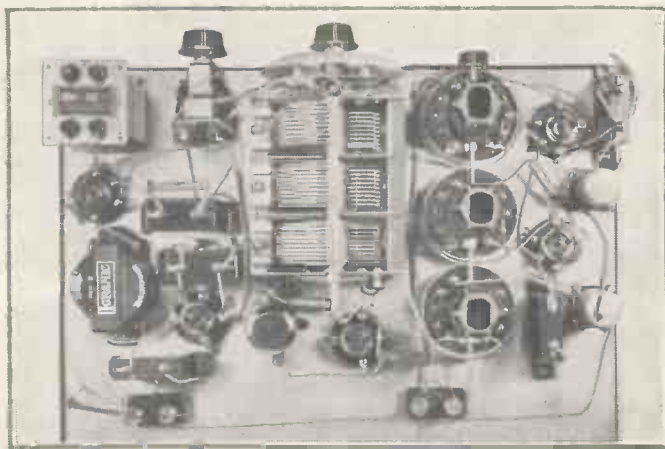
Tuning

The object was to have the set so that once the main tuning knob was turned to the correct setting nothing further had to be done except to adjust the volume.

Now, reaction is a most valuable weapon in bringing up the strength of weak

stations. If it is omitted it is essential to include a really good stage of high-frequency amplification; and immediately complications arise in the design, although not in the operation.

Even with modern efficient components it is not easy to produce a



STRAIGHTFORWARD CONSTRUCTION

This photographic plan view of the Super-quality Five shows how simple is the layout and wiring. The construction will not present any difficulty

transmission in the first place.

A great deal of experimental work has been done on these lines in the "Wireless Magazine" laboratories, and the Super-quality Five is the result.

Here we have a receiver that will satisfy the most fastidious listener

really high stage gain with complete stability. But that much has been achieved, we claim, in the high-frequency end of the Super-quality Five.

Two screen-grid valves of the variable- μ type are utilised, which means that there must be at least three tuned circuits (one for the aerial and two associated with the valves).

The problem, then, is to decide whether to introduce band-pass coupling in the aerial, which means adding a fourth coil and the use of a four-gang condenser.

Gain in Performance

Constructors know very well that coils and tuning condensers cost money; and there is no object in adding to the expense of a set unless some corresponding gain is obtained in performance.

Tests were therefore carried out to see whether an adequate degree of selectivity could be obtained from three tuned circuits controlled by a three-gang condenser.

It was found that with this arrangement the local stations spread only a few degrees, and there was no difficulty about separating foreigners. The results obtained with the final design will be clear from the test report on page 379.

COMPONENTS NEEDED FOR THE SUPER-QUALITY FIVE

CHOKES, HIGH-FREQUENCY

- 2—Wearite screened, type HPPA (or Goltone, Bulgín), 8s.
- 1—Kinva screened, major type (or Goltone, Bulgín), 5s. 6d.

CHOKE, LOW-FREQUENCY

- 1—Sound Sales standard 30-henry (or Parmeko, Ferranti), 14s.

COILS

- 1—Telsen set of three matched coils, type 288, with coil-switch coupling assembly, £1 6s.

CONDENSERS, FIXED

- 2—British Radiophone .0001-microfarad, type TW10 (or Lissen, Graham-Farish), 1s.
- 2—British Radiophone .0003-microfarad, type TW30 (or Lissen, Graham-Farish), 1s.
- 1—Dubilier .2-microfarad centre-tapped, type BE256 (or Lissen, Graham-Farish), 2s. 6d.
- 3—British Radiophone 1-microfarad, type BT10 (or Formo, Peak), 5s.
- 2—British Radiophone 2-microfarad, type BT200 (or Formo, Peak), 6s. 8d.
- 2—Dubilier 4-microfarad dry electrolytic, 450-volt working (or T.C.C., Hellesen), 9s.
- 1—Dubilier 8-microfarad dry electrolytic, 450-volt working (or T.C.C., Hellesen), 5s. 6d.

CONDENSERS, VARIABLE

- 1—Polar Star three-gang .0005-microfarad with disc drive (or Utility, British Radiophone), £1 10s. 6d.

FUSE

- 1—Belling-Lee twin baseboard-mounting fuseholder, with fuses (or Bulgín), 2s. 6d.

HOLDERS, VALVE

- 5—Telsen five-pin, type W225 (or W.B., Lotus), 3s. 4d.

METAL RECTIFIER

- 1—Westinghouse HT8, 18s. 6d.

RESISTANCES, FIXED

- 2—Erie 300-ohm, 1-watt type (or B.A.T. Dubilier), 2s.
- 1—Erie 10,000-ohm, 1-watt type (or B.A.T. Dubilier), 1s.

- 1—Erie 12,000-ohm, 1-watt type (or B.A.T., Dubilier), 1s.
- 1—Erie 25,000-ohm, 1-watt type (or B.A.T., Dubilier), 1s.
- 1—Erie .25-megohm, 1-watt type (or B.A.T., Dubilier), 1s.
- 1—Erie .5-megohm, 1-watt type (or B.A.T., Dubilier), 1s.

RESISTANCES, VARIABLE, COMBINED WITH SWITCH

- 1—Preh dual potentiometer, 5,000 and 100,000-ohm, combined with gramoradio switch, 8s. 6d.

SUNDRIES

- Tinned-copper wire for connecting, say 1s.
- Lengths of oiled-cotton sleeving, say 2s. 6d.
- Length of Goltone shielded cable, say 9d.
- 1—Wearite mounting bracket, 6d.
- 1—C.A.C. sheet of Konduktite, 2s.
- 2—Lissen terminal blocks, marked: H.T. + and H.T.—, Aerial, and Earth, 2s.

SWITCH

- 1—Becker mains on-off, type 462, 2s. 3½d.

TRANSFORMER, LOW-FREQUENCY

- 1—Igranic Acme, ratio 1 to 3 (or Ferranti AF3, R.I. Hypermu), 17s. 6d.

TRANSFORMER, MAINS

- 1—Parmeko, type HT8/D, £1 15s.

WHISTLE FILTER

- 1—Bulgín, type B, 10s. 6d.

ACCESSORIES

CABINET

- 1—Camco Gresham radio gramophone, in walnut, £6.

GRAMOPHONE MOTOR

- 1—Simpson electric turntable, £1 19s. 6d.

LOUD-SPEAKER

- 1—Ormond permanent-magnet, type R/464, £3 5s.

PICK-UP

- 1—Simpson straight-track arm and pick-up, £1 12s. 6d.

VALVES

- 2—Cossor MVSG metallised, £1 18s.
- 1—Mazda AC/DD metallised, 13s. 6d.
- 1—Micromesh HLA1, metallised, 13s. 6d.
- 1—Micromesh PA1, 17s. 6d.

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower.



Before the set was built up in its final form some time was spent over the choice of actual components. Unless the coils, for instance, are properly matched by

the makers, it is impossible for the user to get correct trimming. The coils finally decided on have been found in practice to be matched within close limits, and there has been no trouble whatever in ganging them.

Condenser Matching

Equally as important as the matching of the coils is the matching of the three-gang condenser. The model we have used comes up to all requirements in this respect; it has the further advantage that the trimmers are provided with screw heads that are readily accessible for trimming.

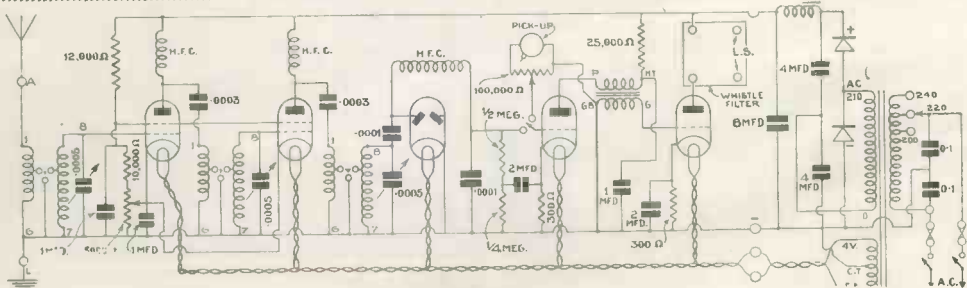
Having provided adequate selec-

TWO VARIABLE-MU VALVES

The two variable- μ valves used in the Super-quality Five can be seen to the right of the baseboard. In front of them are the triple-coil unit and the three-gang condenser.

CIRCUIT DIAGRAM

The valve combination consist of two variable- μ stages, diode detector, intermediate low-frequency valve. The output choke takes the form of a whistle filter. Metal rectification is used for the A.C. mains supply





COMPACT ASSEMBLY

This view of the completed Super-quality Five shows how compact is the assembly. The mains unit is placed on a shelf at the bottom of the Camco cabinet

tivity, we were next confronted with the question of quality. With variable- μ valves there is no high-frequency distortion or cross-modulation, so we can go at once to the detector.

Detector Alternatives

It is well known that the ordinary three-electrode valve with its non-linear characteristic leaves much to be desired in this respect. The alternatives are to use a diode, a double diode, or a metal rectifier.

The difficulty about the last two methods is that the tuning coil must be centre-tapped; and at the present time no commercial coils are thus tapped. We were faced with the problem of whether to have special tapped coils made or whether to make do with a plain diode detector.

Standard Parts

On the grounds that most constructors prefer to use standard parts that can be obtained without difficulty, we decided in favour of the diode detector with standard coils.

It should be noted here, though, that those who are experimentally inclined can try double-diode or metal rectification without much trouble.

The coils used are actually high-frequency transformers with a tuned

secondary (grid) winding. It will not be a difficult matter for the constructor to tap off on this winding if it is desired to use a double-diode arrangement or a metal rectifier.

An article by W. James on the use of the metal rectifier (with circuits) appears on page 380 of this issue; those who are interested should read those notes for further information.

Actually the detector valve used in the set is a double-diode type, but it is used simply as a plain diode. The two anodes are *not* strapped together as the valve is found to work best with only one anode in use.

Of course, the diode detector does

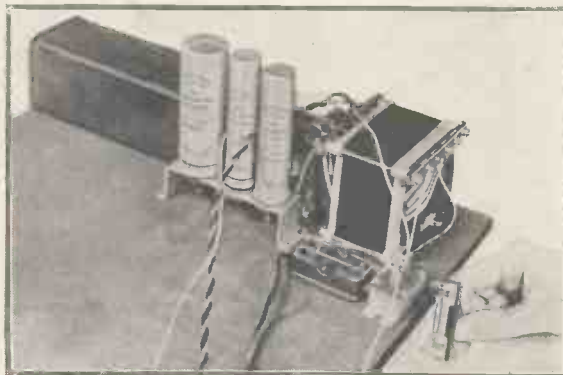
For that reason the extraordinarily efficient Micromesh valves have been used for low-frequency amplification. A glance at the valve tables printed at the beginning of this issue will show that the amplification factors of these valves are much higher than those of other valves of equivalent impedances. If other valves are used a fair amount of amplification will be lost.

Mains Rectification

Metal rectification is used for the mains supply because the recent questionnaire printed in "Wireless Magazine" showed an overwhelming vote in favour of this as compared with a valve rectifier.

Metal rectifiers give a consistently good performance over a period of years and are not subject to deterioration or the possibility of burning out. The type employed gives an output of 60 milliamperes at 200 volts, ample for our present needs.

There is nothing unusual about the mains unit for the Super-quality Five, which follows stan-



SEPARATE MAINS UNIT WITH METAL RECTIFIER

The construction of the mains portion of the Super-quality Five is quite straightforward. It is adequately smoothed, and there is no trace of hum

not amplify at all, so it is essential to use an intermediate low-frequency amplifier between the detector and the power valve. Moreover, to get really good volume it is desirable that the valves used in the last two stages should have high amplification factors.

dard practice in every respect.

One refinement incorporated in the circuit is a whistle filter; this takes the form of an output choke that cuts off everything above 4,500 cycles. This means that high-pitched whistles resulting from interference between stations working on



A QUALITY SET FOR THE RADIO CONNOISSEUR

A view of the Super-quality Five with the valves and coil covers in position. Trimming presents no difficulties, and there is only one knob to tune

adjacent wavelengths is effectively cut out; moreover, needle scratch produced by a pick-up is also greatly reduced.

There is no need to go into the details of the circuit, which is shown in theoretical form on page 375. All the necessary decoupling has been included and there is no likelihood of the set being unstable in operation.

Full-size Blueprints

Although the essential details for the construction of the set are included in these pages, we know that many constructors will prefer to work from a full-size blueprint.

One of these can be obtained at half price, that is 9d., post paid, if the coupon on the last page of the issue is used by May 31. Address your application to "Wireless Magazine" Blueprint Dept., 58/61 Fetter Lane, London, E.C.4. and mention the reference No. WM320.

The layout of the parts on the baseboard is perfectly straightforward, as will be clear from the photographs and the quarter-scale wiring diagram reproduced on page 378.

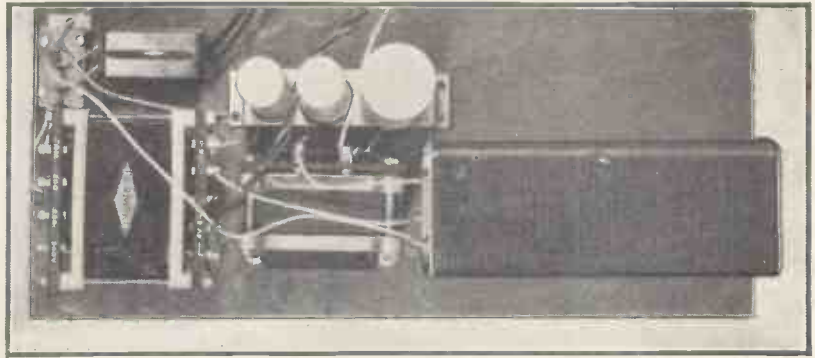
It should be noted that in the interests of stability three screened high-frequency chokes are employed. Those at the right of the baseboard (looking from the back) are provided with pigtailed connections to the anode terminals on the tops of the variable- μ valves.

It is desirable that the third choke, used in the anode circuit of the detector valve, should *not* be of the same type as the first two, or unwelcome resonance may arise between them.

Metal Foil

The whole of the baseboard is covered with metal foil or a sheet of Konductite; a number of connections are screwed direct to this metal foil.

As far as the wiring goes, there will be no difficulty if the blueprint is used. On this, each wire is numbered



PLAN VIEW OF THE MAINS PORTION OF THE SET

For convenience, and in order to obviate the possibility of hum produced by induction, the mains portion of the Super-quality Five is built up as a separate unit

separately in the best and most convenient order of assembly. Start off with wire No. 1, and then carry on in the correct numerical order until all the connections have been completed.

There are, of course, no battery leads as all the current for operating the set is obtained from the mains. The two low-frequency valves are provided with automatic grid bias.

One point about the wiring that should be specially noted is that a number of the connections are made with shielded cable. In these

cases the metal sheathing should be earthed to the metal foil on the baseboard by means of a piece of fine bare wire twisted round it (or soldered to it) and then screwed to the foil.

Dual Volume Control

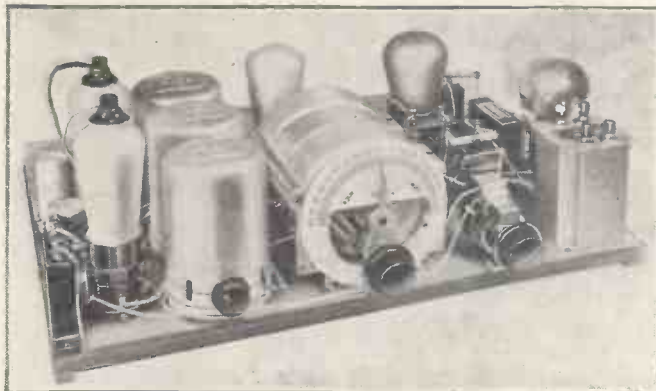
Care should be taken with the wiring of the dual potentiometer, which also incorporates a switch. This controls volume for both radio and record reproduction, and also switches over from radio to records as desired, or vice versa.

As soon as the wiring has been completed, and the valves placed in position, the set can be put into operation by plugging in the mains connection. The mains on-off switch can very conveniently be fixed to one side of the cabinet.

It will be clear that as there are only three controls on the front of the set the operation is not at all difficult. There is the wave-change switch associated with the coils on the left; the main tuning knob in the centre; and the combined volume control and gramo-radio switch on the right.

The operation of the last is somewhat unusual. When the knob is turned as far as possible to the left the set is adjusted for full-volume radio reproduction.

As soon as it is turned 150 degrees to



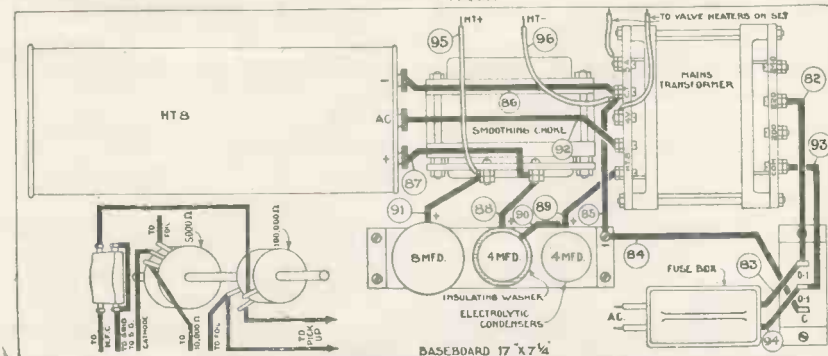
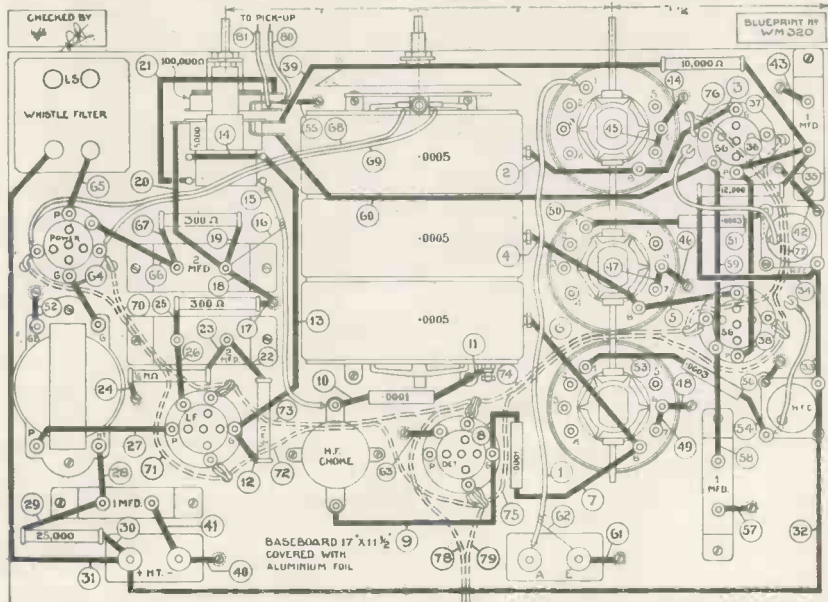
ONLY THREE CONTROLS TO OPERATE!

Anybody can work the Super-quality Five. On the left is the wave-change switch; in the centre the main tuning control; and on the right the combined dual volume control and gramo-radio switch



MOTORBOARD ASSEMBLY WITH SYNCHRONOUS DRIVE

The Simpson motor and pick-up assembly mounted on the motorboard of the Super-quality Five. There is ample room in the Camco cabinet



QUARTER-SCALE LAYOUT AND WIRING DIAGRAM
 If desired a full-size blueprint can be obtained for half price, that is 9d., post paid, if the coupon on the last page of the issue is used by May 31; ask for No. WM320. When wiring up do so in the numerical order indicated

the right the gramo-radio switch is brought into operation, and the set is switched over from radio to records.

In the intermediate positions (that is from full left to the middle position) the volume is progressively decreased for radio reproduction.

As the knob is turned from the middle position to the full right position, the volume of record reproduction is gradually brought up to its maximum.

Automatic Switching

Remember, full left for maximum radio volume and full right for maximum gramophone volume. In the middle position the set is automatically switched over from the radio to gramophone, or vice versa.

When a station has been tuned-in it is desirable to trim the three-gang condenser.

This is best done on some station

working on a wavelength of about 400 metres.

Place the first trimmer (that is the

one remote from the front of the set) in about its half-way position, and then adjust the other two for the maximum strength for the particular station being received.

As the trimmers are turned, of course, it is necessary to swing the main tuning knob about the tuning point so that the position of maximum strength can be determined.

Aerial Trimming

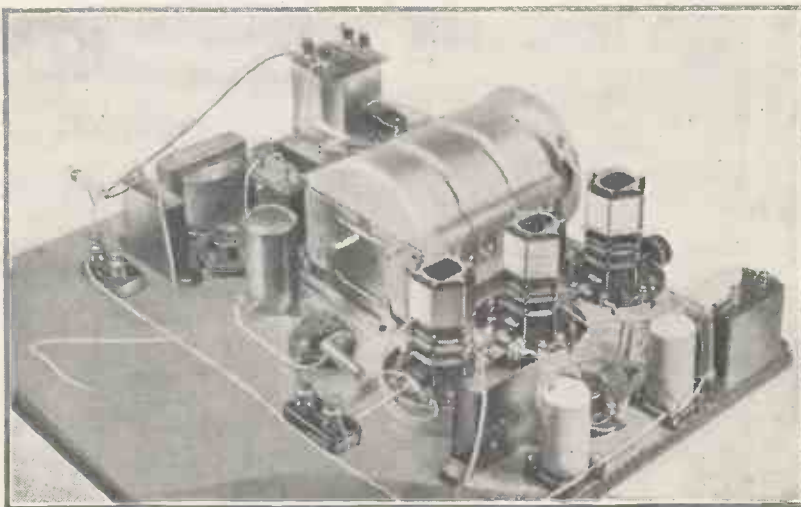
When the second two trimmers have been adjusted the first trimmer should be moved, also for the maximum strength. If the set is ever used on a different aerial from that on which it was first trimmed, complete retrimming will be necessary.

As soon as the set has been properly trimmed it will need no further attention, and every member of the family will be able to enjoy the very best radio or record reproduction without any fiddling about.

Simple Operation

It is only necessary to adjust the wave-change switch for the desired waveband; tune to the desired station by means of the centre knob; and adjust the volume by means of the right-hand knob.

With the Super-quality Five you will be able to enjoy the very best quality of reproduction from more than a score of foreign stations—and you will also be able to reproduce your favourite gramophone records at full volume and first-class quality. It is an ideal family set, free from troubles.



TWO VARIABLE-MU'S AND DIODE DETECTOR

With its up-to-date valve combination and good quality components the Super-quality Five is the ideal set for the connoisseur—and there is only one knob to tune!

Remarkable Results on Test!

Simplicity of Tuning :: Unusual Quality :: Freedom from Interference :: For Every Member of the Family to enjoy



A FINAL LOOK OVER THE SET
A member of the "Wireless Magazine" staff making a final try-out of the Super-quality Five before passing it for press

SEVERAL pleasant and interesting hours were spent on the test of the Super-quality Five, which was carried out in South London. My first impression was the *extreme simplicity of the tuning*, together with good sensitivity and selectivity and an *unusually pleasing degree of quality*.

I found it possible by setting the volume control at about the three-quarter position to make tuning purely a one-knob business. *Station after station came in remarkably free from interference* and at full loud-speaker strength.

Local-station Volume

Of course, for local-station reception the control was turned right down. I found that with a normal outdoor aerial it was necessary to turn the volume control to zero for local-station reception.

The simple tuning of this set will be appreciated by the *non-technical members of the family*.

The list of stations at the bottom of this page tells the story of the set's sensitivity. Only stations that gave *entertainment* are included in this list. No doubt the "fan" could double the list in quite a short time, but his additional stations

would not, to my idea anyway, be of listening value.

Particularly fine results were obtained on the long waveband. In the course of an evening I heard *fourteen very strong signals* on this wave-band. The reception of the eleven, which are named, is one of the most outstanding features of the set.

You will notice that I have included Königswusterhausen — sometimes called Zeesen. This station was heard entirely free of interference by Radio Paris and Daventry. Rather an incredible feat for a set with three simple-tuned circuits, you will agree!

Moscow broadcasting a talk on economical affairs, and Heston and Croydon Airports broadcasting weather reports were other interesting "catches."

A big outdoor aerial is not necessary with this set. In fact, I

Fourteen Long-wave Signals :: Good Results on Short Aerial :: No Trace of Mains Hum :: Thirty or Forty Foreign Stations

found that the *best results were obtained with a piece of wire about 35 ft. long*. I easily logged between ten and a dozen signals in broad daylight on a small indoor aerial.

I am not going to make claims for super-het selectivity on the medium waveband. London Regional spread thirteen degrees on the 180-degree dial, and London National occupied about five degrees. There was no trace of Mühlacker when listening to London Regional, or Frankfurt when listening to London National.

No Unpleasant Jamming

Except in the immediate vicinity of the local stations there is no unpleasant jamming of adjacent stations. *Every station on my log was entirely a separate signal*. Prague, North Regional, and Langenberg were three separate signals with no overlap. Surely sufficient proof of adequate selectivity.

I was very impressed with the quality of this set.

The clean tonal definition noted should appeal to any listener who has an atom of musical appreciation. There is *absolutely no trace of mains hum*; the background is as silent as a battery set.

T. F. Henn.

Log of Stations Received in an Evening

Long Waveband		Station	Dial Reading	Station	Dial Reading	Station	Dial Reading
Station	Dial Reading	Kaunas ..	158	Genoa ..	58	Belgrade ..	112
Oslo ..	48	<i>(Also three strong signals not identified.)</i>		Breslau ..	62	Stockholm ..	115
Kalundborg ..	56	Poste Parisien ..	65	Rome ..	117	Beromuenster ..	127
Moscow ..	70	Milan ..	67	Beromuenster ..	127	Langenberg ..	133
Motala ..	75	Brussels No. 2 ..	70	Langenberg ..	133	North Regional ..	138
Warsaw ..	83	London Regional ..	78	North Regional ..	138	Prague ..	140
Eiffel Tower ..	88	Scottish Regional ..	87	Prague ..	140	Florence ..	148
Daventry National	100	Toulouse ..	90	Florence ..	148	Brussels No. 1 ..	152
Königswuster-		Leipzig ..	93	Brussels No. 1 ..	152	Vienna ..	156
hausen ..	115	Midland Regional ..	97	Vienna ..	156	Munich ..	165
Radio Paris ..	125	Sottens ..	100	Munich ..	165	Sundsvall ..	170
Huizen ..	147	Athlone ..	105	Sundsvall ..	170	Budapest ..	175
		North National ..	53	Berlin ..	108		

How to Use the Westector

By W. JAMES

Great interest is being taken in the possibilities of the new metal rectifier designed to replace the detector valve in a multi-valve receiver. In these notes W. JAMES explains how the new detector is actually used; his remarks are illustrated by a number of representative circuits. A general article on the action of the detector appeared on page 260 of the April issue

EVERY wireless receiver must have a rectifier. In many sets the grid condenser and leak type is fitted. Other sets have an anode-bend rectifier, and some sets are fitted with a diode or double-diode type.

reliable. They have stable characteristics, seem to last for many years and are, of course, a mechanically sound job.

Smaller patterns have been used in measuring instruments and now the makers are producing patterns suitable for use in receivers. A rectifier connected in a receiver has supplied to it modulated high-frequency currents and the output is a low-frequency current plus high-frequency components.

Briefly, the rectifier is used for the purpose of giving us the low-frequency part of the signal, but the high-frequency currents which also flow in the output are often made use of, as, for instance, in a reaction circuit. Most valve detectors are rectifiers and amplifiers.

2 volts, according to the degree of modulation. This would also apply to a diode rectifier and to a crystal detector.

Rectifier Pure and Simple

The Westector scores, however, in that it is a small component, mechanically and electrically stable, having definite characteristics. It must be properly used, according to its characteristics and always bearing in mind the fact that it does not magnify, but is a rectifier pure and simple.

The rectifier actually consists of tiny discs of treated copper. Rectification presumably occurs at the junction of the copper and the film of oxide provided during the manufacturing process.

The lead washers are used merely as a convenient way of picking up contact with the oxide, so that one side of the circuit goes to the copper and the other to the lead washer which is making contact with the treated surface.

Discs in Series

As a rule, two or more sets of discs are used in series. It will be appreciated from this description that the rectifier is mechanically sound.

If you measure the output current for various input voltages and plot the result, it will be seen that above inputs of about .25 volt the characteristics is straight. In other words, apart from the first .25 volt, the output varies exactly with the input and the rectifier is, therefore,

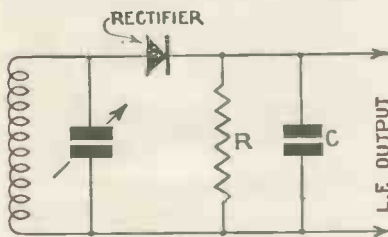


Fig. 1.—Simple detector circuit for Westector

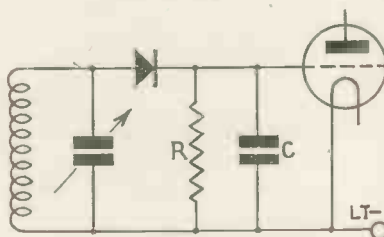


Fig. 2.—Varying the bias on the high-frequency valve

A few years ago the crystal rectifier was fitted to many sets, and in the future we shall see other types, such as the combined diode or double-diode plus either a triode, screen-grid or pentode in the one glass bulb.

In this case a rectifier and a magnifier are combined in the one bulb for convenience and cheapness. At the present time we have a new development, the Westector.

Everybody must be familiar with the Westinghouse power rectifier, such as is used for rectifying alternating current for the high-tension supplies of sets and for battery charging.

These rectifiers, with their treated copper discs, lead washers and cooling fins, have proved to be

In the grid condenser and leak type, for example, the signal is rectified in the grid circuit and the valve magnifies the rectified output. The point is that if we apply, say, .25 volt of modulated high-frequency current to the grid circuit, we may get out 2 volts of low frequency.

The actual output will vary with the degree of modulation and the constants of the circuit and valve, but considerable magnification can be, and is usually, obtained.

Now the Westector is in some respects like a valve diode. It does not magnify at all. It is a rectifier pure and simple. If you apply to the rectifying circuit a signal of, say, 5 volts high frequency, the low-frequency output will be perhaps

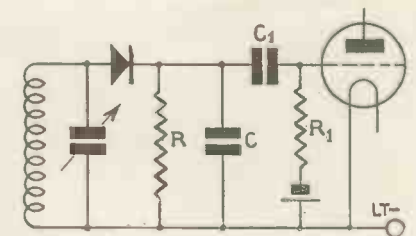


Fig. 3.—Addition of a further coupling

distortionless. The characteristics are, in fact, very much like those of a diode valve. Large inputs can be applied, such as 25 volts or more, according to the particular model used.

It seems apparent from these remarks that the rectifier is not a weak-signal detector, like the leaky-grid valve arrangement, but may be used to deal with strong signals.

Now, owing to the particular construction of the Westector the capacity is rather high. This may not matter at all in certain circuits but the point should be noted. It depends upon how the rectifier is used.

A larger capacity may be used up to the point where the quality is being affected. This will depend upon the loud-speaker and power valve, as is usual.

When strong high-frequency currents are being dealt with it is possible that a filter must be connected as in Fig. 4, consisting of the high-frequency choke coil and the second condenser C_2 . These parts will effectually stop high-

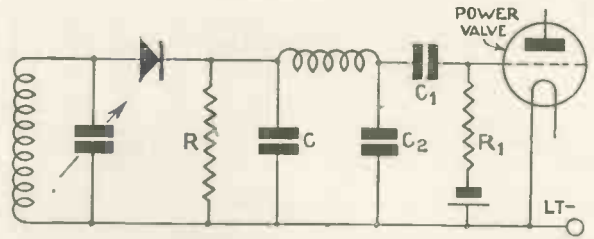


Fig. 4.—High-frequency filter for use with Westector

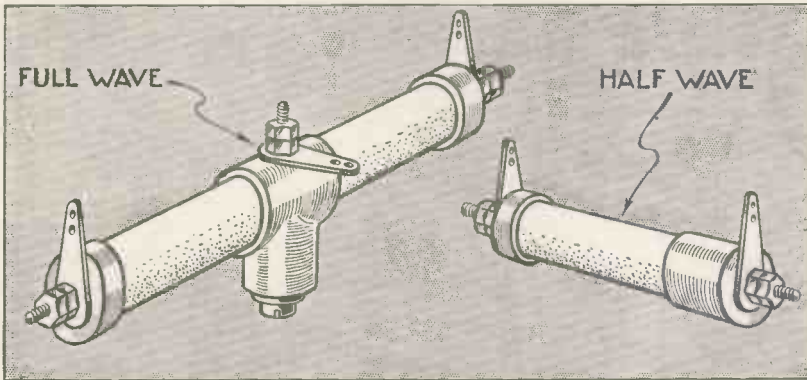
frequency filter for use with Westector detector valve. But if you try this, do not forget that the valve magnifies, say, twenty times whilst the Westector does not magnify.

You are, therefore, bound to notice a reduction in the general sensitivity of the set, but don't forget that you have taken a valve out. If the valve was used as a low-frequency resistance-coupled magnifier, the sensitivity would, naturally, be brought up.

Full-wave Rectifier

There are a number of possible circuits, some being variations of those already given. Thus a full-wave type of Westector is connected as in Fig. 6. Note that, as drawn, both sides of the tuned circuit are at high-frequency potential to earth, but this would not matter in the fixed-tuning arrangement of a super-heterodyne transformer.

A filter circuit is shown for preventing high-frequency from entering the power valve. There is nothing exceptional about this circuit, but probably the normal *Continued on next page*



METAL RECTIFIERS TO REPLACE THE DETECTOR VALVE

The small unit is a half-wave Westector and the large model is for full-wave rectification

In many cases the capacity will be of no importance. The rectifier can be connected into a simple circuit as in Fig. 1. Here the rectifier is in series with a resistance R.

Across the resistance is a condenser C, which is the usual by-pass condenser. The output must, of course, be applied to a power valve.

If the valve is connected as in Fig. 2, the bias of the grid of the valve will vary according to the strength of the high-frequency signal. This is hardly desirable, so a further coupling must be added as in Fig. 3.

Low-frequency Coupling

Here a grid condenser and leak low-frequency coupling is fitted. The condenser C_1 is the coupling condenser and R_1 is the leak, these parts having usual values, such as .01 microfarad, or more, and 1 or 2 megohms.

The by-pass condenser C may be of .0003 microfarad and the resistance R of 250,000 ohms. As condenser C is across R, the tendency will be for the condenser to by-pass a little of the higher notes of the audio-frequency output as well as the high-frequency currents.

frequency currents from entering the power valve.

The rectifier and its circuit does not magnify. If the value of the resistance R_1 in series with the rectifier is lowered, the low-frequency output will fall, so the value must be made as high as possible, always bearing in mind the various shunting condensers and their effect.

Some step-up can be obtained by using a good coupling transformer of about 3-1 ratio between the rectifier and the valve, as shown in Fig. 5. A transformer of good design must be used, with a large inductance. The step-up obtained by the coupling transformer is very useful.

It is easy to apply the rectifier to a super-heterodyne set in place of the usual second

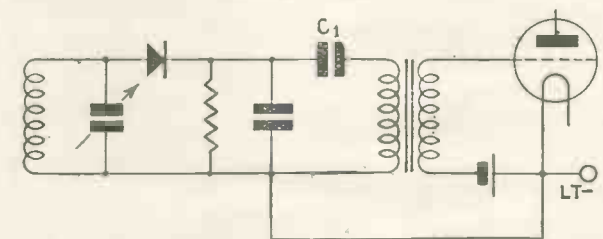


Fig. 5.—Use of coupling transformer between rectifier and valve

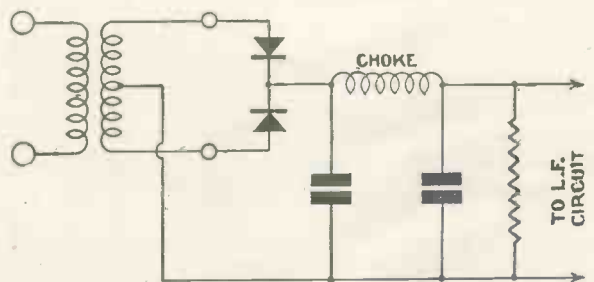


Fig. 6.—Connections for a full-wave Westector

Stories of the Operas

WILLIAM TELL (Rossini)

CHARACTERS

WILLIAM TELL.....Baritone
 HEDWIGA, his wife.....Soprano
 JEMMY, his son.....Soprano
 ARNOLD, suitor of Matilda.....Tenor
 MELCHTAL, Arnold's father.....Bass
 GESSLER, Governor of Schwitz and Uri.....Bass
 MATILDA, Gessler's daughter.....Soprano
 RUDOLPH, captain in Gessler's guard.....Tenor
 WALTER FURST.....Bass
 LEUTHOLD, a shepherd.....Bass
 RUEDI, a fisherman.....Tenor
 Time: Thirteenth Century Place:
 Switzerland.

ACT I

Lake Lucerne, on which Tell's house is situated. The day of the Shepherd Festival. According to custom, Melchtal blesses all loving couples in their midst. His son Arnold asks no blessing, although he loves Matilda, because his heart is in his native land.

The Festival proceeds until interrupted by a sound of horns heralding the approach of Gessler, the hated tyrant and Governor of the district. Leuthold, the shepherd, rushes in, breathless. He has been obliged to kill one of Gessler's soldiers who has insulted his daughter. He is being pursued.

Tell acts immediately. Gessler's guards are already in sight with Rudolph at their head. Tell manages to get the fugitive away, but the soldiers carry off old Melchtal.

ACT II

Arnold and Matilda are in a valley by the lake. There is a love scene between them. Arnold learns from Tell that his father, Walter Furst, has been slain at Gessler's command. He becomes vengeful at once and pledges himself to help to free Switzerland from the Austrian yoke.

ACT III

The market place at Atdorf. There are further celebrations, but they chance to be the centenary of Austrian rule in Switzerland. Gessler, in order to irritate the Swiss, has ordered his hat to be placed at the top of a pole. The Swiss peasants are commanded to make obeisance to the hat.

Tell comes in with his son, Jemmy. He refuses to pay homage to any man's hat, much less Gessler's. He is recognised as the man who saved the life of the shepherd Leuthold. He must therefore be punished. Gessler orders him to shoot an apple from Jemmy's head. The shot is successful.

Tell informs Gessler that, had he missed, he would have shot the second arrow at him. Gessler orders Tell's arrest, but the Swiss, fully armed, approach. Gessler falls by Tell's shot and the fight ends with victory for the Swiss. Matilda finds refuge in the arms of her lover Arnold.

WHITAKER-WILSON

Voltage-dropping Resistances

FREQUENT argument arises as to the best method of employing resistances in decoupling or voltage-dropping circuits when a considerable wattage has to be dissipated.

Supposing that 10 watts has to be got rid of in the resistance, one school of thought advocates the putting of two 5-watt resistances in parallel, using double the required resistance in each branch, while the other school of thought is all in favour of using two resistances, each half the required total, and putting them in series.

Nothing to Choose

Electrically, there is nothing to choose between the two methods. Suppose we have to drop 100 volts in a circuit carrying 100 milliamperes. We must use a resistance of 1,000 ohms, and it would dissipate 10 watts.

Such a resistance is difficult to get hold of, and two 5-watt resistances are far more convenient. If we put two 2,000-ohm resistances

in parallel the voltage drop is still 100 volts and the dissipation in each arm is 5 watts.

On the other hand, if you pass 100 milliamperes through a resistance of 500 ohms you will drop 50 volts and dissipate 5 watts. Therefore, if two 500-ohm resistances are placed in series the total drop is 100 volts and the total dissipation 10 watts.

Practically considered, the series arrangement has some definite advantages. In the first place, if one of the resistances breaks down there is a total cut-off of current, and no possible harm can come to other components in the circuit.

In the second place, lower value resistances are frequently somewhat cheaper and welcome economy can be effected in cost.

J. H. R.

HOW TO USE THE WESTECTOR

Continued from page 381

half-wave arrangement will be more widely used.

It is easy to connect parts to the half- or full-wave circuits for providing bias which varies with the strength of the signal as in various automatic volume control arrangements (see Fig. 7).

Note the polarity of the detector; as the strength of the signal increases so the voltage drop across R_1 increases and the value of the bias also increases.

Strength Decreased

If this is applied to the grid circuit of the high-frequency magnifying valves the strength of the signals will be decreased. The resistance R_2 and the condenser C_2 are for filtering and may have values of .25 megohm and 1 microfarad. This is a circuit worth experimenting with.

It is possible to use the full-wave rectifier in the same way.

Being a new device, it may be used wrongly at first. It has a fairly low impedance compared with some valve circuits and the question of the damping effect must, therefore, be considered.

Broadness of Tuning

If the rectifier and its coupling is joined across the whole of a tuned circuit the tuning will be made broader. By how much, relatively, depends upon the sharpness of tuning in the first place. A circuit consisting of a thin-wire coil and its tuning condenser may tune broadly by itself and the addition of the rectifier to it will perhaps hardly affect the results.

With a good circuit, however, it is advisable to connect the rectifier to a tap on the coil, as a grid rectifier is sometimes connected. This reduces the damping effect and may not cut down the strength at all.

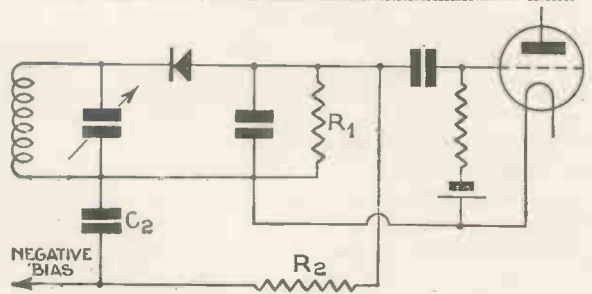


Fig. 7.—Simple circuit for automatic volume control

News of the Short Waves

NOW that the clock has been put forward one hour, we come to the best period of the year for short-wave reception—the improvement will be most noticeable with stations using wavelengths of under 25 metres.

The 13-to-93 metre Westinghouse station, W8XK, which usually fades out between 3 and 4 o'clock, will now be coming over until much later in the afternoon.

Luckily, daylight extends nearly two hours longer in April than during March, which is a great advantage, as we can look forward to hearing our old friend W2XAD on his summer schedule until about 11 p.m.

If you pick your stations, you should have little difficulty in hearing American programmes from 1 p.m. right round until 6 a.m. Until 9 or 10 o'clock, W8XK, on 19 and 25 metres, W2XAD, and W3XAL should all be receivable at R6/8, that is, at good phone or fair loud-speaker strength.

This improvement in conditions is somewhat counteracted by the 50-metre band fading into the background, as stations on these wavelengths will not come over until after midnight.

I frequently mention that numerous stations can be heard at good loud-speaker strength. Readers have queried this point and tell me they have difficulty in hearing, with any degree of reliability, DX stations on the loud-speaker.

Loud-speaker Switch

Perhaps I should mention that I always use headphones with a loud-speaker switch, so I can hear any weak stations there may be going, and bring them up to the required strength before switching over to the loud-speaker.

I have noticed at various times that stations which I can hear on the loud-speaker might not have been picked up had I endeavoured to tune them in directly.

There are so many powerful short-wave transmitters at the present time that automatic volume control can be a distinct help, but it is as well to consider its limitations as well as its advantages.

Many readers assume that A.V.C. on a short-wave set means that fading is completely eliminated—that is certainly not so. Where the stations are of reasonable entertainment value, but suffer from fading, the use of A.V.C. does to a great extent keep the output reasonably constant, and consequently the programmes can be followed without any difficulty.

larger the inductance—the greater is the signal strength. For example, using a .00025-microfarad tuning condenser with a 180-degree dial, when using a six-turn plug-in coil a 50-metre station should come in at approximately 120 degrees, with perhaps fair strength.

Increased Inductance

If the inductance of the coil is increased, and a nine-turn coil used, less condenser capacity is required and the reading would be only 30 or 40 degrees. You will find that this arrangement, where C (the capacity) is fairly low and L (the inductance) is as high as possible, the ratio of L/C is more correct and the efficiency greatly increased.

So remember in future to use the largest coil you possibly can and always try to tune your station in towards the bottom end of the tuning scale.

Conditions have been very unreliable for the last month, with the exception of the 20-, 40-, and 80-metre amateur bands. It is surprising how well the "W" and "VE" stations, those of American and Canadian origin, come in during the afternoon on 20 metres.

I should strongly advise readers to try this band for themselves, but only between 5 and 8 p.m.—it is useless at

any other time.

The 40-metre band is used mainly by European amateurs and on Sunday mornings they can be heard at good strength, although interference is usually very bad.

I suppose some of you might be up early in the morning, particularly in the summer; if you are you will find it the best time of the day to hear the Californian amateurs on 75 metres. It is a little before midnight *their time*, and they come over amazingly well, mainly because the bulk of the distance is in total darkness and the wavelength they use is the most suitable.

Kenneth Jowers.



Magistrate: "Your prison record goes back to 1864!"
Prisoner: "Don't be too 'ard on me yer worship—it's all on account of them there wireless plays wot led me astray."

A very important detail which is very rarely given any consideration in a short-wave receiver is the correct L/C ratio to give maximum efficiency.

Usually a coil having an inductance sufficient to tune over a fairly wide band of wavelengths is utilised, and consequently two coils, with a moderately high maximum capacity condenser, will cover practically the whole of the short-wave bands. As the stations are picked up without very much difficulty, the arrangement is considered to be satisfactory.

When down below 50 metres, the lower the capacity used—and the



TELEVISION

by Cathode-ray Tube

By G. SCOTT

OPINION may be, and indeed is, divided upon the merits of the present development of the art of television, but there seems little doubt that it has a future. Whether its popularity will ever reach that of broadcast sound—as compared with sight—cannot be prophesied.

Technical Difficulties

For one thing, technical difficulties exist which did not hinder the progress of broadcast sound. These are notably connected with the sidebands of frequencies required, and it is a fairly general technical belief that for really good television we will have to go to shorter-wave channels where there is not, at least so far, quite as great congestion as in other bands.

The use of the cathode-ray tube as the receiving device of a television system has many adherents and some technicians are unreservedly of the opinion that it contains the most promising and earliest solution of the problem at the receiving end; indeed, that it has also applications at the transmitting end.

Considerable attention has been paid to the subject, both in Germany and in America, but little work has been reported in this country. It is, however, an open secret that interest is not lacking and, indeed, it is possible that by the time these notes appear a working system of cathode-ray television may have been publicly demonstrated in

London or near it by Britishers.

Although the cathode-ray tube is now fairly well known, a few notes on the device itself and the essential points of its application to television may be welcome to some readers who have not met this entertaining instrument.

First of all the name "cathode-ray" is perhaps not a very good one; and it is now generally agreed that the so-called cathode rays are simply a jet, or beam, of electrons.

The essential action is not unlike that of a valve, except that in the case of the valve we use the electrons simply as a means of obtaining a current-carrying space of certain characteristics.

In the case of the cathode-ray tube we use the electron jet as a moving pointer, capable—on account of its extreme lightness—of operating at enormously high speeds.

The essential features of the arrangement are shown in Fig. 1; F is a filament (cathode), usually of the loop shape shown; A is an anode

in the form of a disc with a central aperture; while C is an open cylinder more or less surrounding the filament.

When the cathode is heated it emits electrons and, if a voltage is maintained between anode and cathode keeping the anode positive, these electrons are attracted to the anode just as in a valve.

Many of the electrons, however, reach the anode with sufficient speed to shoot through the aperture, and it is possible to keep them in a constricted beam so that they reach the end of the tube as a finely pointed beam. This is effected largely by means of the cylinder C surrounding the filament.

Closed Beam of Electrons

This cylinder is made slightly *negative* to the filament so that the negative electrons are kept in a closed beam right at the filament and are all the more easily shot through the anode aperture.

The negative potential of the cylinder has, of course, to be controlled fairly smoothly to secure this effect, while the "focusing" of the jet into a fine point is also controlled by the heating of the filament itself in conjunction with adjustment of the cylinder potential.

When the electron beam reaches the wide end of the tube it hits against a material deposited on the inside of the glass. This material is one of a group

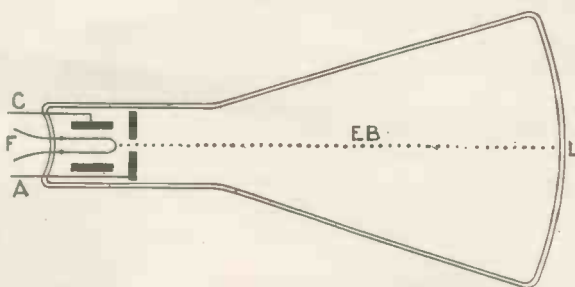


Fig. 1.—Essential features of the cathode-ray tube: F, filament; A, anode; C, controlling or "focusing" cylinder; EB, electron beam; and L, spot of light on fluorescent screen

having the property of phosphorescence or fluorescence, as a result of which it glows when it is struck by the electrons.

The colour of its glow is a property of the material, being usually green or blue, but there seems little doubt that a suitable mixture of known materials should be able to yield a material with a glow that is very nearly white in colour.

Thus when the tube is adjusted and focused there suddenly appears on the screen a bright, glowing spot of light.

Since the jet consists of individual electrons, it must be remembered that each of these is itself a negative charge, while the beam as a whole is a stream of moving electrons and is, therefore, the equivalent of a very light conductor carrying a current.

already given, the spot can be moved in either dimension by current through coils mounted close to the neck of the tube near to the same position on the deflecting plates.

Either method of deflecting — voltage deflection by plates or current deflection by coil—can be used according to the nature of the circuit controlling the deflection. In some applications of the tube both methods are sometimes used simultaneously.

Although several systems of television by cathode-ray tube are now in a fair state of development, relatively little information is available as regards their actual technical details. It is, however, quite possible to indicate the general lines on which the tube can be applied to the reception of a television picture.

To do so, it is perhaps most useful to consider a novel type of "alternating" voltage which has particular application to the cathode-ray tube and more particularly still to its use for television.

This is commonly known as a "saw-tooth" voltage, for reasons

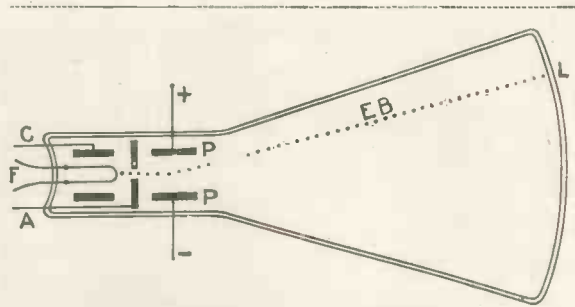


Fig. 2.—Deflecting the electron beam in the cathode-ray tube: P, P are the deflecting plates

which will be clear from Fig. 3, which shows the time-curve of such an e.m.f. Instead of the regular shape of a sine wave, the "cycles" of the saw-tooth voltage take the peculiar shape shown.

Time Duration

The total time-duration T of one "cycle" is divided into two very unequal portions t_1 and t_2 , such that t_2 is about one-twentieth or less of t_1 .

If we apply a voltage of this type to the deflecting plates of the cathode-ray tube the spot will be vibrated back and forward, but in a peculiar manner corresponding to the law of the voltage.

Thus during the time t_1 it is possible to cause the spot to move relatively slowly in one direction, say from top to bottom, with a very sudden return from bottom, to top corresponding to the much shorter duration of t_2 . If, indeed, we slow

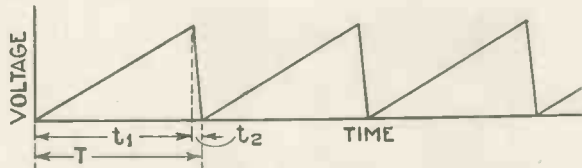


Fig. 3.—Time curve of a saw-tooth voltage

The beam can thus be deflected: (a) regarded as single negative charge it can be deflected by other charges; (b) regarded as a current-carrying wire it can be deflected by a magnetic field.

In Fig. 2 plates P are added on each side of the beam close to where it emerges from the anode. If one plate is made positive and the other negative, the beam is deflected as shown in Fig. 2, and the fluorescent spot is seen to move to a new position on the screen. Reversal of the charge reverses the movement.

Movement of Spot

Alternating voltages applied to the plates thus send the spot up and down. If this is done slowly, say, up to ten or twelve times per second, it is possible for the eye to follow the movements of the spot but, as the speed gets higher, say over twenty-five per second, persistence of vision in the retina prevents the eye from following the spot, which then appears as a steady line.

In addition to the plates shown in Fig. 2, it is usual for the tube also to contain another pair of plates at right angles, capable of oscillating the spot horizontally as well as vertically.

Alternatively, for the reasons

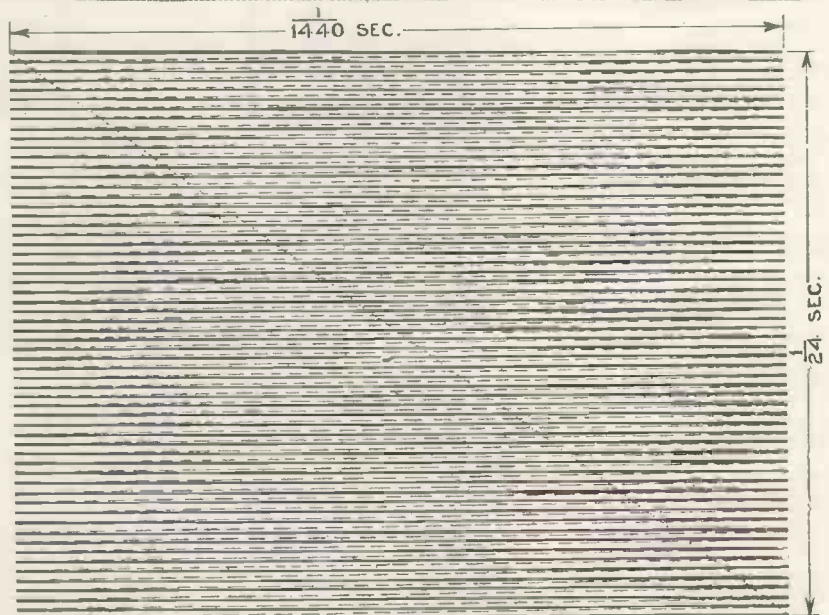


Fig. 4.—Two saw-tooth voltages as scanning motions for television reception by cathode-ray tube



THE MANUFACTURE OF CATHODE-RAY TUBES
This photograph of the manufacture of cathode-ray tubes shows clearly the fluorescent screen at one end

down the frequency sufficiently, it is quite possible to see from the movement of the spot that it is behaving in such a way.

Higher Frequency

If, however, we speed up the frequency so that T is now, say, one-twenty-fourth of a second, then there will be twenty-four sweeps per second across the screen, a speed which the eye fails to follow as individual strokes.

But this accounts only for one dimension of the spot movement, and we have already seen that it can simultaneously be moved in two dimensions.

Thus, if we additionally apply another saw-tooth voltage of say, $60 \times 24 = 1,440$ per second to the plates producing horizontal deflection, then the spot will be deflected back and forward across the screen in a similar manner.

Track of Light Spot

But during the time it has swept *horizontally* sixty times, it will also have been swept *vertically* *once*, so that in one-twenty-fourth of a second the spot will have traced a path such as that shown in Fig. 4.

Thus in the first 1,440th of a second the spot will move from left to right, as shown in the top line of Fig. 4, with a quick return to the left, as shown by the dotted line. At the same time the spot will move downwards just a little, so that the next left to right travel in the succeeding 1,440th of a second will be slightly

lower, and so on until at the end of one-twenty-fourth of a second it has reached the bottom right-hand corner.

Then it suddenly shoots back, more or less diagonally, to the top left-hand corner and proceeds to trace the same path again.

Thus in each one-twenty-fourth of a second the spot traces sixty lines, this

presented or "framed" horizontally at the rate of twelve and a half per second.

Moreover, the Baird system presents an elongated picture of sizes in the ratio of about two to one, height to width.

Attention by most other television enterprises, however, is directed rather towards a more close approach to cinema ratio and rate of presentation, that is, to a ratio of about four to three width to height, and twenty-four pictures per second, which, as already stated, is modern talkie rate of presentation.

Besides this, there is undoubtedly an opinion in many quarters—certainly both in Germany and America—that popular practical television is most likely to be accomplished by way of film transmission, instead of direct scanning of a living person or actual scene.

In this method the scene is therefore ciné-photographed in the ordinary way, and the developed film is run through the transmitter.

In pursuing this system one German firm has devised a system of ultra-rapid development and fixing, combined with a method of



ANOTHER USE OF THE CATHODE-RAY TUBE
Manfred von Ardenne has developed a cathode-ray medical apparatus for recording voices and sounds graphically on celluloid

corresponding to a picture scanning presenting twenty-four pictures per second (normal talkie speed), each picture being scanned in sixty lines.

The arrangement has thus all the essentials of a television scanning system.

Although it is not proposed to deal with the transmitting arrangements in any detail, it is nevertheless necessary to remind readers that the method of television scanning is to traverse the televised object by a beam of light just in such a manner as has been described above.

Incidentally the Baird system, now in use by the B.B.C., scans vertically and "frames" horizontally—that is to say, the higher speed of scanning is done vertically thirty times per picture, while pictures are

running the film through the transmitter while still wet, so that only a few seconds need elapse between the photographing and the transmission on the television system.

The possibilities of such systems appear so great that a brief outline of the operation may be welcome to readers who desire to watch future and perhaps not very remote developments of this art.

The essentials of such a transmission are shown in Fig. 5. The film is drawn downwards continuously—not in jumps. A light source S is directed on a curved mirror M from which it is reflected on to the film. Between the film and the photo-cell P is a lens L which—in the absence of a film or in a transparent piece of film—turns the point of light into an

image of the mirror focused on the photo cell.

This is desirable so that the movement of the mirror does not cause movement of the light spot on the cathode and so that the light on the cell is not in any way modulated by movement of the beam.

Rocking Mirror

The mirror is rocked back and forwards horizontally in accordance with a "saw-tooth" type of movement, so that while one picture frame is being pulled through, it is scanned in sixty lines.

During the time that the film is drawn through over one picture—that is in one-twenty-fourth of a second—the spot on the cathode-ray tube will have correspondingly done one journey down and be restored to the top left-hand corner for the beginning of the next picture.

The essentials of the scanning system at the transmitter are thus reproduced on the tube at the receiver, provided that the impulses operating the tube are *timed* or *synchronised* with the corresponding movements of the transmitter.

Methods of securing synchronism are, of course, about the most important feature of all, and various methods of synchronism exist, although precise technical details of some of the methods pending or under trial are not available.

For our present purpose, therefore, we must take synchronism for granted, and assume that the trans-

mitter and receiver scanning can be kept in step in the manner outlined.

Returning to the transmitter, once we have scanning as described, it will be seen that, as the point of light moves over the film, light will be passed on to the photo-cell in accordance with the varying opacity and transparency of the film.

The variations of light on the film thus follow the instantaneous variations of density of the film, and are used to modulate the carrier frequency of the transmitter just as sound variations are used in telephony.

At the receiver it is then necessary to have a means of varying or *modulating* the intensity of the electron beam in the cathode-ray tube, so that as the beam sweeps about in accordance with the scanning it varies in brightness in accordance with the instantaneous value of light passed through the film.

This will thus reconstruct the picture on the screen of the tube.

One important point has to be emphasised here about this modulation of the beam. The variations of intensity must be effected without varying the focus of the spot—that is, the spot must remain constant and of minimum size and vary only in brightness.

To obtain this some other electrode must be introduced as a *brightness control*. For example, if we apply the modulating voltage (corresponding to the picture) to the simple cylinder of Fig. 1, it will certainly vary the

brightness of the spot, but will also vary its focus or *size*.

Actually, however, it is not so difficult to introduce an extra electrode to do this modulation of intensity and, indeed, several methods of doing so have recently been described in technical publica-

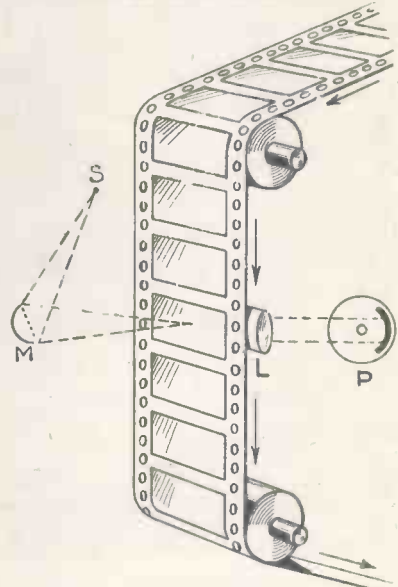


Fig. 5.—Scanning a film for television transmission

tions. Discussion of this subject is, however, outside our present scope.

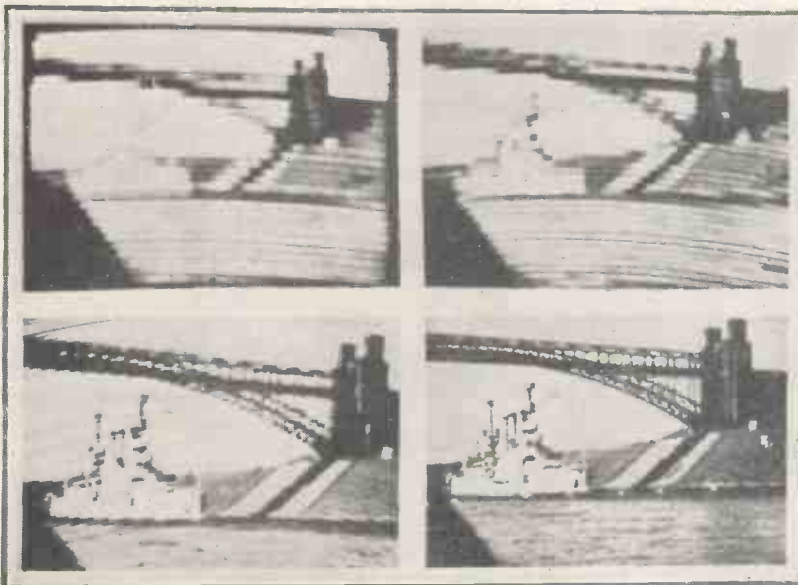
The above is a very general outline of the principles of cathode-ray television. No attempt has been made to describe any particular system, but merely to present the essentials of transmission and reception by this method.

Nevertheless, the actual values of scanning, for example, twenty-four pictures in sixty lines, are such values as are actually being used, and such as we may see in practice.

Improved Methods

It is quite possible that greatly improved methods, particularly of synchronising, may soon become available. Considerable progress is going on in England, America and Germany on the development of the cathode-ray tube itself, and the television application is not being lost sight of by those interested in this development.

Adherents of the cathode-ray method claim that the device can be made very simple to operate—at least as simple as mechanical devices—and methods of synchronising are quite as applicable to it as to mechanical systems.



EXAMPLES OF TELEVISION PICTURES

The picture at the top is of 1,200 points and that on the right of 2,500 points. Below are pictures of 10,000 points (left) and 30,000 points (right).



IN THE SITTING-ROOM—
Enjoying the programmes through an H.M.V. Super-het Lowboy Seven, a fine radio set costing 32 guineas

ON the face of it, the addition of an extra loud-speaker to one's set is not a matter of difficulty.

I found on going into it, however, that there were quite a number of small difficulties.

I propose in this article to consider the subject briefly and to give some particulars of a simple device which will enable any reader to adapt his set for an extra loud-speaker without trouble.

Let us consider first of all what happens to the circuit when we add another loud-speaker. Fig. 1 shows a simple output circuit consisting of a valve with a loud-speaker in the anode circuit. Across the terminals of this loud-speaker we connect a second instrument, and we want to arrange that both loud-speakers shall operate satisfactorily.

Parallel Connection Best

It may be remarked in passing that the connection of the two loud-speakers in series is not a satisfactory arrangement for various reasons, the principal ones being that the power supplied to each loud-speaker is considerably reduced, while any deficiencies in one loud-



—AND IN THE BEDROOM, TOO!
The H.M.V. Universal moving-coil loud-speaker is ideal for extension purposes; it can easily be mounted on a mantelpiece if desired

speaker communicate themselves to the other.

The connection of the second loud-speaker in parallel with the first reduces the effective impedance in the anode circuit. If, for example, we had a loud-speaker of 4,000 ohms impedance and we connect another exactly similar loud-speaker in parallel, the net impedance of the two in parallel would be 2,000 ohms.

We take considerable care with the matching of the loud-speaker to the output valve in most cases. How is this alteration going to affect it?

Let us consider first of all the total power output, irrespective of distortion. Fig. 2 shows the manner in which the power output varies with the load for a triode output valve.

The output is a maximum when

Adding Another Loud-speaker

By J. H. REYNER,

B.Sc., A.M.I.E.E.

the loud-speaker impedance equals the valve resistance, but this output is not undistorted, and the usual working point is at A, where the load is between two and three times the optimum. Apart from any question of distortion, however, it is clear that reducing the load from its normal value to about one-half the normal value causes an appreciable increase in the total power.

This power, of course, is now supplied to both loud-speakers, and therefore each one will receive approximately half. The effect of connecting the extra loud-speaker to the set, therefore, means that each now receives about 70 per cent. of the original amount of power, and no alteration which we can make, either internally or externally, will provide any more.

More Output Required

The only thing we can do is supply more power to the set by increasing the setting of the volume control and, since in most cases there is an ample reserve, this is quite a satisfactory proposition.

So far, however, we have neglected the question of distortion. The normal working point is with the loud-speaker impedance between two and three times that of the valve. This gives a maximum undistorted output.

The connection of the extra loud-speaker in parallel with the normal

one has reduced the effective impedance and therefore we cannot obtain quite as much undistorted power output.

This, however, is only likely to be troublesome when we are developing

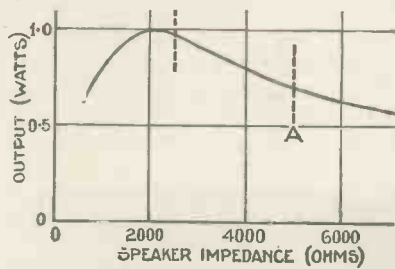


Fig. 2.—How power output varies with load for a triode output valve

practically the full power from the set.

For a triode, then, the connection of another loud-speaker in parallel with the existing one is a satisfactory proposition, provided one is not attempting to obtain full volume from the set.

The case of the pentode is not so good because here the optimum working point occurs below the maximum power output point, as shown in Fig. 3. Consequently the reduction in the anode impedance causes a reduction in the total power output, and the power obtained by each loud-speaker is therefore only about 40 per cent. of the original volume.

Question of Distortion

To offset this the distortion becomes less than with the normal setting so that there is no trouble on this account, but we have to increase the volume control to supply rather more than double the power if we wish to obtain the same volume from each loud-speaker as we originally obtained from one. Fortunately, again, most sets have sufficient reserve to render this feasible.

Let us now turn to a consideration

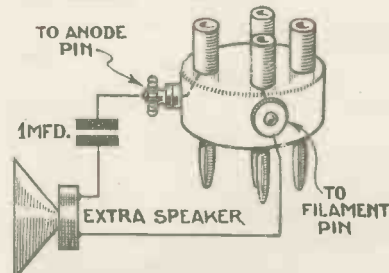


Fig. 4a.—Adaptor for four-pin valve. Note that two side connections are made

of how we are to connect the additional loud-speaker. So far, we have assumed that the extra loud-speaker has approximately the same impedance as the one in the set, but this may be very far from being the case. Many reproducers use a low-resistance speech coil, whereas the additional loud-speaker which we want to connect up may be an ordinary high-resistance moving-iron or balanced-armature model.

If we connect a high resistance across a very low one all the current will flow through the low resistance and practically none will flow through the high resistance, so that we shall obtain very poor results from our external loud-speaker.

There is the converse, although this is not so frequent, where we have a low-resistance loud-speaker to be connected externally whereas the existing loud-speaker in the set is a high-resistance one.

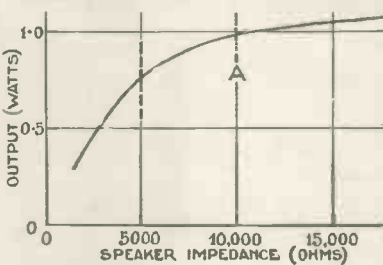


Fig. 3.—How power output varies with load for a pentode output valve

If we do this we shall find that the external loud-speaker will take all the power and completely starve the set.

We can take it, therefore, as a first essential that the loud-speaker impedances must be approximately of the same order, if the power is to be divided equally. If it is necessary at any future time to reduce the power supplied to the external loud-speaker this can very easily be done by inserting a resistance in series.

The next difficulty is that of the actual connection. Some sets provide a pair of terminals or sockets mounted somewhere on the chassis so that an extra loud-speaker may be connected, but there seems to be no uniformity as to the position of these sockets.

In some cases they are placed in the anode circuit, whereas in others they are connected across the secondary of the speech transformer. The point to which we really need to obtain access is the primary of the

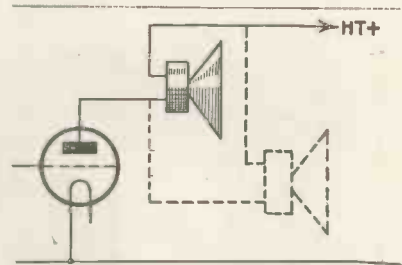


Fig. 1.—Simple output circuit, consisting of a valve with a loud-speaker in its anode circuit

speech-coil transformer or, alternatively, the anode of the last valve.

In the case of a set with an external loud-speaker (or a home-constructed set) the position is usually easier, since there are existing terminals for the loud-speaker connection, but it must be made certain these terminals are suitable for a high-resistance loud-speaker, otherwise the same trouble as before will arise.

Optimum Impedance

Having found the appropriate point in the anode circuit of the last valve, connect the additional loud-speaker across these two points. Then if the loud-speaker impedances are reasonably matched there will be no trouble and satisfactory results will be obtained.

At this point I can hear the reader ask: "How do I know whether the impedances are the same?" It is not usual, of course, to specify the impedance of the loud-speaker in a self-contained factory-built set, but the difficulty is easily overcome.

Examine the output valve in the receiver and from the valve-makers' list determine what is the optimum

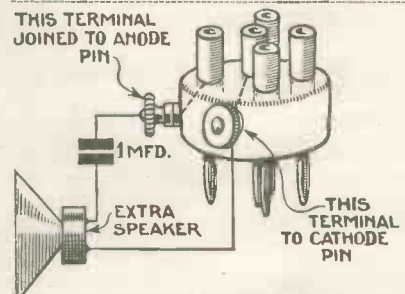


Fig. 4b.—Adaptor for use with five-pin valve. Note again that two side connections are made

load for this valve. Nearly every valve maker quotes these figures. This is approximately the impedance of the loud-speaker in the set, and your own loud-speaker should have the same impedance.



FATHER LISTENS IN HIS STUDY—

With an extension loud-speaker system all members of the family can listen-in at the same time—provided they are satisfied with the same programme!

If your loud-speaker impedance is different from this you should insert an output transformer to feed into your additional loud-speaker, the ratio being so chosen that it adjusts the impedance to the correct value.

If, for example, the impedance of your own loud-speaker is 3,000 ohms and the optimum impedance for the particular valve in your set is 10,000 ohms, then you will require a step-down ratio between your set and your extra loud-speaker of

$$\sqrt{\frac{10,000}{3,000}} = 1.7.$$

Built-in Transformers

Many modern loud-speakers are provided with built-in output transformers which have different ratios so that approximately the correct impedance can be obtained without much difficulty. If this is not the case the reader can use a multi-ratio output transformer. It may be remarked that the matching does not have to be very close, and an accuracy of 20 per cent. is plenty.

For those readers who have no suitable terminals in their set, or where the terminals are mounted on the output side of the transformer or in some other unsuitable position, the use of the little adaptor described

plug in the adaptor and re-insert the valve on top of the adaptor. The leads from the adaptor are then taken out through a 1-microfarad condenser to the loud-speaker in question.

The remarks already made regarding matching still apply. That is, the external loud-speaker must have the same order of impedance as the optimum load for the valve and, if it has not the right value, it must be matched with a suitable output transformer.

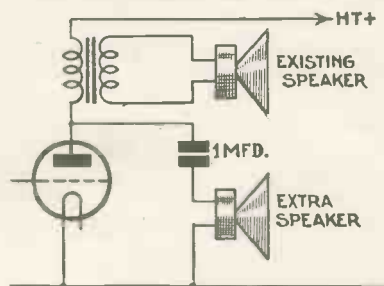


Fig. 5.—Circuit arrangement employed when the adaptors of Figs. 4a and 4b are utilised.

herewith will be very handy.

This is merely a four- or five-pin adaptor, according to whether the set is a battery or mains-driven one.

Remove the output valve from the set,

The circuit of the adaptor is shown in Fig. 5; it is simple in the extreme. Connections are simply taken to the anode pin and the cathode pin (or one filament pin, in the case of battery sets).

The existing loud-speaker (or the primary of the output transformer) acts as a choke and gives us the customary choke-output circuit.

The arrangement is thus simple and effective and has given good results in every case where I have



—AND MOTHER LISTENS IN HER BOUDOIR!

You should have no difficulty in connecting extra loud-speakers to your set with the help of this special article, which explains the snags

tried it. It avoids altogether any doubt as to whether the loud-speaker is being connected across the wrong position, and should give satisfactory results in every case.

In conclusion, therefore, we may say that the best way of adding an extra loud-speaker is either to connect it in the anode circuit in parallel with the existing loud-speaker, or to connect it through a choke-output adaptor as already described.

The impedance of the additional loud-speaker should be equal to the optimum load for the valve as quoted by the makers, and if this is not the case an output transformer must be introduced externally.

Both loud-speakers then draw approximately the same amount of power from the set, this being equal to about half the power supplied when only one loud-speaker is in use.

Distant Switching

Here are further notes by the "Wireless Magazine" Technical Staff on the remote-control switching system that was fully described and illustrated on pages 291-294 of the April issue. Two new circuits are dealt with this month

LAST month the "W.M." Technical Staff described the construction and operation of a simple and inexpensive switching system by means of which a radio set could be shut off from another room.

There is great need for such a device in nearly every home and the scheme revealed in the April issue of "Wireless Magazine" has met with an enthusiastic response.

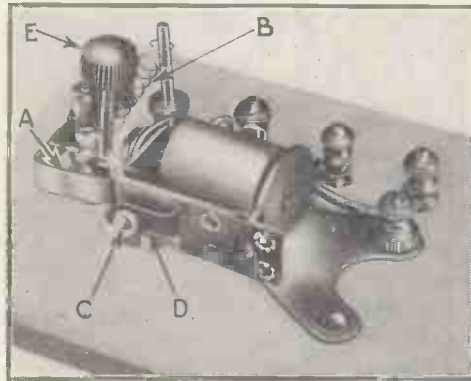
Relay Switch

In brief, the idea is to use a relay type of switch in place of the usual on-off switch associated with the receiver. Connected with the relay switch is a simple push switch (as used for electric bells) and a battery—costing only a shilling or two.

Provided the battery is of the right voltage to overcome any voltage drop in the leads, the push switch can be installed at any convenient point in the house.

As soon as the push switch is operated the set is switched off, wherever it happens to be.

The cost of constructing this remote-control switch will not, in most cases, exceed 2s. 6d. In



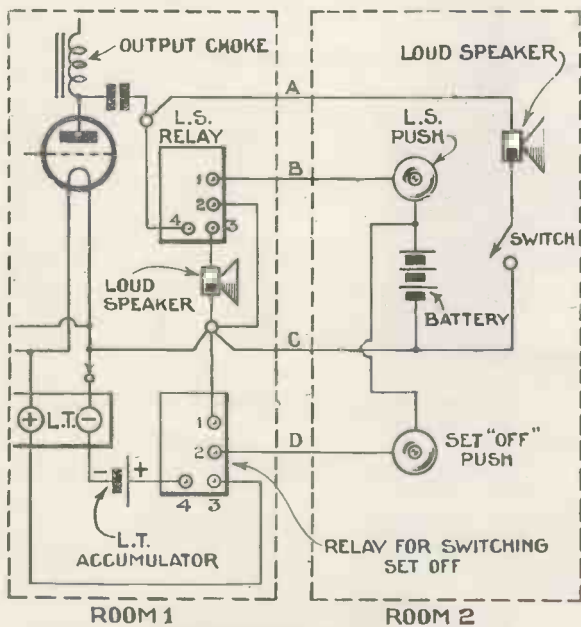
HOW THE RELAY SWITCH WORKS

In this photograph all the parts of the relay switch can be seen clearly. The catch strip A is pulled down by the spring B in the direction of the dotted arrow so that the contact points C and D are held open until it is desired to use the radio set. The latter is switched on by turning the knob E a little to the right

many cases it can be made from parts already to be found in the reader's junk box.

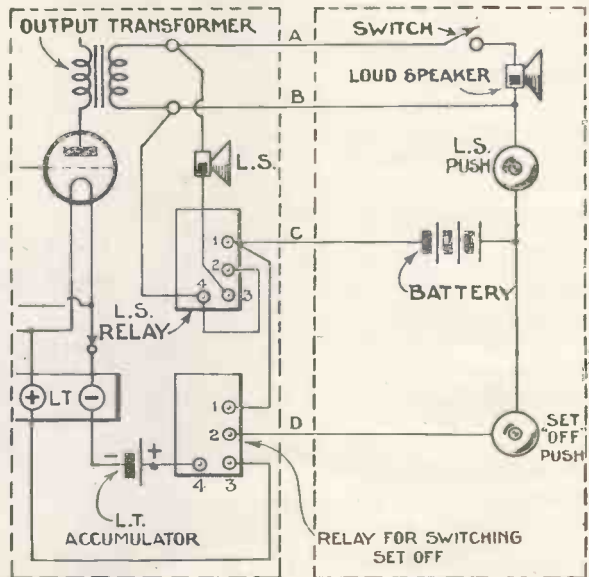
On this page we show a combination of remote-control switches (one is for sets with choke-capacity output and the other for sets with an output transformer) by means of which the loud-speaker associated with the main set can be switched off when the extension loud-speaker is brought into use and by which the set itself can be switched off when reception is no longer desired.

The method of arranging these switches will be clear from the diagrams. By the way, copies of the previous issue can be ob-



ROOM 1 ROOM 2
SWITCHING FOR SET WITH CHOKE OUTPUT

Two remote switches are used, one for controlling the main loud-speaker and the other for switching off the set



ROOM 1 ROOM 2

SWITCHING FOR SET WITH TRANSFORMER OUTPUT
The construction of this remote switching system will be clear from the details published in the April issue

tained for 1s. 3d. each, post paid, on application to the Publisher, "Wireless Magazine," 58-61 Fetter Lane, London, E.C.4.

It will be clear from the diagrams reproduced on this page that four wires (lettered A, B, C and D) are needed between any two rooms where the extension scheme is to be fixed up. Two lengths of twin flex will be suitable.

Set Reports from Our Readers

Here are reports from eight enthusiastic readers who are getting good results from their "W.M." sets. A special report on the Q.P.P. Super 60 will be found elsewhere in this issue. When sending your report remember that half a guinea is paid for every photograph of a home-built "Wireless Magazine" set reproduced in these pages

A.C. QUADRADYNE (April, 1932)

Carshalton (Surrey).—I have been using the A.C. Quadradyne for six months and feel I must write and tell you how pleased I am with its performance. I always thought that selectivity could only be obtained at the expense of quality, but the Quadradyne has taught me otherwise. The quality of reproduction both on radio and records is as good as the most expensive set I have heard. Its performance on records and radio leaves nothing to be desired. The set has real entertainment value. I can tune the knob to fifteen or twenty stations any night and find a musical programme that interests me. I am very partial to good music, and with the Quadradyne I can always find some that interests me. I wish to congratulate you on a very efficient design.

EASYTUNE 60 (May, 1932)

South Shields (Durham).—I built the Easytune 60 two months ago. I have nothing but praise for it, and all my friends who have heard it agree that the results are really astonishing. In South Shields reception conditions are supposed to be difficult. Please accept my thanks for a really good set.

ECONOMY GRAMOPHONE AMPLIFIER (April, 1932)

Woodlesford (Yorks).—I wish to tell you how pleased I am with the Economy Gramophone Amplifier, which was described by P. K. Turner in "W.M." last year. The amplifier is giving excellent results. I have connected a pick-up and microphone, which can be alternatively switched on to the input of the amplifier, and they are both giving very satisfactory results indeed.

REGIONAL A.C. FOUR (December, 1930)

Harehill, Leeds (Yorks).—At the time this set was made it was remarkably selective and far in advance of sets I came in contact with then. Since then the set has been very reliable, and no trouble has been found in getting a particular station I required.

SUPER 60 (March, 1931)

Forest Gate (London, E.).—I must pay tribute to the Super 60. It is the best yet, and I have no wish to

try a better circuit. The set always travels to Australia with me during my sea trips, and the reception of Empire broadcasts on the ultra-short waves is all that can be desired.

Renfrew (Scotland).—I have recently converted my Super 60 into a radio gramophone, and it is a great success as such. The cabinet is an ordinary radiogram type with an extra loud-speaker standing on top. I have a large linen-diaphragm loud-speaker in the lower compartment with the batteries, and in the separate cabinet is housed a moving-coil loud-speaker with a B.B.C.-type box baffle.

A switch at the side of the set controls both loud-speakers through a Harlie tone selector. I have had to alter the layout of the set and bring the second detector valve near the panel where the radiogram switch is fitted.

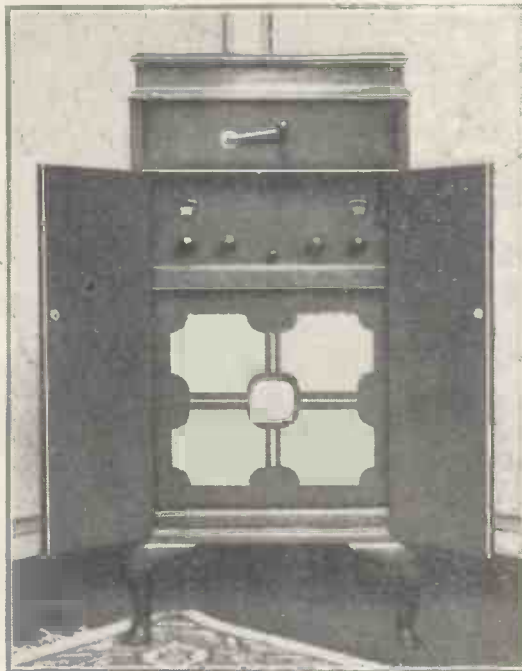
I have had great pleasure and satisfaction from this set and its many advantages—no external aerial or earth, great selectivity, and grand reproduction on both radio and gramophone records.

1932 A.C. SUPER 60 (February, 1932)

Harpenden (Herts).—The publication of your 1932 A.C. Super 60 design enthused me to attempt its construction, and am very pleased to say that I have never regretted same. The selectivity, power and tone are really excellent, and I am delighted with its performance. Thanks for such a splendid design.

"WORDS AND MUSIC" RADIOGRAM (February, 1933)

Peckham (London, S.E.15).—I am writing to let you know of my experiences with the "Words and Music" Radiogram, minus the radiogramophone section. I have found this an excellent receiver—tone and selectivity are all that can be desired.



A report from the reader at Harpenden who built up this 1932 A.C. Super 60 appears alongside on the right. He reports excellent reception



DISCUSSING THE PROGRAMME BEFORE A REHEARSAL

Included in this group (taken at Broadcasting House) are Margaretta Scott, Martita Huni, Ralph Richardson and Harman Grisewood

ONE of the daily press critics recently made a shrewd remark. He said that, on the day he made the criticism, the programmes had looked so dull that he was sorry he had to listen. When, however, he came to the point, he found something to entertain him after all.

Perhaps that sort of experience, he continued, was responsible for so many people saying the programmes were not worth hearing. A programme not illustrated or without some sort of pictorial heading often looks dull and unattractive.

Disappointment

There is something in the view, but it is also true that often the items to which attention is particularly drawn have proved to be disappointing. Then the disappointment seems all the greater.

It is obviously impossible to please everybody—or even half everybody—and one imagines the B.B.C. has long given up trying to do it. On the other hand, nobody can study the programmes closely without noticing some of the leakages.

Since the end of August, 1931, I have not only watched the programmes, but have heard quite a good percentage of what has been broadcast. In looking through my broadcast notes for the period in question, I have come to the general conclusion that things are much better than they were. Great improvements have taken place since

the B.B.C. went into Broadcasting House.

Without seeking to discover the reason for the improvements or in any way commenting on them, I propose to while away some of your time by pointing out a few defects, here and there, that come to my mind. I do not expect you will agree with all of them, but that is, again, the question of trying to please everybody.

* * *

I still find that the B.B.C. has not overcome its pleasure in broadcasting singers in dance-band transmissions who have yet to learn the elements of their art. This microphone-cuddling is not *good* art by a long way. If a singer stands near to the microphone he naturally takes care to sing softly.

Now, singing softly (and sustaining a perfectly-produced tone at the same time) is only given to the great

Since the first number of "Wireless Magazine" was published in January, 1925, great strides have been made in broadcast programme presentation. In this article WHITAKER-WILSON discusses some of the latest developments—and he has some suggestions of his own to put forward as well. His remarks will be read with interest by every listener

singers of the world—amongst whom I have not yet found a dance-band vocalist.

Consequently, all vocal tone has disappeared because the singer has to reduce his quality to such an extent that he is technically defeated. Worse than all, the microphone has been looked upon as the friend of the singer with no voice.

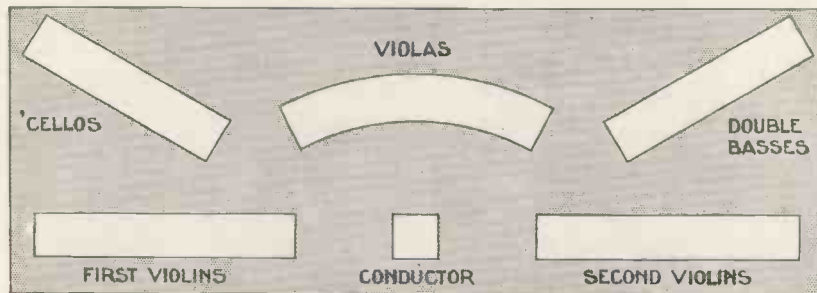
People with the Knack

Anyone who has the knack of rendering what is required for these vocal dance-refrains knows quite well that the microphone will help him. He knows that if he stands four feet in front of the nearest orchestral instrument it is like having eighty yards start in a hundred yards-race.

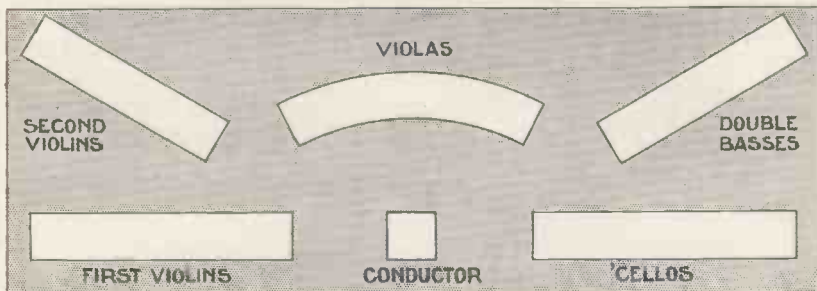
Apart from this consideration it does seem to me to be spoiling what are often really good tunes by having them *murmured*. What can there be against insisting on singers who have really beautiful voices, and placing them three feet from the microphone and asking them to sing up to full tone?

* * *

To turn to something more serious for a moment. I have been interested in the arrangement of the stringed instruments at the symphony concerts in Queen's Hall. It may not be known to listeners who never actually visit Queen's Hall that there are two arrangements in force, according to the conductor's wishes.



Arrangement No. 1, as Dr. Adrian Boult has it—



—and arrangement No. 2, as Sir Henry Wood has it

The two arrangements are illustrated on this page.

It might occur to you to remark that surely it does not matter which of the arrangements is in use. Why cannot the conductors please themselves? The answer, of course, is that they do! Furthermore, either arrangement works fairly well in the hall because the audience is dependent entirely upon the acoustic properties of the building, which are quite good.

When, however, it comes to hearing the concerts broadcast, one of the arrangements fails. It is the first—Dr. Boult's. I am bound to state I am surprised he ever made the arrangement at all, because, from a conductor's point of view, it is advantageous to have the 'cellos and double basses on the same side so that, with one single sweep, both sets of players (so often playing the same notes or, at least, an octave apart) can be "brought in." Nevertheless, each man to his own taste.

From the broadcasting point of view Dr. Boult's arrangement is a bad one, for this reason. The sound comes from the front of a violin and not through its back. If the second violinists are

on his right the front of their instruments are turned away from the microphone. And that is distinctly bad.

We all know how sensitive a microphone is, and we all know that a single step forward or backward makes a great difference to the result when broadcast.

I have always noticed a falling-off in the tone of a "lead" in the second violins—particularly in a fugue, where it is generally clearly marked, when the orchestra is arranged with the second violins on the conductor's right-hand side.

When Sir Henry conducts, and the arrangement is that the second

violins are on the same side of the orchestra as the first violins, there is an unmistakable difference in the wealth of tone.

More Likely to Come Through

Moreover, the fact that the 'cellos are on the right, just under the double basses, makes the bass of the harmony far more secure, and far more likely to come through.

There is no question—in my judgment, at all events—that the two arrangements are incomparable for broadcasting. Sir Henry's is vastly the better. I have made so many comparisons in the last two years that I am sure I am not wrong in pointing this out.

* * *

A devout believer in radio drama, I have been looking through my notes for the past year-and-a-half in order to compare the successes of adaptations of plays not originally written for the microphone with those that have been specially written. As I happen to have written plays myself for the microphone, it may seem as though I had an axe to grind when I say unhesitatingly that my verdict is wholly in favour of the specially-written play.

Outstanding Successes

There have been outstanding successes with arranged plays; I make no denial of it. On the whole, though, the real successes have been with the other kind. The radio play is an art in itself.

Apart from this, by designedly separating radio plays from arrange-

ments of those that have been produced in London theatres I think the B.B.C. will help the theatres. Listeners will learn to enjoy both, and to separate them in their minds.

Exceptions must always be made, even so. *Hassan*, even shorn of its wonderful scenery, was an outstanding success. The great exception, of course, is Shakespeare. He, unwittingly, wrote for the microphone because he depended for his effect upon the lines he wrote. Scenery was not used in his day.



A SCENE IN THE VAUDEVILLE STUDIO
This photograph was taken during the performance of Jack Hulbert's "Follies." From left to right behind the microphone are Jack Hulbert, Betty Astell and Claude Hulbert

"Aural scenery," as provided by the B.B.C., helps to intensify the effect of his lines. I wonder what he would have thought of broadcasting had it been known in his day?

* * *

The advisability of long programmes devoted to the music of a single composer is one over which I have pondered a good deal. Many such concerts have been given from Queen's Hall. I have tried them both ways—by going to the hall and by staying at home and hearing the concert broadcast. The result has been the same.

Mentally Tiring

I have found that listening to the thoughts of one man—even Bach or Beethoven—has tired me mentally, much more than what is generally called a miscellaneous programme.

If broadcasting is aimed at the great public—it is not much good unless it be so aimed—it might be worth while considering the inadvisability of one-man concerts. My argument is that if the sameness of idiom, so apparent in classical writers, tires a *musician devoted to that type of music*, surely it must tire the average amateur listener who,



A CHILDREN'S HOUR BROADCAST

During the Children's Hour there is always a more or less informal atmosphere about the studio. This photograph was taken in Studio 6B of Broadcasting House

sohno; Mozart and Strauss; Haydn and Weber; or Haydn and Debussy, would furnish a contrast without the least trouble on anybody's part.

To divide a number of programmes into two equal portions, contrasting the composers with great care, would be simple to effect from the B.B.C.'s point of view and effectively simple from the listener's.

Wagner must always be excepted.

humour is not a feasible proposition. So this time I must be careful what I say. I think I may be allowed to point out that there ought to be a stringent test for broadcast humour.

It is useless for a comedian to defend himself by saying he delivered that very line at the Palladium and it brought the house down. Of course it did! The reason is obvious. There were a thousand people there.

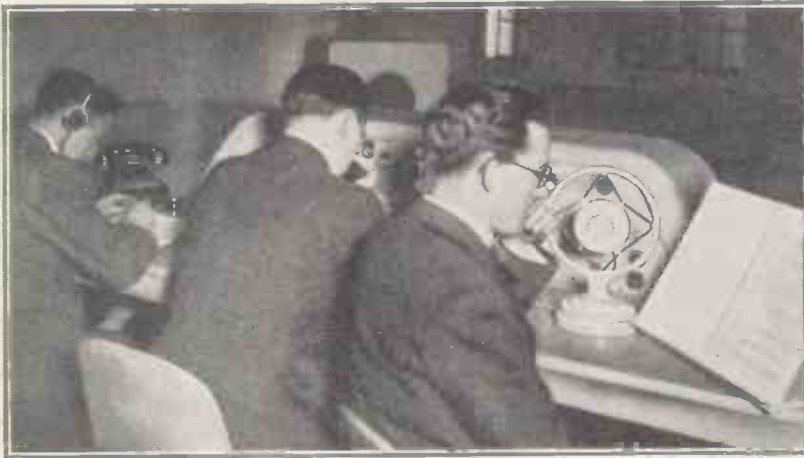
It is simple to make a thousand people laugh, especially when you have the advantage of being seen. If you cannot make a thousand people laugh you must give up being a comedian. That is all about it.

The test of comedianship, so to speak, lies in the ability to amuse a *solitary person sitting by himself at his own fireside*. It has been said that the wireless audience is the largest in the world. Millions of people are listening, etc., etc.

Indifferent Listening

That will not do for an argument. It may be true that millions are listening, but they are probably listening indifferently. What is more to the point still, they are not *together*. The wireless audience is the poorest house a comedian can possibly have.

Vaudeville is the B.B.C.'s bread-and-butter, and on its success primarily depends the success of broadcasting. The comedians are virtually pilloried if they are not comic, but the sort of humour that sets the Coliseum in a roar is not the sort that amuses a single person. Humour must not be of the broad type. It must be subtle and delicate.



PUTTING OVER A RADIO PLAY

A scene at the dramatic control panel. On the right is seen the producer (following the script), with the control engineer on his left

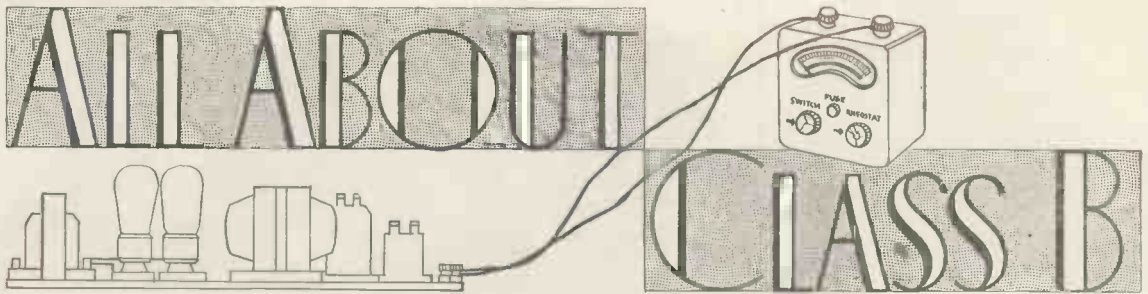
after all, is entitled to consideration? Personally, I should like to see such concerts devoted to two composers—one in the first half and the other in the second. Even so, I should be inclined to separate, say, Bach and Handel. They lived in the same period and their idiom is not dissimilar.

A Bach-Brahms concert; one devoted to Schumann and Tchaikovsky, or to Beethoven and Mendel-

He is a law unto himself and his music is not like other people's. I think he should *always* be by himself; he seems to upset any programme into which he enters. Not only so, but it is a fact that Wagner-lovers are notoriously a species in themselves. Often they do not care for other music of a classical type.

* * *

Lastly, humour. I have been in hot water already for saying recorded



By S. RUTHERFORD WILKINS

WE have heard much lately about the use of two output valves arranged in quiescent push-pull. Briefly, this system consists of the use of two pentodes (or triodes) connected in opposition and biased almost to their cut-off point.

No-signal Current

When used in this manner the quiescent or no-signal current taken by the valves is extremely low, usually about 3 or 4 milliamperes. During modulation, however, anode current rises, the amount of current taken depending upon the percentage of modulation of the signal being received.

In this way it is possible to design a set giving a peak output of 1 to 1.5 watts, but with an average anode current which can be supplied by an ordinary double-capacity high-tension battery.

Although the anode current taken by valves when used thus naturally fluctuates between wide limits, the valves must not be allowed to run into grid current or distortion will result.

This form of operation constitutes a large saving over the more common form of push-pull, where the valves are biased to the mid-point of their characteristics and are worked with a relatively high steady anode current.

We are on the eve here of a development which has achieved great popularity in the United States, and which offers undoubted advantages over quiescent push-pull both as regards economy in anode current and maximum undistorted power output.

This arrangement is known as zero-bias class

B amplification, and consists of two valves working in opposition with their grid return taken to low-tension negative, thus giving zero bias to the grids of the valves.

The valves used are extremely high-amplification triodes, and are such that with no bias on the control grid their steady plate current is quite low, being about 1.5 to 2 milliamperes for each valve, or a total quiescent current of 3 to 4 milliamperes for the output stage.

The average characteristic curve of a valve of this type is shown in Fig. 1, and it will be seen that with zero bias the valve is operating very near the cut-off point of its characteristic.

Thus an alternating current applied to the grid of such a valve would cause the plate current to rise on the half-cycle during which the grid is positive, and to fall almost immediately to zero on the half-cycle which makes the grid negative.

As two valves are connected in opposition, however, during the half-

cycle in which one valve is inoperative owing to its grid being negative, the grid of the other valve is positive. Thus the other valve is in operation and causes the plate current to fluctuate in accordance with the incoming signal.

The combined outputs of the two valves give an input similar in waveform to the input voltage applied to their grids.

Owing to the fact that only one valve of the pair is operating at any one time, the total primary impedance of the output transformer must be four times the optimum load for one valve.

Total Primary Impedance

The latter is usually in the region of 4,000 ohms, thus giving a total primary impedance for the output transformer of 16,000 ohms.

Examination of the valve characteristic will show that during modulation grid current of quite large proportion will flow in the secondary of the input or drive transformer.

Thus, unlike all other well-known output systems, this arrangement results in the consumption of grid power. This power has to be supplied from some source, which is naturally the valve preceding the class B valve or "driver" as it is usually called.

Thus we are presented with a new conception of the intervalve coupling transformer. In all the more common low-frequency systems the transformer is utilised as a voltage amplifier, and its purpose is to transfer the A.C. voltage in the primary and amplify it sufficiently to load the output valve.

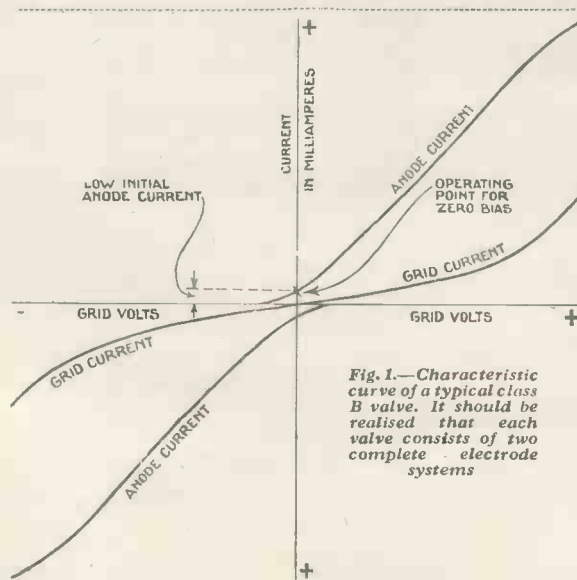


Fig. 1.—Characteristic curve of a typical class B valve. It should be realised that each valve consists of two complete electrode systems

Owing to the fact, that no grid current is allowed to flow, no grid power is consumed, and the secondary resistance of a transformer can be made quite high.

A class B driver transformer fulfils the function of a power "transferrer" rather than a voltage transformer, its object being to transfer the A.C. wattage developed in the anode circuit of the driver valve to the grid circuit of the class B output valve, with the least possible loss.

Matching Essential

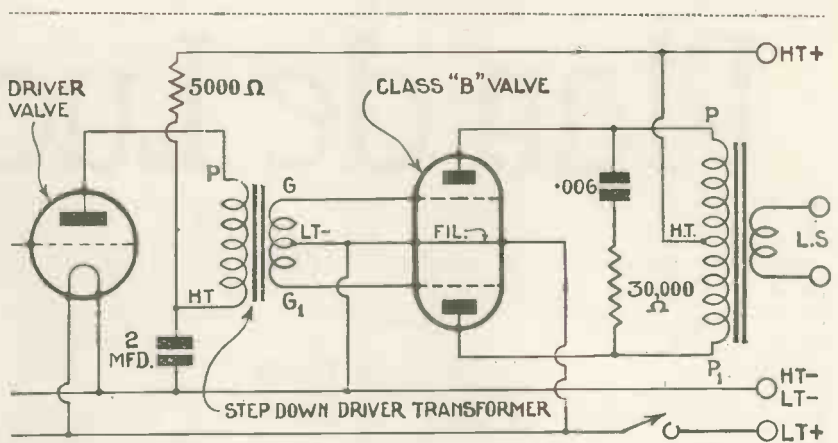
In order to effect this transference, it is necessary to match the anode impedance of the driver valve to the grid input impedance of the class B valve.

As the latter impedance is usually of the order of 1,500 to 2,000 ohms, and the impedance of the driver valve might be anything from 4,000 to 15,000 ohms, a step-down transformer is necessitated.

Its primary impedance must be equal to the optimum impedance for the driver valve, and the ratio of primary turns to half the secondary turns must therefore be

$$\sqrt{\frac{\text{Optimum load for driver valve}}{\text{Grid impedance of class B valve.}}}$$

Another point that has to be con-



CIRCUIT OF TYPICAL CLASS B AMPLIFIER
Every class B amplifier includes a driver valve feeding into a power valve with two complete sets of electrodes; there is no grid bias on the latter

necessary to load the class B output valve, and also the A.C. output to be obtained.

I have handled a class B valve that would give nearly 2.5 watts A.C. output, but as this valve requires an input of nearly 70 to 80 milliwatts, it necessitates the use of a valve of the small power type as a driver.

The objection to this is that, although the quiescent current of the class B valve may be only 3 or 4 milliamperes, the anode current of the driver valve may be as high as 5 milliamperes.

Also, as a grid swing of 5 or 6 volts is required to load the driver valve, a further amplifying valve taking 1 or 2 milliamperes anode current is needed before the driver.

The total quiescent current for an amplifier of this type would be between 8 and 10

milliamperes, which is much too high for economical battery working.

There is, however, a class B valve with slightly different characteristics which will be on the market shortly. This more sensitive valve gives an output of about 1.5 watts A.C. with a quiescent current of the order of 3 milliamperes, and only requires about 20 to 30 milliwatts to load it.

This input is easily provided by a valve of the 10,000-ohm or 15,000-ohm class, taking only about 1 milli-

ampere, and will therefore not need a preliminary valve before the driver. In this way the quiescent current of the amplifier is reduced to about 4 milliamperes, which is an extremely economical figure.

Owing to the fact that the anode current of the class B stage is subject to rather heavy surges, the primary resistance of the output transformer must be kept as low as possible, otherwise the voltage drop on a heavy-current passage will result in a limitation of the output obtainable.

Still more important is the internal resistance of the high-tension battery, as this, in a run-down battery, often reaches a figure of 2,000 ohms.

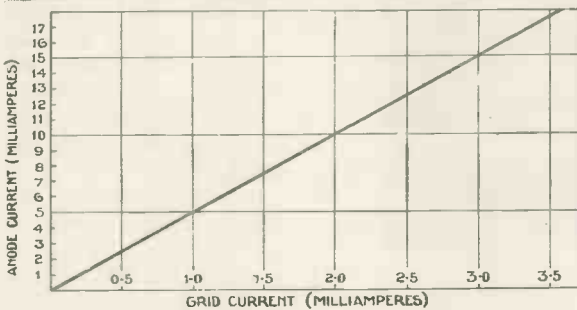
During periods of low modulation the class B valve presents an extremely high impedance to the loud-speaker, thus inviting distortion on high notes or during transient passages.

Limiting Circuit

To combat this it is wise to use a limiting circuit consisting of a condenser of the order of .005 microfarad in series with a 20,000- or 30,000-ohm resistance across the output transformer primary.

It is not advisable, however, to compensate entirely for high-note accentuation by this method as, if tone control is effectively carried out in the stage preceding the class B amplifier, it is possible to obtain a saving of as much as 25 per cent. in the average anode current for the output stage.

In the interests of simplicity and ease of construction, the two Class B valves necessary for the output stage are supplied in one bulb, which will be fitted with seven pins.



EXPERIMENTAL CURVE FOR CLASS B AMPLIFIER
This is the curve for an experimental class B valve; it will be noted that anode current and grid current increase in direct proportion

sidered is the secondary regulation of the driver transformer. Owing to the fact that grid current is constantly varying between wide limits, the secondary resistance of the driver must be kept as low as possible consistent with an optimum turns ratio and minimum copper losses.

In practice, this resistance is usually between 100 and 250 ohms for each half, and with this low value regulation is fairly constant.

The type of valve used for the driver depends on the grid power

"Plan de Lucerne"

LUCERNE, noted for its lovely lake and picturesque peaks, will shortly earn a new title to fame, for it is the *venue* of the European administrations intent on putting the ether in order.

Most listeners know by this time that broadcasting stations work on wavelengths assigned to them under what is called the Prague plan, or protocol. Under this scheme stations' carrier waves are separated by a frequency of 9 kilocycles.

Increase in Power

At the time the separation was agreed upon it was realised that any very widespread increase in the power of the carriers would mean serious interference between the stations.

The worst fears were justified when Mühlacker took the air with high power. Its 9-kilocycle separation from the London Regional station, also a high-power transmitter, was very quickly found inadequate and, for a time, until greater separation was obtained, mutual interference between the English and German stations was experienced.

The lesson learned from this trouble was clear. High-power stations with only 9 kilocycles frequency separation could not work without interference if geographically close together.

In other words, from the inception of Mühlacker it has been clear that the Prague Plan was doomed if high power were to become general. Well, high power is becoming general, and so is interference between adjacent stations.

When the Madrid Convention met last September the broadcasters of Europe made a valiant effort to gain more wavelengths for broadcasting. Little was finally gained, although on the long waves some slight concessions were obtained in the clearing of wavelengths near the lower end of the 1,000 to 2,000 metre band.

Following Madrid, the International Broadcasting Union, which consists of technical experts of most of Europe's broadcasting organisa-

By
ALAN HUNTER

tions, met in Brussels to try to work out a new plan that would meet the needs of modern high-power broadcasting.

As a result of this meeting some sort of agreement has been reached. With so many contesting claims this alone is something of an achievement. Without such an agreement it would, of course, be useless for the Post Office officials of the various countries to meet.

Now that the International Union has provided a basis for discussion, the delegates of each country's

continental broadcasters. But some inkling of what is to be done is not difficult to gather.

For a start it will be proposed that the axiom be accepted that *stations close together geographically must be well separated in wavelength or frequency.*

Secondly, it will be proposed that adjacent high-power stations of 50 kilowatts or more be separated by a *minimum of 11 kilocycles*, such as now obtains, incidentally, between London Regional and Mühlacker.

Now, unless the waveband for broadcasting is extended, which it cannot be now that Madrid has settled against the idea, it follows that any increase in frequency between one group of stations will mean a decrease in the separation of others.

This is, in fact, the proposal. That low-power stations, widely separated geographically, shall be squeezed closer together in frequency, say to 8 or even 7 kilocycles.

Detailed alterations to the wavelengths of any particular stations cannot yet be forecast because nobody knows how the I.B.U. proposals will be received at Lucerne. Assuming that they are agreed to, what can the B.B.C. hope to gain?

Looking at the question entirely without bias it looks as though we shall be lucky to hold what we have, without getting any more. Talk of our getting another long wavelength is certainly wide of the mark.

What we may obtain, with great good luck, are one or two longer medium wavelengths for those we now hold below 300 metres.

Better Wavelengths

We might, that is to say, obtain better wavelengths for our 261-metre London station and 301-metre North National. Possibly also we might plead for a better wavelength for Belfast, especially as this will eventually become a high-power station.

The Plan de Lucerne, as the new wavelength agreement looks like being called, will mark a step forward in the high-power policy.



TWO B.B.C. REPRESENTATIVES

Mr. Noel Ashbridge and Vice-admiral Sir Charles Carpendale photographed in London on the eve of their departure for the recent International Radiotelegraphic Convention held in Madrid

postal administration, or whatever authority is responsible for the broadcasting service, have some object in getting together.

This they will do on May 17 in Lucerne. At the same time the International Broadcasting Union, which would be due to meet anyway in a month or so, has decided to foregather at Lucerne, so as to be on hand in case the administrations need any further technical help.

What, in brief, are the proposals agreed upon at Brussels and up for consideration by the postal authorities? The lips of the B.B.C. are sealed, and so are those of the various

GRAMO-RADIO SECTION

Modernising An Old Gramophone

In these notes Captain E. H. ROBINSON explains how an old acoustic gramophone can be converted into an up-to-date electric machine by the addition of a radio amplifier and a loud-speaker—a conversion that many people desire to make



A FINE RADIO GRAMOPHONE
Ambrose, the well-known dance-band conductor, with his H.M.V. nine-valve super-het radiogram, which has an automatic record-changer

SINCE electrical reproduction and, incidentally, electrical recording have come into fashion, there are a large number of excellent reproducers of the old acoustic type which have ceased to satisfy their owners and have either been replaced by more modern instru-

ments or have become mere pieces of furniture.

In any case, they can often be picked up quite cheaply, and are well worth the attention of the home constructor.

A case in point was an H.M.V. No. 203 acoustic gramophone for which the owner desired "a good home," having acquired a radiogram with all the latest gadgets.

This old acoustic gramophone is in a beautiful mahogany cabinet, has an electric turntable, a shrouded lamp for illuminating the needle and disc (which switches on when the lid is raised) and was the last word in its class before the radiogram put its nose out of joint.

Having decided to bring this reproducer up to date, the first task was the removal of the large double-folded horn which filled practically the whole of the lower part of the cabinet. This was an easy job.

Removing the tone-arm freed the top of the horn, and on taking out the front fret the removal of a couple of dozen wood screws enabled the horn to be drawn out through the back of the cabinet complete. The space

it had occupied was enough to take any amount of apparatus.

The "back door" of the cabinet was a solid piece of timber nearly an inch thick and was hailed with delight as an ideal baffle board. It was subsequently cut with a keyhole saw to fit the diaphragm of an Epoch 101 loud-speaker.

As it did not fill the whole of the space behind the fret it was made up to the necessary dimensions by adding a board to the top, which was held to the main baffle board by a couple of 1-ft. iron strips drilled for the necessary wood screws.

Pick-up Attachment

The electric motor being provided with an automatic stop for which there was an attachment on the tone-arm, the original tone-arm was retained and an H.M.V. No. 11 pick-up attachment used to replace the existing soundbox.

This attachment is provided with long leads and a volume control. To make the job neat the pick-up was drilled through the back, where it slipped over the tone-arm, with a $\frac{1}{8}$ -in. hole so that the lead could be passed through this hole and down through the tone-arm.

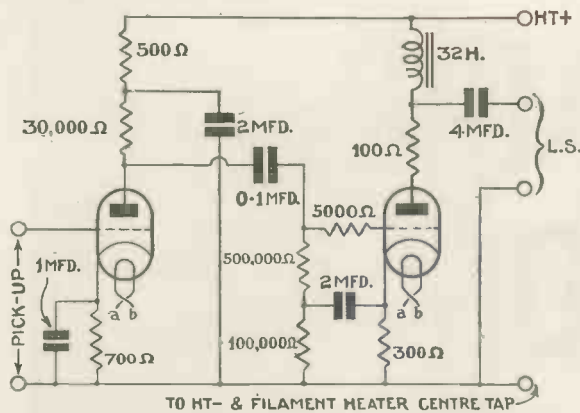


Fig. 1.—Two-stage resistance-capacity coupled amplifier for reproducing gramophone records through a loud-speaker

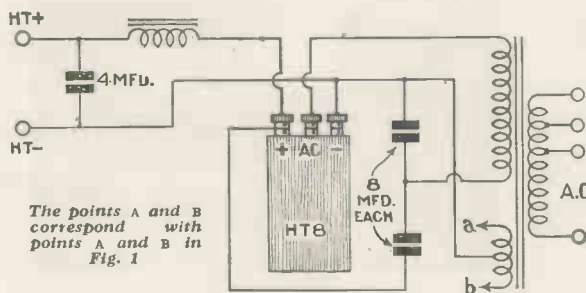


Fig. 2.—Power unit designed by Captain E. H. Robinson for use with the gramophone amplifier described in these notes

A length of wire was first passed through the tone-arm and the lead fastened to it so that it could be dragged through without trouble.

Having got over these preliminaries the next thing was to decide on the type of amplifier, bearing in mind the possibility of an ultimate complete conversion to a radio gramophone.

After some consideration an output of 2 watts of undistorted power was decided upon, and a Cossor 41MXP chosen for the output position. This valve takes 47 milliamperes at 200 volts, and requires 12 volts grid bias. With this preliminary idea the design of the amplifier could be started upon.

The mains equipment would obviously have to give more than 200 volts, though at a pinch 200 volts at 50 milliamperes could be made to do the trick. It did not seem worth while, however, spoil-

ing things for a shilling or two, so a Westinghouse H. T. 8 rectifier was specified with a Junit transformer with a filament winding to give 4 volts at 2 amperes.

It had already been decided that there was no need for the amplifier to use more than two valves. After some experiment the very simple resistance-capacity amplifier shown in Fig. 1 was found all that was necessary to give remarkably good quality and ample volume. The first valve is a Cossor 41MHL.

The small resistance in the anode lead of the output valve serves two purposes. It drops the voltage to approximately 200 volts and, in conjunction with the stopping resistance in the grid circuit, absolutely prevents any possibility of parasitic oscillations.

This is a fault which we have been accustomed to associate with push-pull and parallel output valves, but there is more than mere danger of this fault

modern high-efficiency triodes. Since we have volts to spare this small resistance may as well be used.

The amplifier is quite simple to construct. No particular care need be taken with the disposition of the parts, and it can be adapted to any reasonable space available.

PARTS NEEDED FOR GRAMOPHONE AMPLIFIER

- CHOKE, LOW-FREQUENCY**
 - 1—Pye 32-henry, type 658 (for output circuit).
 - 1—Ferranti, type B2 (for smoothing).
- CONDENSERS, FIXED**
 - 1—Dubilier .1-microfarad, mica type 620.
 - 1—Telsen 1-microfarad paper type W234.
 - 2—Telsen 2-microfarad, paper type W232.
 - 2—T.C.C. 4-microfarad, paper type 64.
 - 2—T.C.C. 8-microfarad, paper type 64.
- VALVE-HOLDERS**
 - 2—Clix five-pin.
- PICK-UP**
 - 1—H.M.V. No. 11 attachment.
- RECTIFIER**
 - 1—Westinghouse, type HT8.
- RESISTANCES, FIXED**
 - 7—Colvern strip type, values 100, 300, 500, 700, 5,000, 30,000, and 100,000 ohms.
 - 1—Erie 500,000 ohms, 1-watt type.
- TRANSFORMER, MAINS**
 - 1—Junit, type WH8, with 4-volt 2-ampere heater winding.
- VALVES**
 - 1—Cossor 41MHL.
 - 1—Cossor 41MXP.

In operation it proved remarkably free from hum, even without an earth connection. The volume control being a resistance shunted



THE OLD AND THE NEW

A scene from a recent Pathé Weekly film shows between Caruso's old records on an acoustic machine (belonged to him) and the new electrical recordings on an up-to-date electrical machine.

Choosing Your Records

SACRED MUSIC

- (a) *Deep Harmony*, (b) *Lavinia*, Colne Orpheus Glee Union, 1s. 6d. **REG-ZONO MR845**
 "When I Survey" is not to the usual tune. Both sides are from the "Deep Harmony Hymnary," a compilation new to me. Quite attractive and well sung.
- (a) *Nearer My God To Thee* (Carey), (b) *There is a Green Hill* (Gounod), Paul Robeson, 4s. **H.M.V. C2517**
 Mr. Robeson is in an unusual vein. Those who collect his



PAUL ROBESON

records can safely add this to their repertory. It is thoroughly well produced.

CLASSICAL ORCHESTRAL MUSIC

- ★ *Capriccio Italian*—Op. 45 (Tchaikovsky) (d.s.), Berlin State Opera Orch., 3s. 6d. **DECCA-POL LY8066-7**
 Tchaikovsky's Italian Caprice is one of his most attractive works. It is a work for every collector of records of melodious music. The Berlin State Opera Orchestra does it full justice—as one would expect. Very attractive!
- ★ "*Der Freischutz*"—Overture (Weber) (d.s.), B.B.C. Symphony Orch. 6s. **H.M.V. DB1678**
 This is exceptionally good. Apart from the fact that *Der Freischutz* is one of the most attractive overtures in existence, it has here been produced amazingly well. This is a record for all lovers of good, light orchestral music. I say "light" because it is not in the least difficult for the average amateur—or, indeed, the amateur below the average. It ought to sell splendidly.
- Samson and Delilah*—Selection (d.s.), Great Symphony Orch., 3s. 6d. **DECCA-POL LY6026**
 I do not quite know what to say about this. It is well played and produced, but I am not sure that selections from an opera like *Samson and Delilah* make good art. The whole thing seems to lack what is so obviously connected with it, namely the voices!
- ★ *The Mastersingers* (fantasia), Berlin State Opera Orch., 2s. 6d. **DECCA-POL P05058**
 Another of these first-class records at half-a-crown. I sincerely recommend you to hear

Here are reviews of the latest releases by **WHITAKER-WILSON**, the "W.M." Music Critic. Outstanding records are indicated by an asterisk (★) against the title

this. I think you will take a copy home with you. One of the best orchestral records I have heard recently.

LIGHT ORCHESTRAL MUSIC

- (a) *By the Sleepy Lagoon*, (b) *Under Heaven's Blue*, Albert Sandler and His Orch. 2s. 6d. **COL DB1061**
 Albert Sandler's style is so well known as to need no comment. You will find him very attractive in this record, the waltz especially.
- ★ *Light Cavalry* (d.s.), Berlin State Opera Orch., 2s. 6d. **DECCA-POL P05040**
 This ought to sell. Supp's famous overture is played magnificently in a hall with some resonance about it. Half-a-crown for such a record is very cheap. I was most impressed with it.
- ★ (a) *The Song of the Nightingale*, (b) *Butterflies in the Rain*, Fred Hartley's Quintet, 1s. 6d. **REG-ZONO MR853**
 Here is pleasant light music, very melodious and well played. The recording is excellent. The tone of the instruments is so good that I have starred it as an outstanding record.

ORGAN MUSIC

- ★ (a) *Gagliarda* (Schmidt), (b) *Fugue in G* (Van den Gheyn), and *Toccata in C Minor* from Op. 25, Alfred Sittard, 4s. **DECCA-POL CA8149**
 These works all pleased me. They are not too involved and therefore come out clearly. Organists cannot exercise too much care in their choice of works either for broadcasting or recording.

VIOLIN SOLOS

- (a) *Poem* (Fibich), (b) *Le Cygne* (Saint-Saens), Wolfi, 2s. 6d. **COL DB1058**
 Two violin solos in different style. Quite worth having. The recording is so good, for one thing. I recommend it.
- (a) *Danse Espagnole* ("La Vida Breve") (De Falla—Kreisler), (b) *Minstrels* (Debussy), *Flight of the Bumble-bee* (Rimsky-Korsakov—Hartman), Yehudi Menuhin, 4s. **H.M.V. DA1280**
 The Debussy and Rimsky-Korsakov excerpts are arrangements for violin and piano. They sound very well, though a trifle unusual to the ears of anyone accustomed to hearing them in their original form. The record, as a whole, is quite attractive and worth recommending.

PIANO SOLOS

- ★ *Rapsodie Espagnole* (Liszt) (d.s.), Walter Rehberg, 4s. **DECCA-POL CA8145**
 Liszt's Spanish Rhapsody is always worth hearing. I think lovers of piano music will be pleased with this rendering of it. It is well recorded, which is everything with piano music.
- ★ (a) *Rondo Brillant* (Weber), (b) *Three Ecossaises* (Chopin), Ania Dorfmann, 4s. **COL DX449**
 A very fine pianist, whose broadcast recitals have attracted attention. I like the rendering of the Weber better than the Chopin, but the *Ecossaises* are not amongst Chopin's best works. These works are light in character, if you do not know that already.

SONGS AND BALLADS

- ★ (a) *God, Make Me Kind*, (b) *Bless This House*, Muriel Brunskill, 2s. 6d. **COL DB1060**
 Muriel Brunskill is one of the best of our contraltos. She is heard here to the best advantage with an accompaniment for violin and organ. Very attractive, light songs.
- (a) *If I am Dreaming*, (b) *Without Your Love*, Richard Crooks, ten., 4s. **H.M.V. DA1306**
 These are from *The Dubarry*. I am not impressed with the music, which seems rather ordinary to me; but the singing is distinctly good. The words of the songs leave much to be desired.
- ★ (a) *Pieta, Signore!* (Have Mercy, O Lord! (Stradella), (b) *Cujus Animam* (Rossini), Beniamino Gigli, ten., 6s. **H.M.V. DB1831**
 It is years since I have heard anything from Rossini's *Stabat Mater*. This is a splendid rendering of it. The other side does not interest me quite so much, but there is some good singing in it. I recommend the disc sincerely.
- ★ (a) *Rose of Havana*, (b) *Loretta*, Titterton, 2s. **DECCA F3481**
 Frank Titterton never lets you down because he keeps his voice so well poised and takes care to let you have every syllable of his words. This record is outstanding, in my opinion.
- ★ (a) *Minstrel Memories* (d.s.), The Minstrel Singer with Orch., 4s. **COL DX452**
 This is very well done. "Come Where My Love Lies Dreaming" and "Love Among the Roses" give an idea of its contents. You can take my word for it that it is worth hearing.
- ★ (a) *The Merry Peasant*, (b) *The Harmonious Blacksmith*,

FRANK TITTERTON
(See column 3)

Malcolm McEarchern, 2s. 6d. **COL DB1059**
 The singer is, of course, Jetsam. The words to Schumann's *Merry Peasant* are by Flotsam. I expect you have heard them do it in one of their broadcasts. I must say I think Flotsam has been reverent both to Schumann and Handel in setting the tunes to such well-written words.

BRASS-BAND MUSIC

- ★ (a) *Boadicea*, (b) (a) *Fanfare and National Anthem*, (b) *Deep Harmony*, (c) *Abide With Me*, Massed Bands of the Leicester Brass Band Festival, 4s. **H.M.V. C2550**
 This is another of the Leicester Brass Band Festival productions. I think it will appeal to many. I certainly enjoyed it. Brass bands are not everyone's taste, admittedly, but they make good variation from jazz and dance music.
- Passing of the Regiments March* (d.s.), Massed Bands of the Leicester Brass Band Festival 2s. 6d. **H.M.V. B4397**
 If I remember rightly the Massed Bands of the Leicester Brass Band Festival gave a good account of themselves in a recent broadcast. They are well worth hearing. You can safely take my word for it.

NOVELTY RECORDS

- (a) *Dan, Dan, the Yodelling Man*, (b) *Sitting In a Jail House*, Harry Torrani, 1s. 6d. **REG-ZONO MR847**
 Another record of a novelty kind. Yodelling with a guitar is singularly effective. I must say I was entertained by this record.
- (a) *That's My Home*, (b) *A Broken Rosary*, Reilly and Comfort, 1s. 6d. **REG-ZONO MR850**
 Piano and guitar—both sides—as an accompaniment to a pleasant baritone voice. The songs are of a light and sentimental type and the whole is quite pleasant.
- (a) *The Good-night Waltz*, (b) *Sunny Madeira*, London Piano Accordion Band, 1s. 6d. **REG-ZONO MR859**
 For lovers of piano-accordions this will be a delight. I do not say that sarcastically or merely because I am not a lover of them; I mean it. This is a good record of its particular kind. The singer is quite attractive.

ADDITIONAL RECORDS REVIEWED by CHOPSTICK

LIGHT SONGS

- (a) **How Deep is the Ocean?** (b) **Ain't Ya Kinda Sorry Now?** The Southern Sisters, 2s. 6d. **BRUNS 1458**

The success of the Southern Sisters is due largely to their fine broadcasts with the B.B.C. Dance Band. Their singing closely resembles that of the Boswell Sisters, the famous American trio, but there is that English individuality as an added attraction. You know both numbers and the recording is excellent.

- (a) **I'm Playing with Fire,** (b) **Lonesome Me,** Paul England, 2s. **DECCA F3461**

Paul England is accompanied by Claude Ivy and Harry Jacobsen on two pianos in these love ballads. He sings with the usual "passionate" feeling, but the honours of the disc go to the pianists—they play admirably. Gramophone companies, as a whole, neglect modern piano duets. Let us have some soon, please.

- ★(a) **Sittin' in the Dark,** (b) **Hold Up Your Hands,** Elsie Carlisle and Sam Browne, 2s. **DECCA F3504**

Look at the titles and remember that the artists are Elsie Carlisle and Sam Browne, who sing every Saturday night with Ambrose's Mayfair Hotel Band. A pair of cute love duets, which I particularly recommend.

- ★(a) **Yes, Mr. Brown,** (b) **Leave a Little for Me,** Jack Buchanan, 2s. 6d. **H.M.V. B4398**
- Jack Buchanan is always good. Besides two songs in his cheerful style, Buchanan provides, as an extra, a step-dance at the end of (a). I have not heard better orchestral accompaniment for a long time. An outstanding production.

LIGHT ORCHESTRAL SELECTION

- Cavalcade** (d.s.), Jack Hylton and His Orch., 2s. **DECCA F2729**

"Soldiers of the King," "I Do Like to be Beside the Seaside," "Everybody's Doing It," "Tipperary," and "Pack Up Your Troubles" are specimens of the incidental music. If you like these old songs, bear in mind that here they are played by a modern dance orchestra. I think it a dull and uninspired production.

ORGAN MUSIC

- (a) **Her Name is Mary,** (b) **Play, Fiddle, Play,** Harold Ramsay, 2s. **DECCA F3438**

A most unusual organ record. Harold Ramsay, the American cinema organist whose broadcasts are relayed from the Granada Cinema, Tooting, pulls out the tremulo stop before he starts and pushes it in when he has finished. He produces by means of a stop—or stops—a sound which is exactly like a piano. Both sides are full of this queer effect. It is a pity that someone must sing the vocal choruses. It is unnecessary. Recording good!

PIANO SOLO

- (a) **Willow, Weep for Me,** (b)

Young and Healthy, Edythe Baker, 2s. **DECCA F3498**

An excellent record of its kind. Edythe Baker's style of syncopation is exceptionally brilliant. Recommended as good light entertainment.

DANCE MUSIC

- (a) **After To-night** (f.), **Why Can't I Find Somebody to Love?** Casa Loma Orch., 2s. 6d. **BRUNS 1445**

Two quiet dance tunes which I thoroughly recommend. The Casa Loma Orchestra is renowned for its amazing versatility. Whether it is "sweet" or "hot," this band never turns out an indifferent record. This is splendid!

- ★(a) **Body and Soul** (slow blue), **Chansonette** (f.), Ambrose and His Orch., 2s. 6d. **BRUNS 1845**

Ambrose celebrates his first appearance on Brunswick by recording *Body and Soul*. If you do not know the tune, please get acquainted. Not only is it a haunting slow melody, but it is Ambrose's greatest achievement. A worthy backing, (b) has one of Ambrose's masterly arrangements on which the band's great popularity has been made.

- (a) **Can't We Meet Again** (f.), **Jack Hylton and His Orch.,** (b) **What More Can I Ask?** Lew Stone and the Monseigneur Band, 2s. **DECCA F3459**

Here is a record with a typical "round tone" Hylton recording on one side and a neatly arranged slow-foxtrot on the other. Lew Stone, who is a fine arranger as well as conductor, is making a name for delightful slow-foxtrots. His (b) has a full-length vocal chorus by Al Bowly, and some good solo instrumental work.

- Dreaming** (f.), **What Would Happen to Me** (f.), Tanzoni and His Dance Orch., 1s. 6d. **WIN 5539**

Excellent recording is the chief recommendation here, coupled with a good performance of two popular tunes. I liked the clear singing of the choruses.

- (a) **Girl in the Little Green Hat** (f.), (b) **Hey! Young Fella** (f.), Rudy Vallee and



RUDY VALLEE

His Connecticut Yankees, 2s. 6d. **COL CB582**

It is rather late in the day for these numbers, but better late than never. Rudy Vallee has done them well. The orchestration is perfectly straightforward in

both cases except for some outstanding violin work. I do admire Vallee's clear-cut diction in the vocal refrains.

- (a) **Let Me Give My Happiness to You** (f.), (b) **Three Wishes** (f.), Ray Noble and His Orch., 2s. 6d. **H.M.V. B6332**

Two numbers from the film of J. B. Priestley's *Good Companions*. Ray Noble is first in the field with these numbers, which have "catchy" tunes. Noble plays them well. May I plead for a few dance records without a vocal chorus? I am beginning to tire of bad "crooning."

- (a) **My Love Song** (f.), (b) **Sweetheart** (f.), Roy Fox and His Band, 2s. **DECCA F3505**

The change in dance-music technique during the last few months is really amazing. The tendency has been a total neglect of the "hot" style, and in its place the quiet melodic style to which we are now almost accustomed. I believe that Henry Hall was the pioneer in this movement. Here, Roy Fox gives two foxtrots, rather on the slow side, with delightful melody as his keynote and some fine solo instrumental work. Ronny Genardo, whom Fox describes as the English Bing Crosby, sings the vocal chorus in (a). Recommended!

- (a) **Seat Song** (f.), (b) **High Society** (f.), The Blue Racketeers, 2s. **DECCA F3434**

Two fox-trots that strike the happy medium between "hot" and "sweet" dance music. The success of this disc is due to the fine solo instrumental work, notably by the trumpet and clarinet players. I am not acquainted with the Blue Racketeers, but they gave the firm impression of being a "snappy" combination. The tunes are labelled as fox-trots, but the tempo is quite fast enough for quick-steps.

- ★(a) **Serenata Cubana** (rumba), (b) **La Belle Creole** (Biguine), Don Barreto and His Cuban Orch., 2s. **DECCA F3454**

Don Barreto and His Cuban Orchestra are described as a genuine rumba band that is the rage of Paris. The production strikes a quaint note. The rhythmic background, heavily marked, is played by a double bass piano and a plucked string instrument resembling a guitar. Vocal choruses are sung in French. An unusual and charming entertainment!

- Sing** (f.), **Please Handle With Care** (f.), Ralph Bennett and His Seven Aces, 1s. 3d. **PANA 25385**

Panachord tell me that Ralph Bennett is one of the most popular of America's younger generation of dance-band leaders. I am not surprised! Quite a suitable record for the purpose for which it was issued!

- (a) **Street of Dreams** (f.), **I Called to say Good Night** (f.), Guy

Lombardo and His Royal Canadians, 2s. 6d. **BRUNS 1447**

These are two delightful slow foxtrots, admirably played as a whole. There is one fault, however. The rhythm bass is not marked enough for dancing purposes, but it is fine light music.

- ★(a) **There's Something About a Soldier** (march), (b) **Have You Ever Been Lonely,** Jack Hylton and His Orch., 2s. **DECCA F3476**

(a) is one of those tunes which is whistled continuously after a few hearings. Cicely Courtneidge sings it in her new film, *Soldiers of the King*. It also happens to be one of those tunes that fits in admirably with Hylton's band. A first-rate disc!

- ★(a) **There's Something About a Soldier** (f.), (b) **The Moment I Saw You** (f.), Ray Noble and His Orch., 2s. 6d. **H.M.V. B6325**

A couple of "infectious" tunes. (a) is full of guards band imitations and, for once in a while, is effectively done. Both tunes are from the film, *Soldiers of the King*. (b) is a "straight" foxtrot rather snappily played and an excellent dance record. Outstanding recording.

- (a) **Under My Umbrella** (f.), (b) **And So Married the Girl** (f.), Ambrose and His Orch., 2s. 6d. **BRUNS 1487**

Sam Browne and Elsie Carlisle get caught in the rain. This, with the usual cross talk about kisses in the rain, is the theme of (a). Some brilliant violin team work and all Ambrose's wonderful showmanship combine to make another great success. (b) is a delicate number, which one cannot help admiring. Ambrose at his best!

- ★(a) **You're Going to be a Habit** (f.), (b) **Young and Healthy** (f.), Ben Selvin and His Orch., 2s. 6d. **COL CB578**

A strongly recommended record. The band is new to me, but I am impressed with its fresh and attractive style. Each instrument gives a short solo and the well-marked rhythm makes it ideal for dancing. A word for the lady vocalist. She has a perfectly charming voice—good diction and little accent. Very attractive.

- (a) **White Lightning** (f.), (b) **Wild Waves** (f.), Baron Lee and His Blue Rhythm Boys, 2s. 6d. **BRUNS 1463**

This record is No. 153 in Brunswick's modern rhythm series. The monocled, top-hatted negro conductor, Baron Lee, with his all-coloured boys, go the pace here. Edgar Hayes, the celebrated rhythmic pianist, shows what lightning fingers can accomplish. The speed of (a) is amazing and the work is faultlessly carried out, but I must warn the ordinary listener. It is not a record that will have universal appeal.

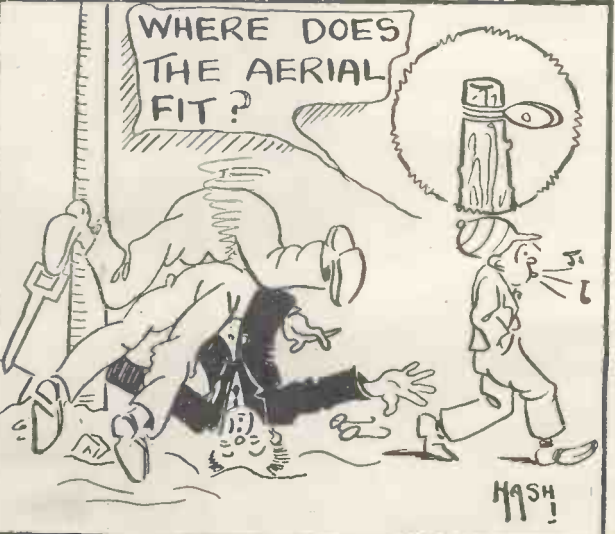
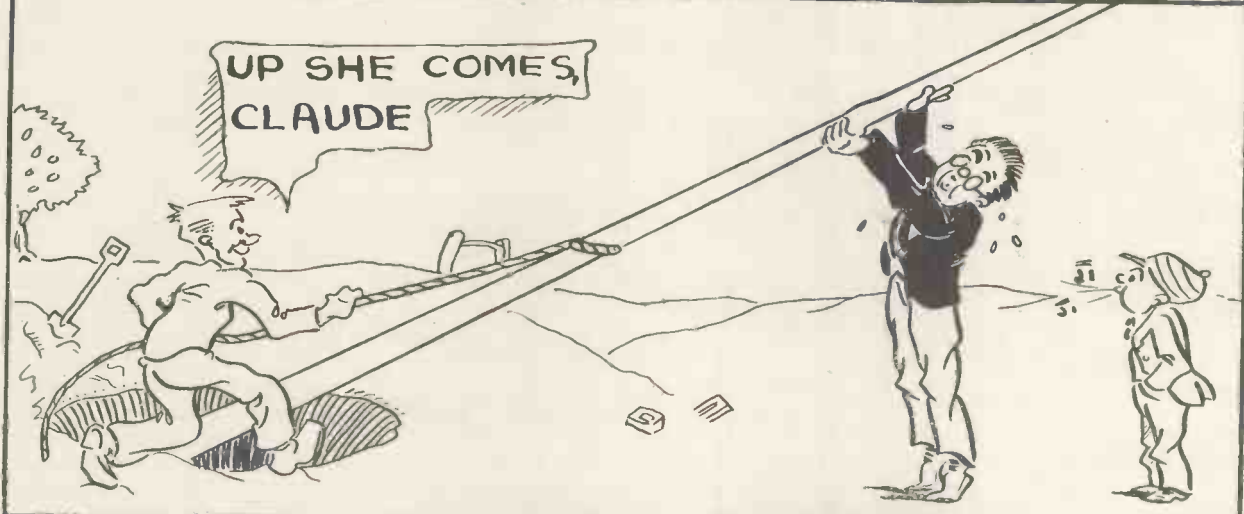
ABBREVIATIONS USED IN THESE PAGES

bar.	..	baritone	H.M.V. HIS MASTER'S VOICE
BRUNS..	BRUNSWICK		orch. .. orchestra
COL ..	COLUMBIA		PARLO .. PARLOPHONE
com. ..	comedian		REG-ZONO
con. ..	contralto		REGAL-ZONOPHONE
DECCA-POL.	DECCA POLYDOR		sop. .. soprano
d.s. ..	double-sided		ten. .. tenor
f. ..	fox-trot		w. .. waltz
			WIN .. EDISON BELL

(a) and (b) indicate the titles of each side of a record.

A Hint for Beginners

Up the (Aerial) Pole!



SHIPS THAT

Some Notes on Ship-to-



"EMPRESS OF BRITAIN" TELEPHONE TRANSMITTER
The Marconi International Marine telephone transmitter, which has a range of 2,000 to 3,000 miles, installed on the "Empress of Britain"



ON THE R.M.S. "MAJESTIC"
A view of the radio-telephony transmitting room from the deck; this gear was supplied by the International Marine Radio Co., Ltd.

IT was not until the latter end of 1929 that passengers on board ship were able to communicate with relatives or with their offices when on the high seas.

On December 8 in that year the American liner *Leviathan*, bound for Cherbourg from New York, was equipped with two-way short-wave apparatus and carried out tests with an experimental short-wave transmitter, which had been erected for the purpose at Deal Beach, New Jersey, in the laboratories of the Bell Telephone Co.—the receivers used in collaboration with the

passengers making short trips to arrange details such as hotel accom-



TRANSATLANTIC TELEPHONY ON SHORT WAVES
The receiver and terminal equipment installed by the Marconi International Marine Communication Co., Ltd., on the "Empress of Britain"

Deal Beach transmitter situated at Forked River, N.J.

The tests and subsequent service proving so satisfactory and reliable, other important liners were equipped in a similar manner.

Vessels such as the English *Empress of Britain*, the German *Europa* and *Bremen*, the Italian *Rex* and later the *Conte di Savoia*, were all in a position to call up telephone subscribers on both sides of the Atlantic.

No doubt within a very short space of time every liner of any appreciable tonnage will be so equipped, enabling business men to keep in touch with their offices and

moderation before their arrival in port.

Ship-to-shore telephony differs from the more familiar transoceanic service as in the latter both terminal points are definitely fixed, enabling the transmitting aerials to be erected directionally to obtain the maximum strength in the desired area.

With one end a moving object such as a liner, slightly different methods have to be employed.

Earth-bound Wave

It is well known that for quite short distances over the sea the earth-bound wave is more satisfactory as it is less subject to fading and is not affected in any way by the Heaviside layer, but over distances of 2,000 to 3,000 miles it would be quite useless. The upward wave, which is reflected by the Heaviside layer, can be made directional and focused within a comparatively limited area.

If suitable wavelengths are used for the time of day, the absolute maximum strength can be obtained and a reliable service guaranteed.

It will be realised that to use a directional aerial and to attempt to focus this on a moving ship for the whole of its voyage would not be a practical idea, so after a considerable

amount of experimental work had been carried out it was finally decided to erect the aerials in such a manner as to cover the more important steamer routes.

The equipment on the various ships differs in detail to a certain extent but, broadly speaking, is fundamentally similar.

Up to eight carrier frequencies are used, these being in pairs, one in each being for transmission to Deal Beach and the other to Rugby. The carrier frequencies vary between 20,000 and 4,000 kilocycles,

TALK^{by}RADIO

shore Telephony by K. JOWERS

or approximately 15 to 75 metres.

In the actual transmitter the output from a crystal-controlled oscillator circuit is amplified and modulated by the speech current and, incidentally, the carrier and both side bands are radiated. The same

—are sent via Rugby on the European side and via Deal Beach on the American side, the replies being received through the Post Office station at Baldock in England and Forked River on the American side.

There is no limit to the possibilities of this service. For instance, when conditions are favourable two-way communication has been maintained with ships as far away as Sydney Harbour and Buenos Aires. It is

usual to communicate with the nearest land station irrespective of the destination of the message, for a liner crossing the Atlantic is never more than 1,500 miles away from either Rugby or Deal Beach.

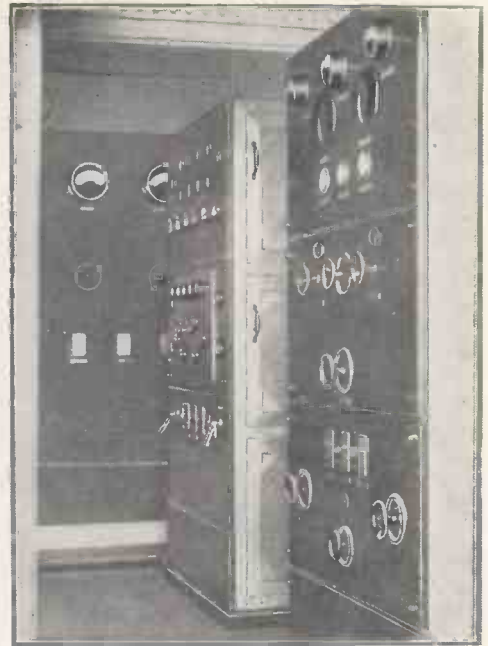
If, for example, the *Empress of Britain*, 500 or 600 miles out from Southampton, wishes to get in touch with

a subscriber in New York, it would not call up Deal Beach but Rugby, where the message would be transferred, re-transmitted over the usual Transatlantic phone system, and distributed in the usual way on the American side.

Should conditions be unusually bad, it is possible for one liner to send the message on to another nearer the coast, breaking up the distance quite effectively, as the second liner would pass on the message to the proper quarter.

On the European side, we are in rather a unique position as Rugby is the terminal point for all Transatlantic calls. Subscribers in Vienna, Budapest, or Oslo, for example, who wish to communicate with either a ship at sea, or to North or South America, would be connected via the usual continental landlines to Rugby, and from there via the Atlantic phone to the recipient of the call.

A marvellous achievement!



A RANGE OF 1,000 MILES
Working on medium power, this Marconi wireless telephone installation on the "Queen of Bermuda," has a range of about 1,000 miles



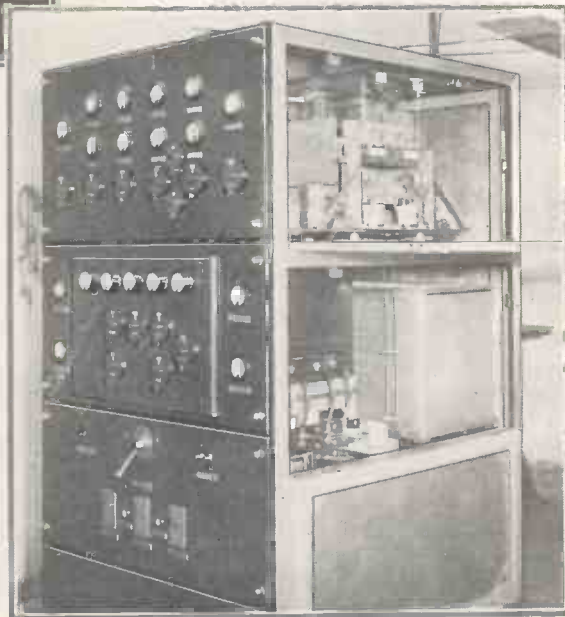
TRANSMITTER CABIN

More of the International Marine Radio equipment on the "Majestic." In the foreground is the 4-kilowatt amplifier

basic transmitter is used for all frequencies, and the familiar frequency-doubling system is used to obtain the correct wavelength down to approximately 25 metres, but below this a system of duplex frequency doubling is brought into operation.

On the receiving side the incoming signal is modulated in two steps and very carefully filtered of any extraneous noise. Automatic volume control is an essential feature and has proved very effective in removing all traces of fading and "dither"; the final effect is perfect clarity as obtained during a local telephone call.

The outward messages—those from a normal telephone subscriber



OSCILLATOR-MODULATOR UNIT ON THE "MAJESTIC"
This photograph shows the International Marine Radio oscillator-modulator unit installed on S.S. "Majestic"

A New-season's Set

Details of a New Set to be Designed by W. JAMES

DURING the past few months, new valves have been developed and fresh circuits devised. At the time of writing, the new valves are not on sale, but samples show the order of performance to be expected.

As a result, it is safe to state that a far better performance can be put up with the new arrangements than we have grown accustomed to.

Now to-day we need selectivity, sensitivity, enough volume and good quality. We have been able to get satisfactory volume and quality from mains sets, but there has been difficulty with battery sets because of the urgent necessity for keeping high-tension consumption within economical limits.

It is, therefore, satisfactory to learn that the problem has been tackled, and in my view battery users will soon be able to enjoy the volume and the quality hitherto experienced practically only by those using mains sets.

"Class B" amplification is the system which is going to mean so much to the battery users.

A class B amplifier is, briefly, one having the valves so arranged that the anode current when there is no signal is quite small. When a signal is received, the anode current of first one valve and then the other increases according to the strength of the signal.

Low Relative Current

The result is that the average current for a given sound output is relatively low or, expressed in another way, which shows the advantage more clearly, for a given average anode supply current, comparable with that taken by valves working in the usual way, the sound output will be much greater.

The special class B valves really consist of two valves in one glass bulb. They are designed to pass a small anode current at zero grid bias. Therefore, a signal produces grid current, and it is characteristic of these valves that *power* is needed to drive them.

Readers interested in the set outlined in these notes should also look at the following special articles in this issue:

New Valves That Will Revolutionise Radio, page 369.

How to Use the Westector, page 380.

All About Class B, page 396.

Iron Cores in Tuning Coils, page 421.

A glance at these articles will show beyond all doubt the possibilities of the new set now being designed for "Wireless Magazine" by W. James.

This power comes from the preceding stage, and a special step-down coupling transformer is used to supply the power to the grid circuits. There is also an output transformer or other matching device.

The circuit is a form of push-pull, using a pair of valves or the equivalent in one bulb and centre-tapped input and output transformers designed to suit the particular working conditions.

It may be just possible to supply the stage directly from the detector, but usually a driver valve will have to be used in order fully to load the power stage.

A development of this nature more or less settles the output end of a new set. Now what of the high-frequency side and also the detector?

Here again there have been developments. I have worked out a nice super-heterodyne set, giving all the selectivity and sensitivity required.

The new iron-cored coils make a very sharp-tuning input filter, and a new circuit allows us to make full use of a screen-grid valve as a combined detector-oscillator.

The net result is an extremely sharp tuning and sensitive circuit. Plenty of magnification can easily be obtained with a good long-wavelength amplifier.

Difficulties in the past have usually

been confined to the input and output circuits. Now it is possible to make a really sharp-tuning input circuit that magnifies very well, and we can also construct a class B output stage to give the necessary quality and power.

There remains the detector, and here I use a Westector, which will deal with strong signals in a satisfactory manner.

It will be quite clear that something exceptional is on the way. There is not merely one improvement but four, and each improvement is a very real one. The net result is much better selectivity, more volume, better tone and the cost is not increased over that of normal sets.

The iron-cored coils tune sharply by themselves and thus help to remove one of the chief faults of many super-heterodyne sets, which is that the input circuit tunes too broadly.

Then, again, the combined oscillator-detector generates oscillations of such a strength that there need be no fear of disturbances through radiation. Many present-day sets *do* radiate the locally-generated oscillations, and this is a nuisance. Attention to the circuit and the values of the parts has shown how it is possible to obtain the correct results without the nuisance.

I hope to describe the construction of the new set in an early issue.

Four Chief Features

Its four chief features will be:

- (1) Exceptional selectivity, using iron-cored coils.

- (2) The maximum useful sensitivity.

- (3) A Westector for rectification.

- (4) A class B output stage for good quality and remarkable volume considering the normal high-tension current consumption. (Of course, if class B valves are not available in time I shall have to use some other output arrangement—probably Q.P.P.)

It is not often that one is able to introduce so many new and worthwhile features at once.

WE TEST BEFORE YOU BUY

Special Reports on Ten of the New Season's Sets

IF you are a regular reader you will notice that this month we are reviewing double the usual number of sets—ten instead of five. In future, it will be our practice to deal with ten of the latest sets each month. Only in this way can we cope with the fact that there are now some 300 sets on the market.

Allowing for the proportion that do not come up to our standard, this still means that we cannot deal with every good set in the course of a season.

Representative Selection Each Month

It will be our endeavour, though, to present to you a representative selection each month. Obviously, the doubling of our testing activities will mean you have a better selection than in the past.

The abbreviation of each set's report does not mean that essential information is omitted. Our aim is to tell you something about the cabinet work, about the set's controls, its selectivity, range, and, above all, its quality.

From our remarks you should then be able very fairly to judge whether any set reviewed in our pages exactly suits your reception requirements at the price you wish to pay.

We should like to remind you that the job of making a selection from the wide range of sets can be considerably eased if you care to conform with the simple rules of the "Wireless Magazine" Set Selection Bureau. This service, which is quite free to all readers, provides a unique opportunity for all set-buyers to obtain really unbiased advice.

To enable us to advise you with authoritative knowledge of the most important sets on the market we test them all as soon as they come out. Not all the sets so tested are reviewed, although naturally many do find their way into the test pages.

The point we wish to emphasise is



YOUTH WILL HAVE ITS FLING!
A young member of the family is very interested to find out how the Marconiophone portable works

By the "Wireless Magazine" Set Selection Bureau

that "Wireless Magazine" really has the interests of the set-buyer at heart. Our tests and free advice together constitute a set-buyer's service no other radio paper offers.

Most of the tests are done in South-west

London, about 20 miles from the Brookmans Park stations, on a standard 60-ft. aerial with a good earth. The mains are A.C., but where necessary a D.C. supply is available in London and in the country.

When remarking upon the quality of a set's reproduction we have to bear in mind that this aspect of reception introduces a personal factor. Listeners' tastes vary greatly. It would be almost impossible to satisfy every listener with one standard of quality.

What we do, therefore, is to satisfy ourselves that the reproduction is pleasing, that it does not greatly lack any particular frequencies, and does not too greatly accentuate either high or low frequencies. You may be sure that no set really deficient in quality of reproduction passes into the test pages.

Quality First

Bad quality is something we will not tolerate because we believe that, in the long run, it is the quality of the reproduction that determines how much pleasure you will get from the set, rather than such things as range of reception and selectivity. Important as these other attributes are the quality is our first care.

In reading through the reports in the following pages we should like you to make sure that all the information you require before buying a set is given. It would be interesting to hear whether you want more details of the circuit, or whether, as we imagine, you are more interested in the results obtained.

If there is any way in which you think these reports might be made more useful, please write to tell us.

FREE ADVICE TO PROSPECTIVE SET BUYERS

To make the most of this free advice service, we ask you to answer the following questions:—

(1) The maximum price you wish to pay, and whether you are prepared to exceed this if there is no suitable set at your desired price.

(2) The locality in which the set will be installed.

(3) The stations required, that is, locals only or a selection of foreigners.

(4) Whether you want an entirely self-contained set or one with external aerial and earth.

(5) Whether battery or mains driven. If the latter, whether A.C. or D.C.

A stamped-addressed envelope for our reply is your only expense. Address your inquiry to Set Selection Bureau, "Wireless Magazine," 58-61 Fetter Lane, E.C.4. Tell your friends about this useful service, exclusive to "W.M."

Columbia Super-het Seven Fox Synchro-dynamic Five

MAKERS : Columbia Graphophone Co., Ltd.
 MODEL : Super-het Seven.
 PRICE : £25 4s.
 VALVE COMBINATION : Super-het sequence of six valves and mains rectifier.
 POWER SUPPLY : A.C. mains.

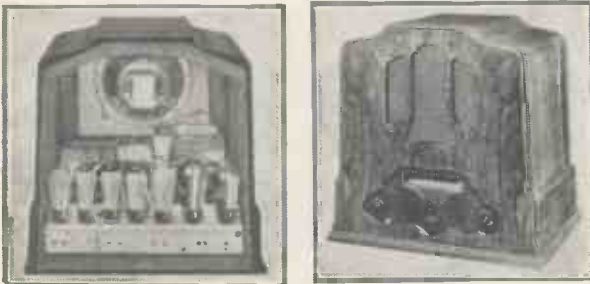
POWER CONSUMPTION : 95 watts.
 TYPE : Table-cabinet set needing small external aerial and a good earth.
 REMARKS : Reliable super-het for good all-round results. Specially recommended for "difficult" reception areas.

MAKERS : Fox Industrial, Ltd.
 MODEL : Synchro-dynamic Pedestal.
 PRICE : £28 7s.
 VALVE COMBINATION : Two screen-grids, detector, resistance-capacity low-frequency stage, and resistance-capacity pentode output, with mains-valve rectifier.

POWER SUPPLY : A.C. mains.
 TYPE : Pedestal-cabinet set needing external aerial and earth.
 Provision for gramophone pick-up.
 REMARKS : Handsome cabinet contains powerful straight set, giving good quality from wide range of stations.

THIS has proved to be one of the most popular super-hets of the season. The reasons are easy to see. It is a good-looking set, in a dark walnut cabinet of ample dimensions. It is inherently easy to work. With the most meagre of aerial-and-earth equipment it brings in a host of alternative programmes.

The success of the super-het circuit to-day depends very largely, as in this set, on the use of variable-mu type screen-grid valves. We find they give in this model a fine control of the volume, and a welcome freedom from cross-talk interference.



COMPACT TABLE SUPER-HET

These photographs show the compact nature of the Columbia super-het. The six valves and rectifier are seen mounted in line on the set chassis

In addition to the usual tuning, volume and combination switch controls, this set has a tone control, which varies the high-note response over a wide range of frequencies.

You can make the tone suit the type of programme, and you can materially cut down interference due to background noises from heterodynes and other ether nuisances.

The tuning scale is notable, turning round the medium- and long-wave scales according to the setting of the wave-change switch. The markings are easily located by the moving pointer. The volume control works a dual control, the variable-mu control for radio, and a potentiometer control across the pick-up sockets, provided at the back for the external connection of a pick-up.

The quality is pleasing enough. There is a lack of very high frequencies, inevitable with this type of set, but speech is clear and music not lacking in definition. Cabinet boom is not offensive.

Selectivity is of the highest order. We got Mühlacker with only the faintest trace of side-band splash from London Regional. Many foreigners clear of interference, though some naturally suffer from side-band splash. There are always plenty of clear programmes available on this set. Its great amplification avoids the need for a large aerial. We got all we wanted with a 15-ft. piece of wire and a good earth.

The short aerial should be perfectly satisfactory close to a regional station, whereas in out-of-the-way localities a good aerial should enable the listener to depend on the nearest home station and most foreigners.

FOR those who like a pedestal type of cabinet instead of the more common table cabinet, this Fox set has a great appeal. The cabinet is finished with a matt surface, in walnut, and measures 36 in. high, 22 in. wide and 13½ in. deep.

Housed inside is a powerful five-valver and a moving-coil loud-speaker. It is a straight circuit, with two screen-grids for high-frequency, power-grid detector, low-frequency stage and pentode power output. The valve rectifier for the mains makes the sixth valve.

Double band-pass aerial tuning is used, a four-gang condenser providing the tuning variation. Resistance-capacity coupling is used for the low-frequency stages. The control knobs are unusually large and handy to grip. One for tuning at the centre, another on the left for volume and mains switching; one on the right for wave-changing and a little knob below the tuning for tone control.

We liked the quality of the reproduction. The Rola loud-speaker works well when it has a large baffle area as in this set. Ample bass without boom. The "top" is controllable by the tone control over quite a wide frequency range.

Selectivity. Almost up to the best super-hets. Mühlacker was louder than the interference caused on that wavelength by London Regional. Hamburg and Strasbourg were quite clear of London. Clean-cut separation between foreigners a feature. Söttens, for example, clear of Midland Regional. On long wave-band Königswusterhausen suffered only from faint side-band splash from Daventry.

Sensitivity. In daylight eighteen foreign stations were tuned in on the medium waves at full loud-speaker strength. At night the condition of the ether is the only limit to the stations you can get.



POWERFUL "STRAIGHT" FIVE

A neat and compact design is the feature of the Fox Synchro-dynamic receiver. The cabinet, well finished in oak, is a handsome piece of furniture

Pye Model G/B

MAKERS : Pye Radio, Ltd.

MODEL : G/B Table Four.

PRICE : £14 14s.

VALVE COMBINATION : Screen-grid, detector, and matched pentodes for the output.

POWER SUPPLY : Batteries, including 160-volt high-tension.

POWER CONSUMPTION : Depends to some extent on the volume output, average being 12 to 15 milliamperes.

TYPE : Table-cabinet set complete except for aerial and earth.

REMARKS : Very fine quality from good selection of home and foreign stations.

SPECIAL interest attaches to this set as it is one of the first to be marketed with the new Q.P.P. system of power amplification. The idea, you will recall, is to obtain a greater volume than usual—comparable with mains-set volume—without increasing the anode-current consumption from a standard high-tension battery.

This is a three-stage set, with one valve for high-frequency amplification, another for the detector and the remaining two valves—matched pentodes—for the push-pull stage. The set chassis, moving-coil loud-speaker and batteries are contained in a light walnut cabinet of pleasing appearance. Self-contained except for the aerial and earth.

The set has all the best attributes of a mains set. The wavelength scale is illuminated when the set is switched on. Medium and long waves are marked each side and main stations down the centre. Exceptionally easy scale to read.

Control is done with three knobs. One is for tuning, another for volume and the third for reaction. Control is excellent.



A TRANSPORTABLE WITH Q.P.P.

The handsome cabinet and sound interior design of the Pye G/B set. The main on-off switch is fitted in a convenient place on the back of the set

Quality. Really first-rate. Best we have ever heard on a battery set. Full round bass with a tune in it—not a cabinet thump. There is ample volume and no blasting when loud passages occur. A complete vindication of the quiescent new push-pull idea.

Selectivity. Good anyway, and very good indeed if you use the reaction and volume controls intelligently. Stations eighteen kilocycles from the locals clear of interference. Many foreigners completely clear of interference.

Sensitivity. With indoor aerial thirty stations, making full use of the reaction. The tuning goes from well below 200 metres to 520 metres, and long waves cover the wide range of 800 to 2,000 metres.

Provision is made for an external loud-speaker. This can be used with or without the internal one. You can also use a pick-up with this set.

Regentone Quadradyne

MAKERS : Regentone, Ltd.

MODEL : Quadradyne Table Four.

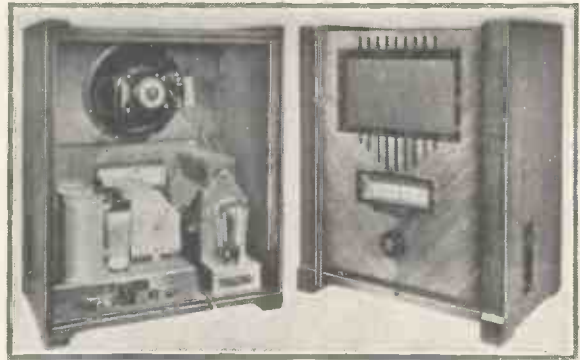
PRICE : £16 16s.

VALVE COMBINATION : Two screen-grid high-frequency stages, screen-grid detector, and pentode output.

POWER SUPPLY : A.C. mains.

TYPE : Table-cabinet set with moving-coil loud-speaker. Needs external aerial and earth. Has mains aerial for limited reception.

REMARKS : Exceptionally simple set to work, giving full-strength results from most foreigners.



A HANDSOME ALL-ELECTRIC RECEIVER

The tasteful walnut cabinet with full-vision station-calibrated tuning scale can be seen from these photographs. An energised moving-coil reproducer is used

THIS is a good straight four with two screen-grids for high-frequency amplification, a screen-grid detector and a pentode power output, working into a Rola moving-coil loud-speaker, the complete assembly housed in a pleasing walnut cabinet.

The simplicity of the front of this cabinet is striking. There is only one knob, a large control for the tuning. Let into the right-hand side of the cabinet is a lever for changing the waveband and a knob for varying the volume. We would stress the utter simplicity of the control of this set. Its powerful action does not depend in any way on control *finesse*.

There is a tone control at the back. In the down position this cuts off the top notes, useful when there is a strong heterodyne-whistle interference. The tuning scale is well marked in wavelengths and stations. A hair-line pointer moves across this scale. Precise and accurate tuning.

Selectivity. Hamburg and Strasbourg clear of London Regional. Apart from the stations adjacent to the locals this acts almost as well as a super-het. Adjacent foreigners are not difficult to separate. For example, Söttens practically free from Midland Regional—a feat many super-hets cannot completely perform.

Sensitivity. With 60-ft. aerial and good earth all the worth-while foreigners—between twenty and thirty stations—were brought in at full strength without going to the maximum on the volume control. This set will work well with an indoor aerial, or for local and more powerful foreigners only the mains aerial works satisfactorily.

Quality. Will please most listeners. Plenty of bass, with a little cabinet resonance to augment it. The top-note response is controllable by the tone switch. Quite brilliant with top in and not too “woofy” when cut off.

When foreigners are suffering from severe heterodyne interference the tone switch cuts down the background.

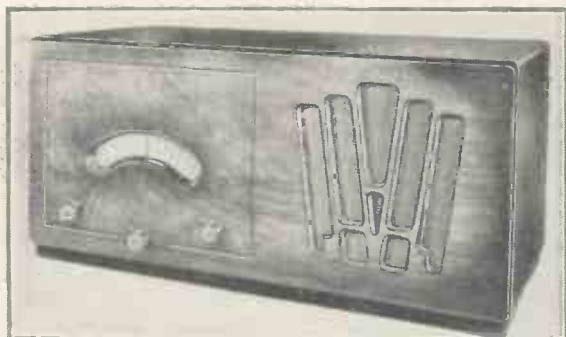
Portadyne MC4

MAKERS : Portadyne Radio, Ltd.
 MODEL : MC4.
 PRICE : £11 19s. 6d. without batteries.
 VALVE COMBINATION : Two screen-grids, detector and pentode.
 POWER SUPPLY : Self-contained batteries.

POWER CONSUMPTION : Anode current at 120 volts was 11 milliamperes.

TYPE : Table-cabinet set complete except for aerial and earth.

REMARKS : A well-designed battery set, giving good quality and great range.



AN UNUSUAL SELF-CONTAINED BATTERY FOUR
 The set, a powerful four-valver with two screen-grid stages, is mounted in the left of the cabinet and the moving-coil loud-speaker, an R. & A. Challenger, on the right

ONE of the relatively few battery sets available that has a really effective high-frequency amplifying system, this MC4 four-valver entirely satisfied us on test. There are two screen-grid amplifying valves, detector and pentode output, driving a self-contained permanent-magnet moving-coil loud-speaker.

Room is available inside the dark grained walnut cabinet for the necessary batteries. The set and loud-speaker are fitted side by side in the long narrow cabinet, which measures 23 in. long, 10 in. high and 11½ in. wide.

We are glad to note that provision is made for an external loud-speaker. By a simple plug-and-socket idea the internal loud-speaker can, if desired, be cut out when using the external one. Actually it is not likely that you will want to cut out the permanent-magnet loud-speaker, which is admirably matched to the pentode power valve. We thought the quality above the average for a battery set of the straight type. There is a satisfactory balance of high and low notes and very little cabinet resonance.

The control is simple. A wide tuning scale is marked in wavelengths from 200 to 550 and from 900 to 1,900 metres. The volume-control knob also switches on and off the set. There is a separate knob for wave changing. As the battery current is 11 milliamperes the standard battery is slightly overrun but the good quality seems to justify this. The makers say 10 milliamperes, and that may well be the average.

Selectivity. Quite up to standard for this type of set. Scottish Regional clear of London Regional. Plenty of foreigners clear of interference. There are three aerial taps, A2 being the best compromise between sharp tuning and range.

Sensitivity. Twenty-eight stations were logged on the medium waves simply by turning the tuning knob and not touching anything else. One of the most powerful battery sets we have tried. It would work well with an indoor aerial, or with an outdoor aerial in remote parts of the country.

Six-Sixty Super Five

MAKERS : Six-Sixty Radio Co., Ltd.
 MODEL : Super Five.
 PRICE : £14 14s.
 VALVE COMBINATION : Two screen-grids, detector and pentode, with mains rectifier valve.
 POWER SUPPLY : A.C. mains from 100 to 250 volts.

TYPE : Table-cabinet set, needing external aerial and earth. Very small aerial sufficient.
 REMARKS : Specially commended for good selectivity and vast range of reception. Ideal for use with existing moving-coil loud-speaker if this is fitted with matching transformer.

THIS provides a fine example of how a perfectly straight set, when really well designed, can compete and almost, if not quite, equal in performance the super-het type of set. It is a four-stage set with two screen-grids for high-frequency amplification, power-grid detector and pentode output, the fifth valve being a mains rectifier.

Special tuning coils and condensers are used and a micrometer tuning scale is provided to take full advantage of the knife-edge selectivity. The set is housed in a dark walnut cabinet, rather shallow but quite attractive. The chassis, robustly constructed, is at the bottom and above is a large moving-iron loud-speaker.

We were surprised at the good quality of this reproducer. It certainly has not the real bass of a moving-coil, but against that must be recorded the excellent upper register and the high sensitivity. When a good set drives a moving-iron loud-speaker you do sometimes, as here, get surprisingly good tone. It is significant, perhaps, that the makers have made it very easy to use an external loud-speaker with this chassis. An ideal set for those having on hand a high-grade loud-speaker.

We must stress the great ease of operating this set. One-knob tuning and volume combined with mains on-off on the left, with wave-change on the right. Without any fiddling you can bring in all Europe on an indoor aerial. We did this.

Selectivity. Quite the best we have experienced outside the super-het class. Gets Mühlacker with only faint trace of intelligible London background. Precise and clean-cut separation of all adjacent foreigners easily done. That this is done without too much high-note cutting speaks well for the design of the coils.

A notable feature of the reception is the entire absence of background. Also, with or without an earth, there is very little trace of mains hum. You can use a pick-up with this set, with external volume control.



A FINE STRAIGHT RECEIVER
 A neat walnut cabinet houses the new Six-Sixty Super Five. The large tuning scale is calibrated in wavelengths. A cone loud-speaker is incorporated

Aerodyne Hawk

MAKERS: Hustler, Simpson and Webb, Ltd.
MODEL: Hawk.
PRICE: £12 12s.
VALVE COMBINATION: Variable-mu screen-grid, detector and push-pull pentode output.
POWER SUPPLY: Self-contained batteries.

TYPE: Table-cabinet set with moving-coil loud-speaker. Needs efficient aerial and earth for good results on foreigners.

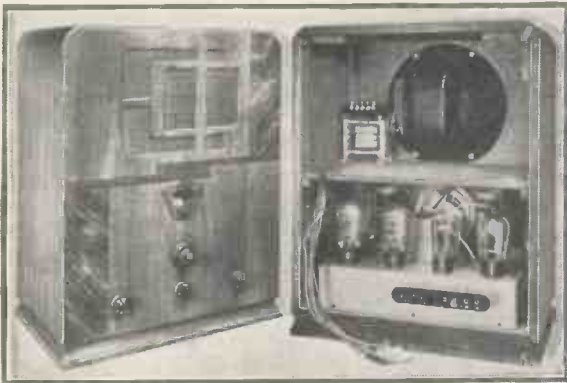
REMARKS: Interesting for use of quiescent push-pull system, giving good quality with volume above the normal.

ONE of the first commercial sets to incorporate the quiescent push-pull system of power amplification, this is a good-quality three-stager with a variable-mu high-frequency amplifier, detector and two pentodes for the output. Included in the walnut cabinet is the set chassis and a permanent-magnet moving-coil loud-speaker. Space is left behind the loud-speaker for the batteries.

A twin-gang variable condenser tunes the two tuning circuits, one for the aerial and the second for the intervalve coupling. Accurate ganging all round the scale is ensured by using a condenser with a superimposed trimmer knob. The tuning scale is wavelength marked and lights up when the set is switched on. Medium waves are marked from 200 to 500 metres in steps of 20 metres, though the actual range is a little more than this. Long waves go from 800 to 1,900 metres in steps of 100 metres.

Control is straightforward. The volume control is on the left, reaction on the right, with combination switch knob below the tuning.

Selectivity. Depends ultimately on the way you



A HANDSOME TABLE FOUR WITH Q.P.P.

Two photographs showing the well-designed layout and cabinet of the Aerodyne Hawk receiver. Batteries are accommodated on the top shelf behind the loud-speaker

handle the volume and reaction controls. There is a 25-metre spread for the locals. Not difficult to separate most adjacent foreigners. Long waves are satisfactory, five stations being heard at good strength.

Quality. Has characteristic ability to handle loud passages without blasting. Minimum anode current is about 10 milliamperes, and the average depends on the average volume. The loud-speaker gives appreciable bass response.

Sensitivity. Up to standard for type of circuit. Set brings in most of the worth-while foreigners on medium waves at good strength, even on an indoor aerial, providing reaction is fully exploited.

Pick-up sockets are worth using, we think, as there is ample volume and quality is above normal for a battery set, thanks to the special output stage.

H.M.V. Radiogram Seven

MAKERS: The Gramophone Co., Ltd.

MODEL: Super-het Seven Radiogram.

PRICE: £50 8s.

VALVE COMBINATION: Seven-valve super-het sequence, includ-

ing U12 rectifier and PX4 power output valve.

POWER SUPPLY: A.C. mains.

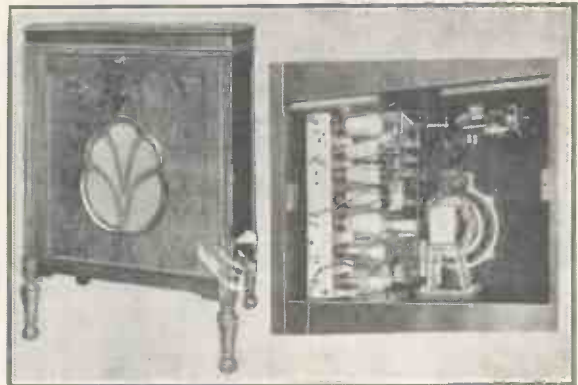
TYPE: Pedestal radio gramophone.

REMARKS: High-class instrument giving really fine quality on radio and records.

LIKE all H.M.V. products, this radio gramophone is a handsome piece of furniture. When the lid of the instrument is closed, all you can see of the controls is a single knob mounted above the grille of the loud-speaker on the front of the cabinet. This knob controls the volume of the output, not only for radio, but for records.

All the other controls, few enough for even the novice, are suitably positioned in the left-hand corner of the motorboard under the lid.

Three knobs are fitted. One is for tuning. Another is for switching from one wavelength range to the



A NOTABLE RADIO GRAMPHONE

Only the volume control is fitted to the cabinet front of this H.M.V. radio gramophone. Note the compact set design in the interior view. The set chassis is mounted vertically

other. The third knob is in the nature of an extra, being a control of the tone, on both radio and records.

All the usual gramophone accessories are fitted on the motorboard. These include a gramophone pick-up with swivel action for easy needle changing, an automatic brake that can be switched out of action if not desired, and a motor-speed regulator. The motor is an induction type with a very smooth action.

On test we first noted the entire absence of mains hum. This applied with and without the earth lead.

Next thing we played over some test records and were highly pleased with the sonority of the reproduction.

Top-note response is entirely under control. You adjust the tone control until just the right timbre to your liking is obtained.

On the radio side we were soon logging all the worth-while foreigners of Europe, revelling in the reserve of power imparted by the seven-valve super-het circuit, and delighting in the ease with which this great power could be controlled.

Selectivity is definitely of the nine-kilocycle order all round the dial, whether in separating London from Mühlacker or one foreigner from another. Similarly, on long waves the German station between Daventry and Paris was clear of interference.

Gecophone Model BC3340

MAKERS : General Electric Co., Ltd.
 MODEL : BC3340.
 PRICE : £18 18s.
 VALVE COMBINATION : Two screen-grid high-frequency stages, screen-grid detector and pentode power output, with valve rectifier for mains.

POWER SUPPLY : A.C. mains from 100 to 250 volts.
 TYPE : Table-cabinet set needing external aerial and earth. Mains aerial provided.
 REMARKS : First-class quality, easy control, good range, and exceptional selectivity.

AN excellent example of the straight four type of set, this Gecophone table model gives results comparable with the best super-hets. It will do all a super-het can do except get the foreigners adjacent to the locals clear of interference. If anything, better tone than average super-het, due to less high-note cutting.

The cabinet is walnut in dull-matt finish. Modern lines. Rather attractive, especially to those who dislike highly-polished woodwork.

Quality is above the average. Remarkable absence of boom. Bass is real and not faked. There is no



A FINE A.C. TABLE FOUR-VALVER
 A handsome walnut-matt finished cabinet houses the Gecophone Model BC3340. Note the rather unusual layout of the set chassis. A well-designed job!

“tum tum tum” cabinet resonance. As much top as conditions in the ether will permit has been retained. Altogether we would stress this set’s well-balanced tone.

The pentode takes a big volume without overloading. Quality is not affected when the volume is reduced. Operation is really easy. Large horizontal scale marked in medium and long wavelengths, but only one waveband is visible at a time. Whole scale rotates when waveband switch is worked. All the powerful foreigners except Munich are clearly, and as tests prove, accurately marked.

Selectivity. When tuned to Mühlacker this set brought in the German more loudly than London Regional. Could not get it clear, but no difficulty with the next channels—eighteen kilocycles from the locals there is no trace of interference.

Adjacent foreigners are as clear of each other on this set as on any super-het yet tried. The only point to watch is the setting of the volume control, which must be kept down to normal requirements or slight interference is set up. The silent background is delightful. There is no mains hum with or without the earth.

There is more than enough sensitivity for all requirements. Even with a short indoor aerial all the worthwhile foreigners came in at full strength. For localities remote from a home broadcasting station this is a very good set to use with an outdoor aerial. Its range does not depend on fiddling adjustments.

Beethoven Portable

MAKERS : Montague Radio Inventions and Development Co., Ltd.
 MODEL : Screen-grid Portable Four.
 PRICE : £10 10s.
 VALVE COMBINATION : Screen-grid, detector, low-frequency, and power.

POWER SUPPLY : Batteries, self-contained in case.
 POWER CONSUMPTION : Total anode current 8 to 9 milliamperes at 108 volts with full grid bias.
 TYPE : Suit-case portable.
 REMARKS : Really is portable. Gives reliable reception.

ONE of the few really portable sets on the market, the Beethoven is just over 13 in. square by 9 in. deep. The case is finished in blue lizard, the fittings are copper oxydised, the interior woodwork is highly finished mahogany. A handsome little set! The strap is fitted to one side so that your knee is not knocked when carrying the case. Not back-breakingly heavy, either!

The circuit is a screen-grid high-frequency stage, a detector and two low-frequency stages, with a small power output valve driving a Celestion moving-iron loud-speaker. No aerial or earth are needed, as a frame aerial is fitted in the lid carrying the loud-speaker. Terminals are provided for an external aerial and earth for use far from a broadcasting centre.

Running costs are well below the average for a portable set, due to the economy of anode current. On test the total current from the 108-volt high-tension battery was 8 milliamperes, which means the standard battery is not much overrun, and should last at least three months with average use.

Quality. Not easy to define in a portable, is it? We think that in view of the limited power and the economy of running the quality is good. Speech is extremely clear and natural, while music, while lacking real bass, is nevertheless quite pleasant to listen to.

Selectivity. Two tuning dials are fitted one above the other for the control of the two tuning circuits. Very easy to operate this device and to get plenty of foreigners clear of local interference. The frame aerial also helps to separate certain stations.

Sensitivity. Stations from Fécamp at the bottom to Budapest at the top of the medium waveband came through clearly and without effort. On long waves Radio Paris and Huizen and Eiffel Tower very good, with Motala and Kalundborg not at all bad. Several stations are marked on a chart for easy logging. When the set is closed you can lock it. If the loud-speaker rattles you can adjust the unit. For normal volume it is not likely to rattle and can be adjusted for maximum sensitivity.



WELL-DESIGNED AND VERY COMPACT
 The blue lizard case of the Beethoven Portable is 13 in. square by 9 in. deep. It is one of the few portable sets that is easily carried

BETTER PROGRAMMES!

By T. F. HENN

FOR several months I have stressed the importance of developing the lighter side of broadcast entertainment.

I have hoped that some day the vaudeville programmes would improve and I have suggested that a restful alternative to the monotony of late-evening dance music would be greatly appreciated by many listeners.

That the B.B.C. feels it ought to improve matters is evident from news of recent changes in programme make-up. Vaudeville and revue shows have entered a new era under Eric Maschwitz, the newly-appointed director of light entertainment.

Brilliant Ideas

And now more news of a change that has been long overdue. Sitting at his desk on the top floor of Broadcasting House, a prominent member of the Programme Department is busy devising brilliant ideas—that cost money—for brightening the early part of the Regional programme, which begins at 6.30 p.m.

Firstly, it must be remembered



A famous soprano, Ria Ginster, will take part in a performance of Beethoven's Choral Symphony on May 19



A popular cabaret artist who recently returned to the microphone after an absence of two years, Zaidée Jackson

that the early Regional programme is the alternative to one composed mainly of talks and the Foundations of Music, a custom of which everyone must be tired.

Secondly, the city worker may not realise the importance of this time because he usually arrives home in the middle of it, but it must be

remembered that the country folk have long finished their day's work and this part of the programme probably represents their main radio entertainment of the day.

"Early to bed and early to rise" is still the custom in the English countryside.

Hitherto, the first part of the Regional evening programme has been a dreary type of small-orchestral concert with two vocalists to break the ninety minutes monotony. The new idea is to split up the first two hours of this programme into small sections of thirty minutes each.

Best Light Music

Each section will have programmes comprising the best in light music, varied as much as possible. Gipsy orchestras, quintets, septets, and octets, all treating light music from a different angle; piano and light instrumental recitals by popular artists; and organ recitals will all have their turn in the new regime.

Here is the brief outline of the broadcast on May 2. From 6.30 to 7 p.m., Jean Chevreau—one of the harpists in the B.B.C. Symphony Orchestra—and George Nicholson, baritone, will give a light recital. A



The noted Russian conductor, Serge Koussevitzky, is conducting three concerts at the London Music Festival in May



Acclaimed as the greatest woman violinist of the day, Renee Chemet is noted for her international tours and broadcast recitals



A well-known variety artist, John Tilley has featured prominently in recent vaudeville programmes

well-varied orchestral concert will be given by Reginald King and his orchestra, who make a feature of tuneful arrangements of popular dance tunes, from 7 to 8 p.m.

They will be supported by Billy Mayerl, the syncopated pianist, who will play some of his own delightful compositions.

Versatile Accompanist

At 8 p.m. Berkeley Mason, the B.B.C.'s versatile accompanist, is giving a recital on the organ of St. Margarets, Westminster.



Our cartoonist's impression of Patricia Rossborough, the celebrated syncopated pianist

The rest of the evening, unfortunately, will consist of a relay, lasting two and a half hours, of part of Wagner's *Das Rheingold* from the Opera House, Covent Garden. What a pity!

How many times has it been said that opera relays are not worth while? Seeing an opera is to enjoy it, but just hearing it is, surely, rather boring.



Many listeners will remember De Groot's broadcasts from the Piccadilly Hotel in the early days. He will be heard again shortly

Here are some typical examples of the new kind of light programme that will be heard soon:—

April 29.—J. H. Squire String Sextet, 6.30-7 p.m.

Sydney Baynes and his orchestra, 7-8.15 p.m.

Scottish Students' Songs, 8.15-8.40 p.m.

May 1.—Gershon Parkington and his quintet, 6.30-7.30 p.m.

Troise and his Mandoliers in a Venetian Scena, 7.30-8 p.m.

May 3.—Balalaika Orchestra with Nadejin, singer, 6.30-7 p.m.

Serge Kritsh Septet, 7-8 p.m.

May 10.—Leslie Bridgewater Harp Quintet, 6.30-7.15 p.m.

Sydney Baynes and his light orchestra, 7.15-8 p.m.

Sydney Baynes and his orchestra, you will remember, recently innovated the idea of non-stop light music. A splendid idea, which I hope to see continued. Sydney Baynes is an enthusiastic broadcaster; he has specially scored over 2,000 pages of music for his broadcasts alone. Surely a record!

That the new light-music plan

will be a success is a foregone conclusion. I believe it will be a real advance in microphone entertainment.

Three Famous Organists

Arrangements for the opening recitals on the concert organ at Broadcasting House are now well in hand. As I forecast in these pages last month, the organ will not be ready for broadcasting until the last week in May or the beginning of June. Three famous church and concert organists—Dr. Alcock, G. D. Cunningham, and Thalben Ball—are engaged for the first recitals. Dr. Alcock has been the B.B.C.'s



Fred Duprez was one of the earliest of comedians to broadcast, and his subtle jokes are always a success

advisor on the choice and construction of the new organ.

Normally, the months of May, June, and July are free from important symphony-concert relays from Queen's Hall. This year, however, the B.B.C. has organised a London Music Festival, which will take place at Queen's Hall on Monday, Wednesday, and Friday evenings of the second and third weeks in May.

The first three concerts will be part of the B.B.C.'s celebration of the centenary of the birth of Johannes Brahms, who was born at Hamburg on May 7, 1833. Unlike most great musicians, Brahms' career was most uneventful. I believe it is safe to suggest that Brahms' music has a very limited appeal to the ordinary listener.

Mr. Fuller Maitland, in *Groves' Dictionary*, says that: "As years go on, it is more and more generally realised that he is not only among the great masters, but that he must be assigned a place with the very greatest of them."

On the other hand, Tchaikovsky, whose music has a wide and popular appeal, said that Brahms was "ungifted, pretentious, and lacking in all creative power." Listeners can form their verdict from these three Brahms concerts, for many of his best-known works will be included. Compare them with the performance of Tchaikovsky's *Fifth Symphony* on Monday, May 15, and see for yourselves.

Special Works

Artur Schnabel, the famous German-Slovakian interpreter of Brahms, will be the soloist in the *Piano Concerto No. 2* at the first concert on May 8. The *Violin Concerto in D* will be played by Adolf Busch on May 12. Other works to be included are the *Academic Festival Overture*, *Variations on a Theme of Haydn*, and the first, second, and fourth symphonies.

Serge Koussevitsky, the conductor of the Boston Symphony Orchestra, will conduct the orchestra during the second week. Every item of the three concerts is of an outstanding nature.

All types of music, past and present, are booked for performance, including Prokofiev's *Symphonie Classique*, Sibelius' *Seventh Sym-*

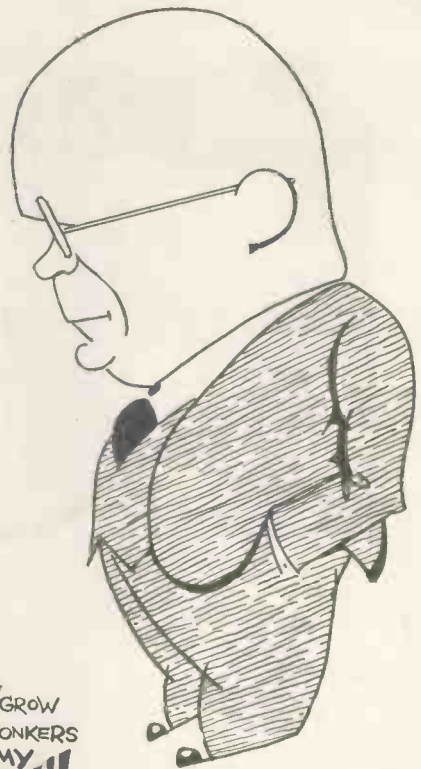
phony, some famous works of Wagner, Arnold Bax's *Second Symphony*, and the fourth and choral symphony (No. 9) of Beethoven.

In the general outline of the May programmes there are a number of dates set aside for vaudeville and revue entertainments. A repeat performance by the Kentucky Minstrels will be given on May 6. An hour of dance music by Debroy Somers will be heard on May 10.

A very interesting programme



A caricature of the "man with the moustache," Harry Tate



An impression of Sydney Baynes, whose orchestra is featuring in coming light-music programmes

is arranged for the evening of May 13. A vaudeville show with "star artists" begins the revels at 7.30 p.m., followed by Frances Maddox and the Savoy Orpheans at 8.30 p.m.; and at 9.30 p.m. the B.B.C. Theatre Orchestra, with soloists and chorus, are presenting an hour of Talbot and Monckton memories.

Vaudeville Report

An extract from the B.B.C.'s annual report commenting on broadcast vaudeville is extremely interesting. The report states that "the problem of conveying humour purely by oral methods within the limitation of the microphone and programme policy has not yet been solved. The success of humour depends more than is generally realised upon visual impression and on an audience."

I take it that the last sentence means that a weak joke, which would start a laugh at a theatre, would probably have no effect upon the solitary listener at home.

To me, it implies that to make the worst of a bad job it is essential to have an audience in the studio.



David Jenkins and Suzette Tarri are two clever pianists who have been heard in recent variety concerts

the first detector, which has a bias resistance of 600 ohms by-passed by a .0005-microfarad fixed condenser common to the oscillator and first detector.

The first low-frequency stage is coupled to the pentode output valve by means of the parallel-feed system

of the higher frequencies.

All the necessary grid bias for the valves is supplied automatically by placing fixed resistances between the cathode and high-tension negative of each valve in exactly the same way as with indirectly-heated A.C. valves.

Unlike an A.C. set, there is no need for a valve or metal rectifier for the mains supply, which is taken direct to the anode of the valves after, of course, smoothing has been carried out. The smoothing choke is a standard 30-henry type, with a 4-microfarad smoothing condenser.

You will note from the list of parts that the 4-microfarad smoothing condenser is of the 400-volt D.C. working type. It will be seen from the circuit diagram that this condenser has to withstand practically the full mains voltage; for safety, the specification should be strictly adhered to.

The smoothing circuit is adequate and constructors will find the set absolutely hum-free—a good set should be.

The heaters of the indirectly-heated mains valves require 16 volts and the mains voltage has to be reduced, of course, for this purpose. This is carried out very simply; the valves are wired in series and the main breakdown resistance only carries the current required by one valve, in this case .25 ampere.

It will be clearly seen that it is possible to run all the valves in series provided the total filament voltage required does not exceed the voltage



THE BACK OF THE SET

This view shows clearly how the set and the loud-speaker are mounted inside the radio-gramophone cabinet



THE FINISHED JOB

The "W.M." D.C. Super-het is very attractive in appearance, as this photograph shows. Operation is not at all difficult

of transformer coupling. It will be seen from the circuit diagram that this stage is amply decoupled to ensure complete stability.

Most listeners are familiar with the main idea of the parallel-feed method of transformer coupling. Briefly, the system is to have no direct current flowing in the primary winding of the low-frequency transformer, this, of course, maintaining the high inductance of the transformer and ensuring a level frequency response.

We would refer readers to the article by W. James on page 380 of this issue in which he describes fully the uses of the new West-ector.

A resistance and fixed-condenser corrector circuit is fitted across the primary of the loud-speaker matching transformer. This prevents over-accentuation

of the mains. The breakdown resistance can be adapted to work on any D.C. voltage from 200 volts upwards.

Some precautionary measures are necessary in the handling of a D.C. mains set because a connection direct to earth will, in some cases, result in the main house fuses being blown.

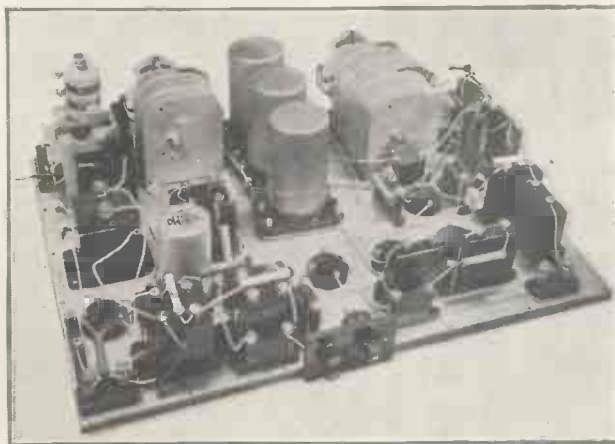
Earthed Positive Lead

This may seem rather strange, but in isolated cases the positive lead of the house mains is earthed. It follows very simply that if we earth the negative lead of the set some serious consequences will result.

The usual precaution of fitting a fixed condenser in the lead to the earth terminal is adopted in this design. Remember always to make the earth connection to the terminal provided on the back of the set and not to any point inside the set.

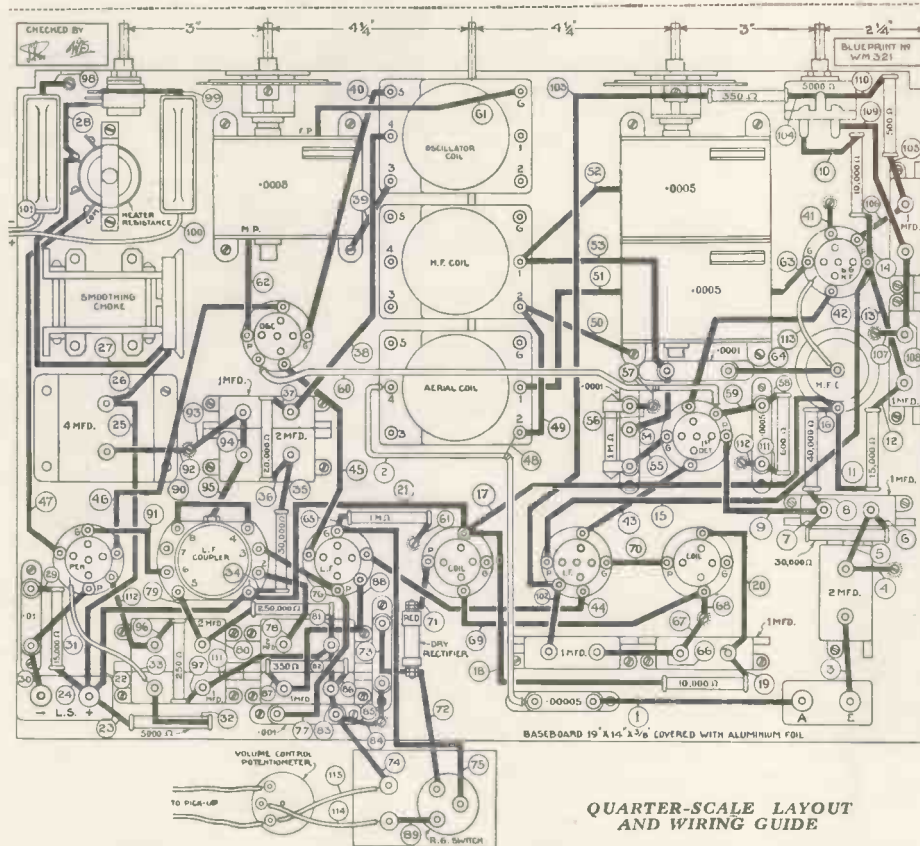
A mains voltage of 100 or 110 volts is not sufficient for this set.

So much for the theoretical details of the set; now for a few words on the practical construction. Included in these



STRAIGHTFORWARD CONSTRUCTION

There are no snags in the construction of the "W.M." D.C. Super-het, which follows standard practice except for the inclusion of a metal detector in the second-detector position



QUARTER-SCALE LAYOUT AND WIRING GUIDE

If desired a full-size blueprint can be obtained for half price, that is 9d., post paid, if the coupon on the last page of this issue is used by May 31. Ask for No. WM321. Wire up in the numerical order indicated and there will then be no chance of making a mistake

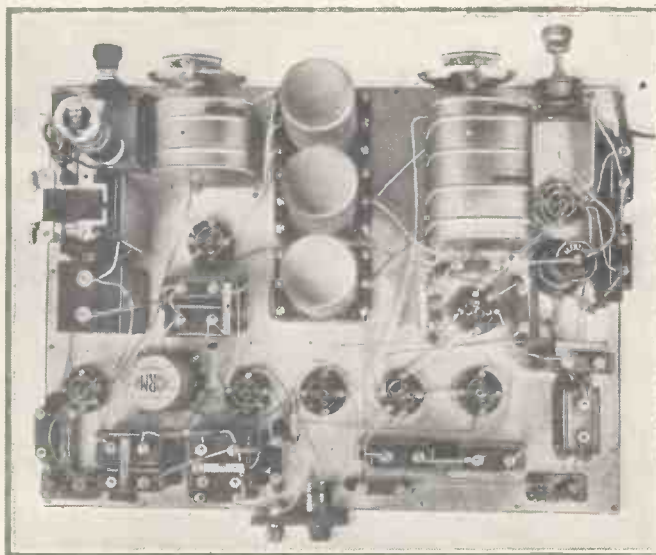
pages are several photographs showing all details of the set and a quarter-scale layout and wiring plan.

Constructors who need more detailed guidance should take advantage of the special half-price blueprint offer. There is no need to remind regular readers that all "W.M." blueprints are full-size drawings, which can be used as templates, showing the positions of fixing holes and all wires. The wires are all numbered in the best order of assembly.

Constructors should start with wire No. 1 and continue until the last wire has been fixed. Wiring up the set in this way obviates the chances of mistakes occurring in the construction.

If a full-size blueprint is desired, the coupon on the last page of this issue should be sent with

a postal order for 9d. to "Wireless Magazine" Blueprint Department, 58-61 Fetter Lane, E.C.4. Ask for No. WM321. Remember that the offer of a half-price blueprint is only open until May 31.



PHOTOGRAPHIC PLAN VIEW

This plan view of the "W.M." D.C. Super-het should be consulted with the quarter-scale reproduction of the blueprint printed above. The metal rectifier used as second detector appears immediately above the pick-up terminal block in the centre of the baseboard

As soon as the set has been built the constructor will want to try it out. The preliminary tests should be made before the set is fixed in the radio-gramophone cabinet. Take care to insert the valves and coils in their respective holders.

Make certain that the leads from the intermediate-frequency transformers make good contact with their associated screen-grid valves.

A pole-finder device or a good voltmeter can be used to determine the polarity of the mains before the mains plug is inserted in its socket.

For a moment glance at the few controls, which can be clearly seen from the photographs reproduced in these pages. The two main tuning dials are mounted prominently on the panel. A two-gang condenser is actuated by the left-hand knob; this tunes the aerial and tuned-grid circuits. A single condenser on the right is for oscillator tuning.

On the extreme left of the panel is the variable-mu volume control; the wave-change switch is seen in the centre; and the rotary on-off switch on the right.

Connect up the aerial and earth leads and the loud-speaker to the terminals on the back of the set and switch on by turning the rotary on-off switch to the right.

It is essential that the positive mains lead from the set should be connected to the positive side of the house supply. If no signal is heard after the set has been switched on for a minute or two the mains plug should be withdrawn from the house supply and reversed.

Then adjust the set for medium-wave reception by turning the wave-change switch to the right. Turn up the volume and turn the two tuning dials in step until

a signal is heard. The set must then be ganged.

This is a very simple procedure. Reduce the volume control until the signal is weak and adjust the wheel trimmer on the two-gang condenser until the signal is heard at maximum strength.

Medium-Wave Ganging

The set should be ganged-up in the middle of the medium waveband; Leipzig or Söttens are suitable stations for the purpose.

No constructor should find the slightest difficulty in operating the "W.M." D.C. Super-het. Always turn the two knobs in step where the set sounds "live"; there will be no difficulty in recognising this "live" sound.

The gramo-radio switch is fitted on the back of the set to ensure that the associated leads are kept short. The connections from the small terminal strip with the pick-up switch and terminals to the pick-up and volume control are clearly shown in the small sketch on the blueprint.

Ready-drilled Cabinet

Fitting the finished receiver into the radio-gramophone cabinet is quite easy. The cabinet makers will supply the cabinet with the front ready drilled if desired.

It will help the "Wireless Magazine" Technical Staff when considering future designs if readers would send reports on the performance of their "W.M." sets. Remember, also, that half-a-guinea is paid for every photograph of a home-constructed "W.M." set published in these pages.

COMPONENTS NEEDED FOR THE "W.M." D.C. SUPER-HET

CHOKE, HIGH-FREQUENCY

- 1—Slektun, standard type (or Varley, Bulgin), 4s.

CHOKE, LOW-FREQUENCY

- 1—Davenset, type 101 (or Parmeko, Varley), 18s. 6d.

COILS

- 2—Lewcos dual-range, type ATG/R, 17s.
1—Lewcos dual-range oscillator, type TOS/GR, 8s. 6d.
2—Lewcos I.F. transformers with pigtails, type IFT/P, £1 1s.

CONDENSERS, FIXED

- 1—T.C.C. .00005-microfarad, type 34 (or Lissen, Goltone), 1s. 3d.
2—T.C.C. .0001-microfarad, type 34 (or Lissen, Goltone), 2s. 6d.
1—T.C.C. .0001-microfarad, type SP (or Lissen, Goltone), 2s.
1—T.C.C. .0005-microfarad, type 34 (or Lissen, Goltone), 1s. 3d.
1—T.C.C. .001-microfarad, type 34 (or Lissen, Goltone), 1s. 6d.
1—T.C.C. .01-microfarad, type 34 (or Lissen, Goltone), 3s.
8—T.C.C. 1-microfarad, type 50/61 (or Lissen, Preh), £1.
4—T.C.C. 2-microfarad, type 50/61 (or Lissen, Preh), 14s.
1—T.C.C. 4-microfarad, type 80/81, 400-volt D.C. working (or Lissen, Preh), 7s.

CONDENSERS, VARIABLE

- 1—Ormond .0005-microfarad, single-screened, type R/489/S1, (or J.B.), 7s.
1—Ormond .0005-microfarad dual-screened type R/489/S2 (or J.B.), 14s.

FUSES

- 2—Belling-Lee single safety fuseholders and fuses (or Bulgin), 3s.

HOLDERS, VALVE

- 2—Bulgin four-pin, type VH4 (or W.B., Lotus), 1s. 6d.
6—Bulgin five-pin, type VH5 (or W.B., Lotus), 5s. 3d.

METAL RECTIFIER

- 1—Westinghouse Westector type W4, 7s. 6d.

RESISTANCES, FIXED

- 1—Set of 17 B. A. T., values 250, 350(2), 500, 600, 5,000, 10,000(2), 15,000(2), 20,000, 30,000(2), 40,000 ohm; .25 and 1-megohm (2), 1-watt type (or Erie, Dubilier), 14s. 10½d.

- 1—Bulgin skeleton type D.C. mains resistance, type MR11, 5s. 6d.

RESISTANCE, VARIABLE

- 1—Rotor 5,000-ohm potentiometer (or Lewcos, Preh), 5s. 6d.

SUNDRIES

- Tinned-copper wire for connecting, say, 1s.
Lengths of oiled-cotton sleeving, say 2s. 6d.
Length of rubber-covered flex, say 6d.
Length of Goltone shielded cable, 9d.
Sheet of C.A.C. Konductite, 2s.
2—Lissen terminal blocks, marked; Aerial and Earth, and L.S., 2s.
2—Belling-Lee type Q terminals, 4d.
1—Piece of ebonite 3 in. by 2 in.

SWITCHES

- 1—Bulgin rotary on-off, type S91, 1s. 9d.
1—Bulgin rotary change-over, type S86, 1s. 9d.

TRANSFORMER, LOW-FREQUENCY

- 1—Formo Multicoupler, 10s. 6d.

ACCESSORIES

CABINET

- 1—Stenibac radio gramophone, in mahogany, model 19, £4 15s.

GRAMOPHONE MOTOR

- 1—Garrard universal electric, £5 15s.

LOUD-SPEAKER

- 1—R. & A. Victor permanent-magnet moving-coil, £3 10s.

PICK-UP AND VOLUME CONTROL

- 1—Igranic with tonearm, £1 15s.
1—Lewcos 100,000-ohm potentiometer, 3s.

VALVES

- 2—Marconi VDS metallised (or Osram VDS), £1 18s.
1—Marconi DSB metallised (or Osram DSB), 19s.
2—Marconi DH metallised (or Osram DH), £1 7s.
1—Marconi DPT (or Osram DPT), £1.

The prices mentioned are those for the parts used in the original set; the prices of alternatives as indicated in the brackets may be either higher or lower

Screen-grid Detectors

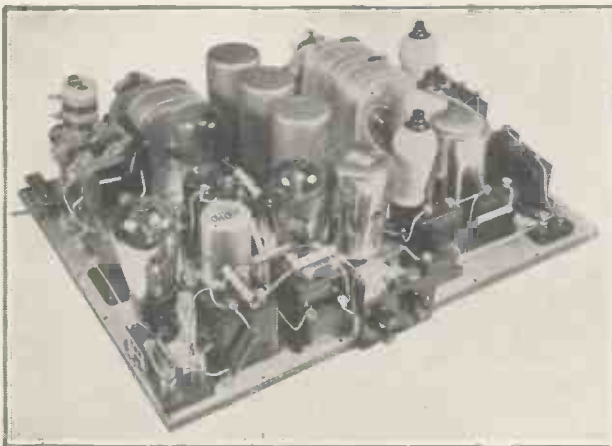
IN any three-electrode valve there is a certain amount of capacity coupling inside the bulb. The plate, grid, and filament electrodes form a three-plate condenser, part of which is in shunt across the grid-filament circuit.

When the valve is used as a detector, this shunt capacity tends to damp the preceding high-frequency

circuits, and so reduces the selectivity of the set.

For this reason designers are beginning to favour the use of the screen-grid valve as a detector, because the extra grid prevents any feedback between the plate and the control grid inside the bulb and so avoids the damping effect just referred to.

L. S. K.



INDIRECTLY-HEATED MAINS VALVES

The cathode wiring in the "W.M." D.C. Super-het is similar to the arrangement used with indirectly-heated A.C. valves



AN IDEAL SUPER-HET FOR D.C. MAINS

Anybody who has D.C. mains will find it hard to beat the "W.M." D.C. Super-het for station-getting properties; it gives fine results

A Short Cut to Musical Understanding

A Record Album That Will Interest Every Listener

DO you *listen* to music—or just *hear* it? There is a tremendous difference. To-day there are probably twenty people who hear for every one who listens. Whatever the reasons for this state of affairs, there are doubtless many who would welcome the means towards such informed appreciation of music as would create more *listening* and less *hearing*.

Appalling Catastrophe!

That everybody should become "highbrow," heaven forbid! This would be as appalling a catastrophe as if everybody turned 100 per cent. jazz mad!

Both are generally poses, and, as such, equally unhealthy. There is no reason why one should not enjoy a concerto and a well-arranged dance tune equally—many can, because they are able to explain the reasons for their enjoyment; they *understand*.

It is quite a mistaken idea to assume that an understanding of music which is adequate to ensure real appreciation must rest on arid study over years and years. Not a bit of it!—although many writers would have it so believed.

For example, a reasonably approximate assimilation of the atmosphere surrounding the singing of a sea shanty will place the listener in a far better position to understand the music (and therefore enjoy it) than any amount of study in metrical form and what not.

Assimilation of Atmosphere

Much of the solution lies in assimilation of the atmosphere—the period, the circumstances, the human factor—on these can musical appreciation be very surely built.

Now, where to go for this atmosphere? Obviously, to some book or other. And for the musical illustrations? Equally obviously to the gramophone record. (Radio cannot help at this stage: connected, logical sequence is essential and repetition

is necessary from time to time, which facility radio cannot afford.)

Find out about *The Columbia History of Music Through Ear and Eye**—the shortest cut to musical understanding (and enjoyment) in existence. The aural part of the history is—so far—contained in three albums of 10-in. records. With each album goes its visual counterpart, a handbook by Percy A. Scholes.

Every radio listener remembers Mr. Scholes' genius for making

OUR NEXT ISSUE!

We believe that everybody who reads this special 100th number of "Wireless Magazine" will agree that our slogan—"The Best Shillingsworth in Radio"—is more than justified.

We can go a step further, however, and promise readers that the 101st issue will be equally as good. Already we have a large number of special features in hand for the June issue, which will be published on Wednesday, May 24.

music understandable and these books are typical of his ability in that direction. They are lavishly illustrated, and are so written as to create the atmosphere for each record by the inclusion of historical notes of the times to which each example refers.

The scope and musical scholarship are immense, and yet the style is lucid and simple.

In regard to the records themselves they are no whit less brilliant in conveying aurally all the picturesque charm of their proper period. It is

* *The Columbia History of Music Through Ear and Eye*: In three albums of eight records, each with textbook by Percy A. Scholes; £1 3s. 6d. per volume.

a great achievement to have reproduced an excerpt from a tenth-century cathedral service, as is done in the singing of the plainsong *Veni, Sancte Spiritus*.

Then, later, come examples of virginal music (from the very first book of keyboard music ever written). Here the times of Queen Elizabeth are recalled in the slow dance (Pavan) and the quick dance (Galliard).

Musical Structure

These and many other examples not only build up the fabric of musical structure for the eye and ear, but actually do translate the hearer to their period so that an assimilation of custom and history becomes the easiest and most pleasant of pastimes.

Naturally, the examples run chronologically, beginning with choral music somewhere about the tenth or eleventh century, and so on up to Beethoven, where the third volume ends.

In just the same way that a social or political history is built up, so these "landmarks" are explained in relation to previous principles and their due importance as stepping-stones to future development.

In the case of this musical history, however, the living examples given in the records aid understanding and appreciation as no mere written and illustrated history can.

A Second Sense

The employment of a second sense—that is, hearing—makes the process of musical education not only easy, but truly fascinating.

There can be no doubt that if everybody owned and studied these volumes of musical history, a badly needed renaissance of musical enjoyment would quickly come about. *Hearers* would become *listeners*, which would make for better music all round—yes, even better *dance* music!

C.

Iron Cores in Tuning Coils

Their Advantages Discussed between Amateur and Expert

By ALFRED SCHNEIDER

THE Amateur: Well, Mr. X, I've heard a lot about the new iron-cored tuning coils, but I really cannot understand the fundamental difference between these new coils and our usual ones, and why they are so much better.

The Expert: Your question is, indeed, somewhat difficult to answer, but I will do my best to explain the mystery in plain words.

We can start from another consideration; imagine the low-frequency choke in your mains receiver, which is to restrain the alternating-current pulsations from the D.C. section of the set. What does it consist of?

The Amateur: There are mainly the copper windings and a compact iron core.

The Expert: And do you know what the iron core is for, although it is not electrically connected to the wiring?

The Amateur: Yes, the magnetism of the iron core increases the efficiency of the choke.

The Expert: Exactly, the magnetic field of the choke is greatly intensified by the iron core. If an electric current is flowing through a wire, lines of force are produced around the wire, and if the wire is wound up in the form of a coil the lines of force of each winding form a common magnetic field (see Fig. 1). This will be demonstrated by placing a magnetic needle near the coil, or a piece of iron, which will be attracted by the coil.

Now if such a piece of iron is introduced into the coil, the magnetic field will obtain quite another distribution (see Fig. 2). There are more lines of magnetic force in the iron than in the air around it. We say that the lines of force are intensified by the iron. The density of the lines of force is about one thousand times greater in iron than in air.

This property of the iron of increasing the density of the lines of force is called its permeability. If the density of the lines of force is one thousand times greater in iron than in air, it has a permeability of one thousand.

The Amateur: I understand that, but when I took a low-frequency choke to pieces I found the core not to consist of a solid iron body, but of a package of many thin plates with intermediate paper layers. What is the paper for? I think it must reduce the permeability as it is non-magnetic.

The Expert: You are just coming to the crux of the matter. The point is that a changing magnetic field, as produced by a transformer

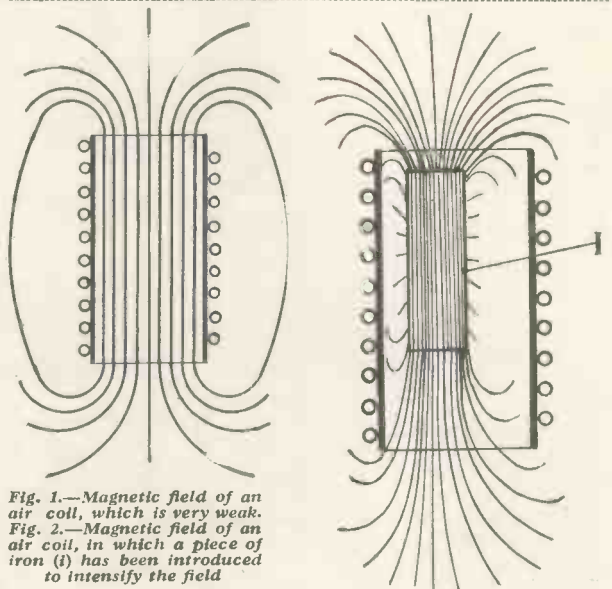


Fig. 1.—Magnetic field of an air coil, which is very weak.
Fig. 2.—Magnetic field of an air coil, in which a piece of iron (I) has been introduced to intensify the field

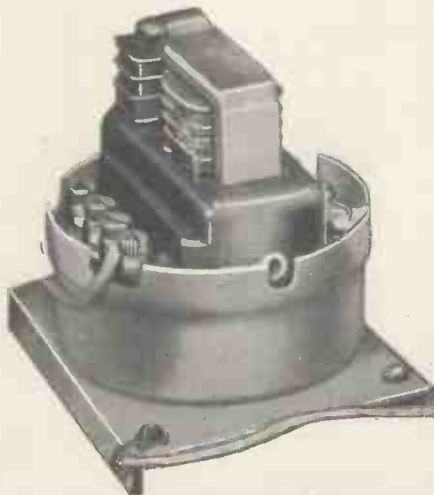
or choke, through which A.C. is passing, will induce an electric "induction current" in any electric conductor, so naturally it will also in the iron core.

As the iron core represents a short conductor of great cross-section, an enormous current would be produced in such a solid iron core, which is called "eddy current" and is to be looked upon as a loss current.

To reduce the "eddy-current" losses, the core is built up of sheet-iron plates with intermediate insulating paper layers, thus interrupting the path of the electric current and subdividing the solid body into many small bodies, in which only small local eddy currents will be developed (see Figs. 3 and 4).

The Amateur: That is interesting, but, tell me, what has the low-frequency choke to do with a tuning coil?

The Expert: The low-frequency choke is a self-induction coil and the tuning coil is likewise a self-induction coil, but for radio-frequency currents. As I have explained to you already, a changing magnetic field induces an electric "induction voltage" in any electric conductor, a rule which was discovered by the great Faraday.



A BRITISH FERROGART COIL
This photograph shows a standard Ferrogart coil as produced by Colvern. Assemblies of two or three coils can be obtained

So the magnetic field of the tuning coil, produced by the radio-frequency current coming from the aerial, will induce an induction voltage even in the windings of the coil, which is therefore called self-induction voltage.

By forming an oscillatory circuit of a tuning coil and a variable condenser, and adjusting the latter to be in resonance with the frequency of the transmitter to be received, it is possible to obtain a self-induction voltage across the terminals of the coil which is much higher than the original one obtained from the aerial.

This property of a coil of inducing a self-induction voltage in its own windings is called its inductance. The amount of inductance depends on the number of turns of wire, the diameter of the coil, and the permeability of the core material.

The Amateur: But if the function of a low-frequency coil and a high-frequency coil is the same in principle it

building up the core of sheet-iron plates and intermediate paper layers in the same way as you told me was the case with the low-frequency choke?

The Expert: It has been tried, and since the beginning of radio inventors have experimented to make high-frequency magnetic cores of very thin insulated sheet-iron plates or even of insulated iron powder (see Fig. 5).

However, the induction effect of the high-frequency current is about one thousand times greater than that of low-frequency current, because the direction of the magnetic field is changing much more rapidly (a million times at 300 metres wavelength = 1,000 kilocycles as compared with 50—10,000 times in the case of low frequency).

Therefore the eddy-current losses are much greater, and hitherto it was practically impossible to make a core material with reasonable losses. Therefore, in spite of their great advantages of compactness and increased efficiency, iron-cored tuning coils could not be practically applied.

The Amateur: And what did the inventor of Ferrocart coils do to overcome these difficulties?

The Expert: First of all, he examined the sources of losses very thoroughly and found that the hypothesis of the sources of losses, based on the experiences in low-frequency work and hitherto considered to be valid for high-frequency conditions too, cannot be applied to high-frequency cores at all.

He found that even when strictly insulating one particle of an iron-powder core from the next, the eddy-current losses in the core could not be avoided. Thus he came to the conclusion that there must be another sort of eddy current in the core, besides the known one, which is using the metallic paths offered in the normal iron core.

Examining the matter further, he discovered that a second sort of eddy current exists in an iron-

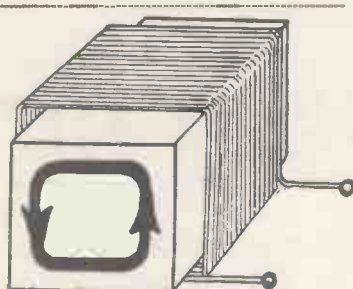


Fig. 3.—Strong eddy current induced in a solid iron core by the alternating magnetic field

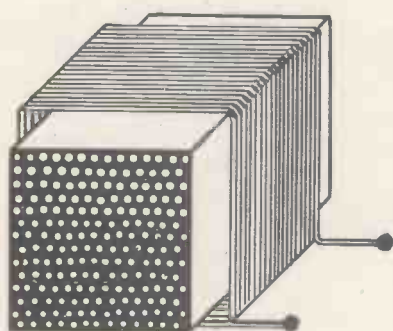


Fig. 5.—Attempts have been made to build up high-frequency cores of insulated magnetic particles, so as to prevent any eddy current. This has been without success, as shown in Fig. 6

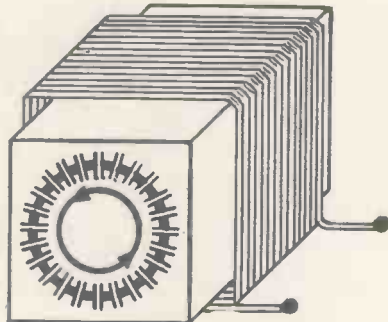


Fig. 6.—This diagram shows schematically that even when building up the core of insulated iron powder, the eddy currents will extend over the whole core

should be possible to increase the efficiency of a high-frequency coil in the same way simply by introducing an iron core. Why have high-frequency coils so far been constructed without an iron core, as air-core coils?

The Expert: Well, it appears natural to apply the principles of low-frequency coil construction to high-frequency coils, but making the experiment and introducing a small piece of iron into a tuning coil, you will find that although the inductance is enormously increased (you must entirely turn out the variable condenser to tune in the same wavelength as before) the selectivity is decreased simultaneously by an enormous extent; in other words, the damping is increased.

This is due to the eddy-current losses produced in the iron core, as in the core of a low-frequency choke.

The Amateur: Why couldn't these losses be reduced,

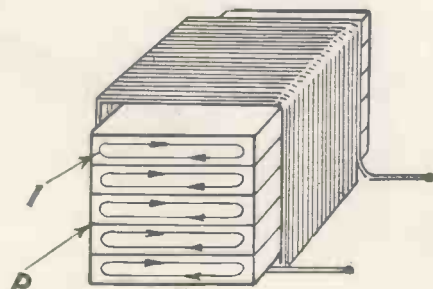


Fig. 4.—By building up the core of sheet-iron plates (I) insulated from each other by intermediate paper layers, a strong eddy current is prevented from extending over the whole core. Only very small local eddy currents will be developed in each layer

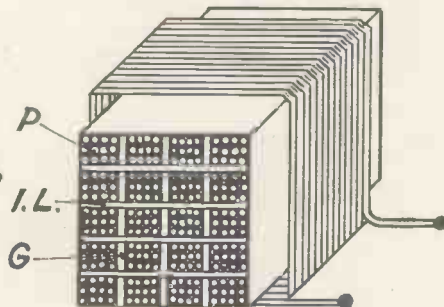


Fig. 7.—In the case of Ferrocart, the capacitive eddy currents are prevented by further subdivisions in horizontal and vertical directions: P, particles; I.L., intermediate paper layers; G, intermediate grooves

powder core, which he termed "capacitive eddy currents" as distinct from the normal "galvanic eddy currents" using the galvanic current paths in a normal iron core.

The formation of such "capacitive eddy currents" may be imagined in such a way that each two adjacent particles, separated by an insulating layer, are forming together a little condenser, so that the eddy currents, missing a galvanic current path, yet may continue their way by capacitive coupling through the whole core (see Fig. 6).

The Amateur: This is a very remarkable discovery, but, tell me, what has been done to diminish these "capacitive eddy currents?"

The Expert: The iron particles, apart from being individually insulated, were arranged in thin layers with intermediate paper layers, similar to the sheet-iron cores. The paper layers form a great capacitive resistance, so that the eddy-current path offered by capacitive coupling is interrupted very often.

The Amateur: And within each layer the capacitive eddy currents remain in existence?

The Expert: To a certain small extent, of course; but they are very much reduced by another means. Firstly, the magnetic layer is subdivided once more by intermediate grooves (see Fig. 7 and 7a). Moreover, the iron particles, which you may imagine to be little needles, are exposed to the influence of a magnetic field (see Fig. 8).

The Amateur: What is the use of this?

The Expert: The little iron needles are all aligned in the direction of the magnetic field and they form chains of particles, one attracting the other in the longitudinal direction of the magnetic field due to their contrary polarisation.

The magnetic path is therefore almost fully closed from particle to particle so that the permeability is increased accordingly. The eddy currents are not increased thereby, for the tendency of forming eddy currents exists in the right-angle direction of the magnetic field only, that is,

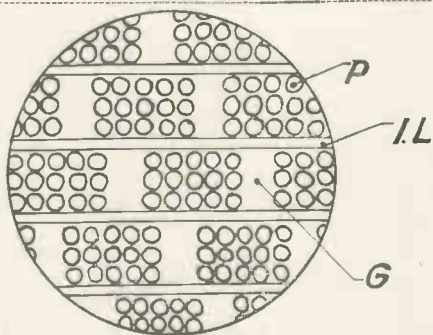


Fig. 7a.—Another cross-section of a Ferrocort core, specially arranged to prevent losses: P, particles; I.L., intermediate paper layers; G, intermediate grooves

other by interstices, which are filled up by the insulating mass.

Thus, by magnetic alignment, the capacitive coupling between the particles is considerably reduced and the capacitive eddy currents prevented, while the magnetic properties of the material are greatly improved simultaneously (see Fig. 9).

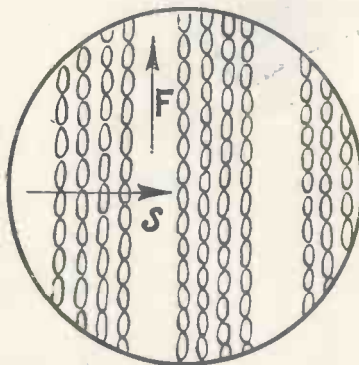


Fig. 9.—Arrangement of the particles after magnetisation. The lengthy particles form continuous chains in the direction of the magnetic field (F) to increase the permeability, while in the cross-section (S), where the eddy currents are tending to develop, the particles are repelling each other, forming interstices

The Amateur: This is an ingenious method. Now I understand how it was possible to overcome the difficulties hitherto making it impossible to produce iron-cored coils. For the rest, is the difference of the new coils as compared with air coils to be found in their small size only or what other differences, advantages or drawbacks are there?

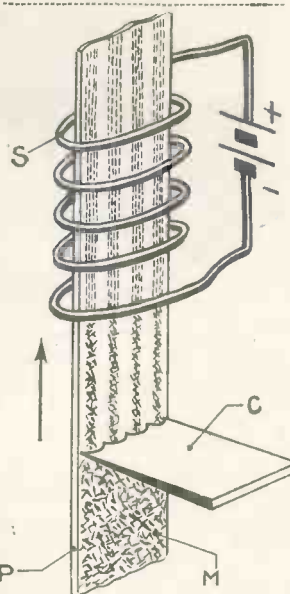


Fig. 8.—Making the grooves in the Ferrocort layer and influencing the arrangement of particles by a magnetic field

The Expert: The compactness of the iron-cored coils is a very appreciable property, yet it is of inferior importance as compared with the electrical advantages of these coils.

The Amateur: What are the electrical advantages?

The Expert: I explained to you that much fewer turns of wire are required to obtain a given amount of inductance. The less wire you have in a coil, the smaller are the copper losses in the wire; in other words, the smaller is the damping.

Thus you get double, or more, the resonance voltage with an iron-cored coil, which has a twentieth, or less, of the volume of an air coil of the same inductance. The selectivity is thus enormously increased. The coil can also easily be screened very closely without producing new eddy-current losses in the screen.

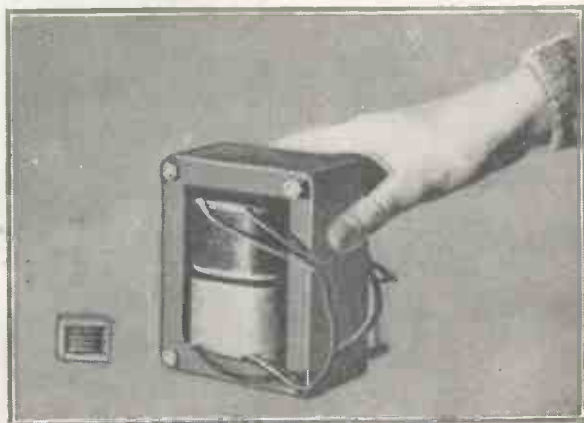


Fig. 10.—A comparison between a low-frequency choke and the new Ferrocort tuning coil, being identical in shape, though much smaller and having a core of a special material

Eighty Stations on the Q.P.P. Super 60



**SIMPLE
CONVERSION**

Many of the parts used in the original Super 60 are utilised in the new Q.P.P. model

By
Capt. E. H. ROBINSON

Special features of the new Q.P.P. Super 60, the construction of which was fully described in the April issue, are band-pass aerial tuning, variable-mu intermediates, screen-grid detector, and quiescent push-pull output, which gives "mains" volume with a moderate high-tension consumption. The fine results obtained will be clear from this independent test report

Staff in adding Q.P.P. to this excellent receiver is abundantly manifest.

The Super 60 will be well known to a large number of my readers, but its actual performance was new to me. Whatever the old set was like, the new one is certainly remarkably good.

In the April issue T. F. Henn gave a very long list of stations received, with dial settings. There are seventy-two stations in this list, which ought to satisfy anybody.

I tuned in and identified sixty-five of them at really full loud-speaker strength; but what delighted me more was that I was able to receive, on the medium wave-band, thirty stations at full loud speaker strength in broad daylight between 4

and 6 p.m. on a Sunday afternoon.

This is an achievement of which any set designer or builder has every reason to be proud.

Some time ago a friend of mine, whose experience of wireless dates back to the year when Marconi got his first signals across the Atlantic, told me that he believed that one of the reasons why anybody wanted more than three valves in a receiver was because of the paucity of the B.B.C. Sunday programmes.

Well, here is a set which will give you any amount of interesting programmes during the week-end.

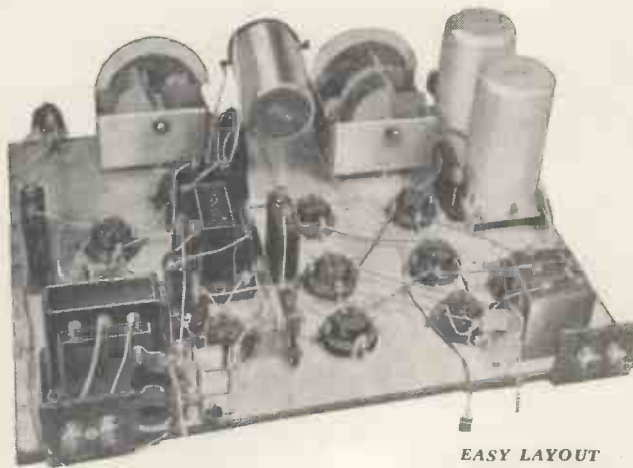
SHALL I talk first of the Q.P.P. or of the Super 60? Perhaps, as Q.P.P. is very new, a word had better be said about this first.

Any owner of a battery-operated set who hesitates to incorporate this output arrangement because he is under the impression that it is still in the experimental stage can instantly disabuse his mind of any such notions and get busy.

Q.P.P. really does what has been claimed for it. That is to say, it gives all-mains volume with an economy of battery current which is remarkable.

Realistic reproduction cannot be achieved without considerable volume, and really life-like speech and music are now possible with battery-operated sets provided that the high-frequency energy is properly treated.

This is where such a set as the Super 60 comes in and the wisdom of the "Wireless Magazine" Technical



EASY LAYOUT

As this photograph shows, the Q.P.P. Super 60 is quite straightforward



A COMPLETE RADIO GRAMOPHONE

The Q.P.P. Super 60 takes the form of a complete battery-operated radio gramophone with a fine performance

The Q.P.P. Super 60 is ridiculously easy to operate. The exterior knob on the band-pass tuning condenser is a most excellent idea and the delightful sensitivity over the whole of the broadcast band can be largely attributed to this very simple idea.

Q.P.P. Grid Bias

Just to see what sort of difficulties the constructor of such a set might come up against in adjusting the Q.P.P. output stage, I shifted the potentiometer, took out the grid-bias plugs and started afresh to adjust the bias, following the published directions and refrained from the use of a milliammeter.

I found no difficulty at all in making the adjustments by ear and on testing again with a milliammeter found that I had got the bias on each valve almost exactly right.

Despite the fact that the tuning is remarkably selective—the claim that no station extends beyond one degree is correct—and despite the fact that there is no adjustable tone control, the circuit has been so well thought out that quality is all that can be desired.

Worth A Good Loud-speaker

The set is worthy of the best moving-coil loud-speaker its owner can afford. More than this I cannot say.

My tests were made at Pirbright, about five miles south-west from Woking. The aerial is 100 ft. long and is 40 ft. above the ground.

The number of stations that can be logged on any given night depends so much on circumstances that no list can aim at being a complete record of what a receiver will do in favourable conditions.

The Q.P.P. Super 60 will certainly receive eighty stations here, for I identified, in two nights, all the stations that T. F. Henn has given on



READY FOR TESTING
The completed Q.P.P. Super 60 being given a final test in the "W.M." laboratories

COMPONENTS NEEDED FOR THE Q.P.P. SUPER 60

CHOKE, HIGH-FREQUENCY
1—Goltone super, type R3/46, 4s. 6d. (or Lewcos, Wearite).

COILS
1—Wearite band-pass unit, type WL3, 17s. 6d.
*1—Wearite oscillator, type O2, 18s. 6d.
†3—Wearite intermediate bandfilters, type OT2, £1 11s. 6d.

CONDENSERS, FIXED
1—T.C.C. .0001-microfarad, type 34, 1s. 3d. (or Goltone, Dubilier).
*1—T.C.C. .0002-microfarad, type SP, 2s. (or Goltone, Dubilier).
1—T.C.C. .002-microfarad, type 34, 1s. 6d. (or Goltone, Dubilier).
1—T.C.C. .006-microfarad, type 34, 2s. (or Goltone, Dubilier).
1—T.C.C. .01-microfarad, flat type S, 3s. (or Goltone, Dubilier).
*7—T.C.C. 1-microfarad, type 50/61, 17s. 6d. (or Goltone, Dubilier). Five of these were used in the original Super 60.

CONDENSERS, VARIABLE
1—J.B. Unitune .0005-microfarad two-gang with cover, 18s. 6d. (or Utility, Formo).
*1—J.B. Nugang .0005-microfarad, type A1 with cover, 10s. 6d. (or Utility, Ormond).

EBONITE
1—Goltone 18 in. by 8 in. by ¼ in., 6s. 5d. (or Becol, Lissen).

HOLDERS, VALVE
*8—Telsen four-pin, type W224, 6s. (or Wearite, Bulgin).
2—Telsen five-pin, type W225, 2s. (or Wearite, Bulgin).

PLUGS AND TERMINALS
*9—Belling-Lee wander plugs, marked; H.T.+4, H.T.+3, H.T.+2, H.T.+1, G.B.+1, G.B.—1, G.B.—2, G.B.—3, G.B.—4, 1s. 6d. (or Clix, Ealex). Eight of these were used in the original Super 60.
1—Belling-Lee Wanderfuse for H.T.—, type 1028, 1s.
*2—Belling-Lee spade terminals, marked; L.T.+1, L.T.—, 4d. (or Clix, Ealex).
4—Belling-Lee terminals, marked; Aerial, Earth, L.S. (2), 1s. (or Clix, Ealex).
2—Sovereign terminal blocks, 1s. (or Belling-Lee, Goltone).

RESISTANCES, FIXED
1—Graham Farish 5,000-ohm Ohmite, 1s. 6d. (or Erie, B.A.T.).
1—Graham Farish 10,000-ohm Ohmite, 1s. 6d. (or Erie, B.A.T.).
*2—Graham Farish 20,000-ohm Ohmite, 3s. (or Erie, B.A.T.).
1—Graham Farish 50,000-ohm Ohmite, 1s. 6d. (or Erie, B.A.T.).
1—Graham Farish 150,000-ohm Ohmite, 1s. 6d. (or Erie, B.A.T.).

*1—Graham Farish 1-megohm Ohmite, 1s. 6d. (or Erie, B.A.T.).
1—Lissen 2-megohm grid leak, 6d. (or Dubilier, Lissen).

RESISTANCES, VARIABLE
*2—Bulgin 50,000-ohm potentiometers, type VC36, 8s. (or Preh, Lewcos). One of these was used in the original Super 60.

SUNDRIES
Tinned-copper wire for connecting (Lewcos or Goltone).
Lengths of oiled-cotton sleeving (Lewcos or Goltone).
Length of rubber-covered flex (Lewcos or Goltone).
1—Sheet of C.A.C. Conductite, 2s.
1—Pair of Bulgin grid-bias battery clips, type No. 1, 6d.
1—Bulgin Duplex needle cup, 2s. 6d.

SWITCHES
*1—Bulgin junior three-point, type S39, 1s. (or W.B., Lissen).
1—Bulgin rotary on-off, type S85, 1s. 6d.

TRANSFORMERS, Q.P.P.
1—Ferranti, type AF12c input, 15s. (or Multitone, R.I.).
†1—Ferranti, type OPM12c output, 15s. (or Multitone, R.I.).

ACCESSORIES

BATTERIES
1—Ever-Ready 120-volt high-tension, type PP120, £1 4s. (or Siemens, Drydex).
1—Ever-Ready 16-volt grid-bias, type Winner, 1s. 9d. (or Siemens, Drydex).
1—Block 2-volt accumulator, 11s. 6d.

CABINET
1—Camco Waverley in oak, £5 10s.

GRAMOPHONE MOTOR
1—Garrard No. 30 clockwork with 12-in. turntable, £1 10s.

LOUD-SPEAKER
†1—W.B. permanent-magnet moving-coil, type PM4 with transformer, £2 2s.

MAINS UNIT
1—Atlas Super Q.P. Unit for A.C., £4 2s. 6d. (in place of high-tension battery).

PICK-UP
1—Bowyer Lowe pick-up, type Mark 111, with volume control, £1 15s.

VALVES
First Detector
1—Cossor 220SG metallised, 16s. 6d.
Oscillator
1—Cossor 210HL metallised, 7s.
I.F. Stages
2—Cossor 220VSG metallised, £1 13s.
Second Detector
1—Cossor 210 Det metallised, 7s.
Q.P.P. Output Stage
2—Cossor 220PT pentodes, £1 15s.

*Indicates parts that were used in the original Super 60. †All three intermediate coils used in the original Super 60 can be used in the new set, although one has no pigtail connection. See note on page 248 of April. ‡See note on page 250 of April.

his list, excepting Algiers, which I missed for some reason or another, and added ten others to it.

They were, with the oscillator-dial settings:—

Plymouth	18
Cork	24
Nimes (not strong) .. .	27
Valencia (fair)	41

Bratislava	47
Viiipuri	50
Milan	67
Lwow	71
Moscow	100
Brussels No. 1	129

Little Side-band Trouble

All these stations, with the exception of the two noted, were at good loud-speaker strength. I found very little side-band splashing; but as I was not very long on most of the stations tuned-in I may have been favoured.

I should say, however, that this receiver is very free from this distressing complaint.

The Q.P.P. Super 60 is the best battery set—a very long way the best—I have yet tested. I include commercial sets in this. There certainly is not a constructor's set within streets of it.

On the Crest of the Waves

Radio News from All the World :: By JAY COOTE

CZECHOSLOVAKIA

AS in Russia, receivers with loud-speakers have been installed in all army barracks in Czechoslovakia. As the Radio Journal of Prague was anxious to ascertain the kind of programme most enjoyed by the soldiers, questions were put to some 5,000 men; of this number, 3,190 declared in favour of military bands; 3,053 wanted light musical entertainments; 1,854 stated their preference for running commentaries on sporting events; 694 favoured symphony concerts, and 654 voted for dance music. Apparently gramophone records were not generally popular, as only 103 men desired their inclusion in the daily broadcast programmes. Talks were decidedly not wanted by many, as only 45 out of the whole 5,000 mentioned them in their replies. As a result of the investigation, more performances by brass bands will be heard in future on the Prague wavelength.

DENMARK

According to a report from Copenhagen, an association of local manufacturers has offered an annual subsidy of one million kronen to the broadcasting authorities for one hour's publicity daily through the studio microphone. Although, under the existing agreement, the Copenhagen station is not allowed to devote any time on the air to sponsored programmes or bald advertisements, the offer is such a tempting one that it is considered that some concession could be made.

As considerable interference with the transmissions of Skamleback on 31.51 metres has arisen with broadcasts on short waves from neighbouring countries, the Copenhagen programmes are now temporarily relayed on 49.4 metres (6,075 kilocycles). On this channel the signals are very well received.

FINLAND

In order to obtain a better reception of the capital programmes, the power of the Viipuri relay transmitter is to be increased to 40 kilowatts, and a further 10-kilowatt station is to be erected at Oulu (Uleaborg). When these additions have been made to the broadcasting system the authorities will possibly close down Pietarsaari, Pori, Jakobstad and Turku. Lahti, which up to the present has been working on 40 kilowatts, may also be increased in power.

FRANCE

Work has been started at La Brague on the construction of the new PTT station, Nice-Monaco-Corsica, which is destined to radiate programmes to the entire French Mediterranean Riviera. When completed the transmitter will work on a power of 60 kilowatts, but is so planned that its energy can be increased to almost double that figure. The wavelength to be adopted is 286 metres, the channel now used by PTT Montpellier, which will eventually close down.

With the taking over of the

Radio Paris station by the French State, it is expected that the Eiffel Tower transmitter will shortly revert to its former official duties. Moreover, it is now proposed to build, as a special attraction to the forthcoming International Exhibition at Paris (1937), a giant tower some 2,200 ft. high, which could eventually be used as a mast for the aerial of Radio France, the super-power station so long promised to listeners. In referring to this scheme, the French press suggests that the tower should be called Le Phare du Monde (The World's Beacon) as it would hold the record as the highest building on earth. The Eiffel Tower, designed by the French Engineer, Eiffel, for the 1889 exhibition, is only 984 ft. high.

GERMANY

With the advent of the new Hitler government, many alterations have been made in the character of the German programmes. They are to be mainly of a national character, and must feature German art, literature, music, and the like. A special decree bars the inclusion in the lighter entertainments of "hot" music deemed by the authorities to be suitable only for negroes, and although syncopated melodies are not definitely forbidden they will be officially discouraged. Artists of every description contributing to the broadcasts must be of German nationality and, in order that no confusion may be possible, if performing under a *nom-de-guerre*, their true names must be given in the published programmes.

GRAND-DUCHY OF LUXEMBOURG

As the broadcasts from Radio Luxembourg are destined to a number of European countries, announcements are regularly made in German, French, and English. In addition, many items are given in the Luxem-

Continued on page 428



RIVERSIDE RADIO

No river picnic is complete nowadays without a portable set. This party is making good use of a Marconi-phone receiver on a river outing

TELSEN

TRIPLE MATCHED SCREENED COILS



TELSEN
TRIPLE-MATCHED
SCREENED COILS

Price **25/6**

have been
**EXCLUSIVELY
SPECIFIED**
for the W.M.

*Super Quality
Five!*

THE DESIGNER SAYS

"Unless the coils are properly matched by the makers, it is impossible to get correct trimming. The coils finally decided on have been found in practice to be matched within close limits, and there has been no trouble whatever in ganging them."

TELSEN Screened Coils embody the ultimate efficiency attainable in a perfectly shielded inductance of moderate dimensions. The designer of the "Super Quality Five" acknowledged their pre-eminence by specifying them to the exclusion of all others. Follow his lead. Insist on Telsens wherever Screened, Band Pass, or Superhet Coils are concerned.

Showing the position occupied by Telsens Triple - Matched Screened Coils in the built-up "Super Quality Five."



TELSEN

RADIO COMPONENTS FOR LASTING EFFICIENCY

ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY, LIMITED, ASTON, BIRMINGHAM

Better service results from mentioning "Wireless Magazine" when writing to advertisers

ON THE CREST OF THE WAVES

Continued from page 426

bourg dialect, in particular on Wednesdays, when a special broadcast is made for the benefit of the local population. Although the programme schedule is not definitely fixed, Mondays and Thursdays appear to be reserved to Germany; Tuesdays and Saturdays to France; Friday to Holland; and Sunday to Great Britain. The wavelength is 1,191 metres (252 kilocycles) and the power 150 kilowatts (aerial).

ITALY

To provide an alternative programme for listeners in the Milan and neighbouring districts, the E.I.A.R. are using both the new Siziano (50-kilowatt) and the older Vigentino (7-kilowatt) transmitters. The latter operates on 453.8 metres and relays its programmes from Rome, Naples, or other Italian cities, the former devoting all its time to a broadcast of entertainments from Milan only.

Both at Rome and at Turin, experiments in telephony and television are to be carried out with short-wave transmitters. No definite wavelength has yet been adopted, but tests will be made on channels varying from 3 to 7 metres.

NORWAY

The Oslo Storting (Parliament) has decided in favour of the State taking over the Norwegian broadcasting system, and to develop it according to a plan drawn up some months ago. The scheme calls for a national network of forty-three transmitters to be brought into operation over a period of three years.

Probably the first step to be taken will be the installation of a 10-kilowatt station at Bergen, and the transfer of the existing 1-kilowatt plant to Haugesund or Stavanger. The power of the small Aalesund relay will be increased to 1 kilowatt and that of Tromsø to 500 watts.

New transmitters are also to be built at Trondheim (20-kilowatt), Arendal, Farsund, Kristiansand, Narvik, Egersund, Florø, Nordfjordeid, Maaløy, Mo, Kragerø, Steinkjer, Svolvær, Vaagaa, Sogndal, etc. The forty-three stations will be connected by landline to Oslo for relays of the capital programmes, but existing studios will be retained for local transmissions.

In view of the mountainous

character of the country it is considered that the number of stations provided by the plan is the minimum necessary to provide an adequate service.

ROMANIA

Many continental states are watching with interest the outcome of the new publicity programme scheme of the Radio Luxembourg authorities, inasmuch as if success crowns their efforts it is thought that a large income may be derived from such sponsored entertainments.

Romania, in particular, is said to be anxious to adopt the same principle and, according to a continental report, is already negotiating with a foreign group of financiers for the installation of a super-power station to be installed at Temesvar, close to the Hungarian border.

RUSSIA

Under the control of the Narkompostschel (The People's Commissariat of Posts and Telegraphs) the Soviet authorities are still further developing the broadcasting system in accordance with the Five Year Plan. The central Radio Palace at Moscow, which was started some months ago, is rapidly nearing completion, and the three new 100-kilowatt transmitters in course of erection at Kiev, Minsk and Sverdlovsk are already carrying out tests.

An extended network of short-wave transmitters is being installed to permit rapid communication between Moscow and all important provincial centres. For the supply of press news and official communiques, for the present, the high-powered transmitters are used at the end of the day's programmes.

Such stations as Leningrad, Moscow, Kiev, Kharkov and so on, may be heard working nightly from 10 p.m. G.M.T., in many instances until the early hours of the morning.

SPAIN

Considerable improvements have been made to both aerial and plant of Barcelona (EAJ15) and, in consequence, the broadcasts from this station on 252 metres are being better received than hitherto in the British Isles. In its call, the announcer mentions: "Barcelona-Catalunya (EAJ15)" or, phonetically, "Ay-ah-rhota Keensay." The transmitter should not be confused with Radio Barcelona (EAJ1), a member of the Union Radio group.

Although many schemes have

been put forward during the past three years for the reorganisation of the Spanish broadcasting system, owing to political differences none has yet been passed by the republican government. In an endeavour to come to a satisfactory solution, Dr. Hans Bredow, who for several years has acted as the High Commissioner of the Reichsfunk at Berlin, has been invited by the Spanish authorities to assist them in developing a network during 1933-34.

SWITZERLAND

Monday, May 15, has been fixed as the opening date of the Lucerne Conference, at which delegates of postal and telegraphic administrations will draw up the new plan of wavelengths to be allotted to the European broadcasting stations.

UNITED STATES

WHAM, Rochester (N.Y.), the new 50-kilowatt transmitter recently added to the National Broadcasting Company's Blue Network is the most modern of the American broadcasters. To protect the operators from the 17,000-volt current feeding the plate circuits of the six 20-kilowatt output valves, the engineers have designed a system of interlocking doors which prevent anyone entering certain danger zones whilst the transmitter is working.

Before the generator can be started by the throwing over of the master switch, every one of these doors must be closed. The station works on 260.7 metres.

The engineers of KYW-KFKX, Chicago, a Westinghouse station in the N.B.C. Blue Network, have installed what is termed a concentrator aerial. The system comprises an exciter or main aerial consisting of a copper rod 204 ft. in height, fixed to a wooden pole 200 ft. high. The actual concentrator is another vertical copper aerial of the same height, which is designed to respond to the frequency of KYW, namely 1,020 kilocycles.

It is contended that the concentrator, by deflecting the waves from the main aerial, considerably intensifies them and that signals thus transmitted are practically doubled in many areas. Although the station operates with a power of only 10 kilowatts it has been demonstrated that the transmissions by this means have acquired a range equal to that of any 50-kilowatt broadcaster in the U.S.A.

PARMEKO

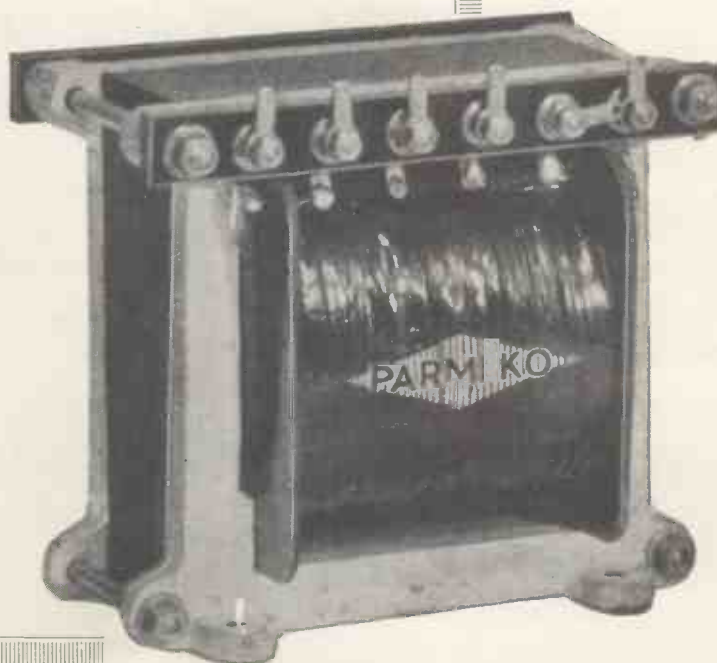
TRANSFORMER HT8/D USED IN THE 5-VALVE SET DESCRIBED ON PAGE 374 OF THIS ISSUE

Once again proving that only the best is good enough. "Parmeko" productions can always be relied upon to do their work thoroughly. They are made to stand up to the modern standard of efficiency. Ask your Dealer for full particulars or write for illustrated catalogue.

PRICE
35/-
EACH

MADE
BY
PARTRIDGE
&
MEE LTD.,

PARMEKO WKS., AYLESTONE
LEICESTER, (Aylestone 487), &
74, NEW OXFORD STREET,
LONDON, W.C.1 (Museum 5070)



Better service results from mentioning "Wireless Magazine" when writing to advertisers



Preh Potentiometers :: Bulgin Q.M.B. Switches :: Goltone Screened Choke :: Grampian Nipper Loud-speaker :: Ealex Short-wave Coil :: Lissen Q.P.P Transformer :: Eta Valve

*** PREH POTENTIOMETERS**

APPARATUS: (a) 10,000-ohm potentiometer, (b) 5,000-ohm potentiometer, (c) 5,000-ohm potentiometer with switch.
 TYPE: (a) 6,023, (b) 6,010, (c) standard.
 PRICE: (a) 3s. 9d., (b) 3s. 6d., (c) 6s.
 MAKERS: Preh Manufacturing Co., Ltd.

WE have received a number of Preh potentiometers, which we understand are now being made in this country. They are very neat

and compact components that will appeal to the home constructor.

mately two-thirds of that of the type A.
 We also received a sample of the combined volume control and switch. In this the whole of the potentiometer is enclosed in an aluminium cup, on the back of which is fixed a small double-acting switch which is flicked over at the end of its travel

We found it altogether rather attractive, although the desirability of incorporating switches on volume controls is not universally admitted.

These Preh products are worth investigation.

BULGIN Q.M.B. SWITCHES

APPARATUS: (a) DPDT toggle switch, (b) rotary toggle on-off switch.
 TYPE: (a) 558, (b) 591.
 PRICE: (a) 2s. 3d., (b) 1s. 9d.
 MAKERS: A. F. Bulgin & Co., Ltd.

TWO interesting Q.M.B. switches have been received for test from A. F. Bulgin & Co., Ltd.

The first of these switches is a double-pole change-over switch which is not usually available in this type. It has many uses, notably as a radiogram control.

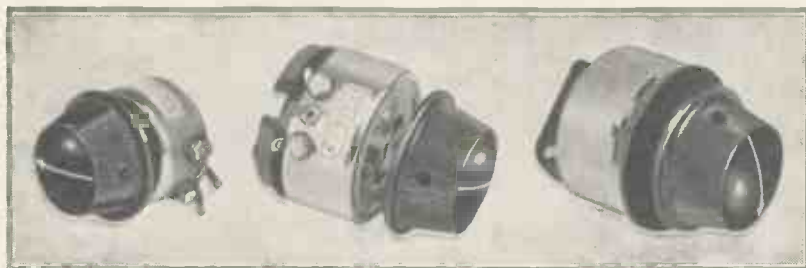
The construction of the switch follows normal practice, and easy access is allowed to the six contacts as these are arranged well away from each other.

The second switch is an ordinary make-break combination, but is arranged for panel mounting, having a rotary control.

This has been done in order to allow a normal type of knob to be used with the switch so that it shall match with the other controls on the panel of the receiver.

Bulgin's have made a name for themselves for small radio parts and these switches come up to the high quality associated with the name.

Cont. on page 432



A FINE RANGE OF WIRE-WOUND POTENTIOMETERS
 Three samples from the extensive range of Preh wire-wound potentiometers, one of which is used in the Super-quality Five described in this issue

and compact components that will appeal to the home constructor.

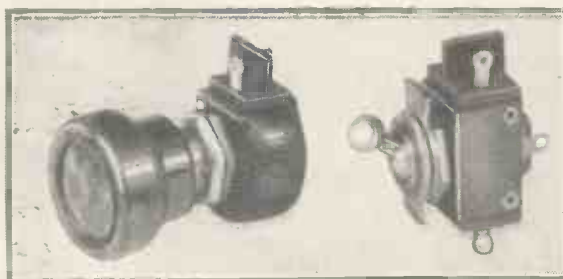
The standard Multiohm type A carries a resistance element wound on fibre housed inside a metal cup measuring 1 5/8 in. in diameter by 1 1/4 in. deep. Contact is by a flexible phosphor-bronze spring rubbing on the edge of the resistance element. The motion is smooth and free from noise, while the current-carrying capacity is quite high.

The particular sample tested was of 5,000 ohms resistance and was rated to carry 30 milliamperes, which it was found to do satisfactorily.

The type B is a smaller edition of this, only 1 1/4 in. diameter and 3/4 in. deep. It is therefore particularly suitable for confined spaces. The current-carrying capacity is naturally somewhat lower, being approxi-

by a projection on the contact arm.

This type of potentiometer is not provided with a sliding contact, but has a swash plate which is forced into contact with the resistance element by a small sliding pad. The sample submitted was of 5,000 ohms resistance and was logarithmically graded.



SWITCHES FOR YOUR MAINS SET

The two new Bulgin Q.M.B. switches reported on in the adjoining column. They are very reasonable in price

Exemplifying Excellence

Every McMichael Receiver is an example of the excellence which is achieved by the combination of experience and talent. Pioneers in radio, McMichael turn that experience to the best account, in inspiring new achievements. And, behind all this, making the assurance of excellence doubly certain, is McMichael high standard of quality in manufacture.

THE McMICHAEL DUPLEX FOUR MAINS TRANSPORTABLE

Within a handsome Walnut Cabinet of modern design, the set is entirely self-contained, so that it is easily transportable and may be operated wherever a suitable mains socket or plug is available, neither aerial nor earth being necessary. The circuit employed is similar to that of the Duplex Four Battery Models, except for the "mains" adaptation. Indicating on the Duplex Scale, this circuit gives maximum range and selectivity with a minimum of controls. Contained in the receiver is a Moving-coil Loud-speaker, the reproduction from which is quite exceptional—no less than sheer delight. Provision is made for applying a gramophone pick-up and an external additional loud-speaker or 'speakers'.

PRICE 21 GNS. (Including all Royalties)

Ask at any high-class Radio Store for a demonstration of this, or any of our other models, and details of our special "Deferred Payments on Hire Purchase Terms" system, if desired, or call at our London Showrooms, 179 Strand, W.C.2.

Telephone:
SLOUGH
441-442

McMICHAEL
RADIO LTD.

Telegrams:
RADIETHER
SLOUGH

Head Office and Works: WEXHAM ROAD, SLOUGH, BUCKS.
London Showrooms: 179 STRAND, W.C.2. Telephone: Temple Bar 6988.

THE
McMICHAEL
DUPLEX FOUR
MAINS
TRANSPORTABLE
(For Alternating Current only)



H.M. THE KING
USES McMICHAEL
RECEIVERS

•• ALL BRITISH—embodying 12 YEARS' successful Radio manufacture ••

DAVENSET AUTO-TRANSFORMERS

With HIGH OUTPUTS
At LOW PRICES



Illustration shows the
DAVENSET Shell-
Type Transformer.

FREE

Write for a copy of "Mains Transformers and Power Smoothing Chokes for Radio and Industrial Purposes."

DAVENSET Engineers have produced High Output Transformers at extremely Low Prices. NO SACRIFICE IN QUALITY HAS HOWEVER BEEN MADE. DAVENSET add to their comprehensive range of double-wound transformers, a further series of Auto-Transformers, designed with Universal Inputs of 200/250 volts, 40/100 cycles, and with Outputs of 100/110 volts.

List No.	Max. Loading.	Retail Price.
18	35 Watts	17/6
19	75 "	22/6
20	150 "	30/-
21	350 "	50/-

DAVENSET Transformers are manufactured to your own specific requirements, whilst our Technical Department is always at your service to advise and suggest the simplest, yet most practical schemes for overcoming your transformer or rectification problems.

PARTRIDGE, WILSON & CO.

Dept. 31, Davenset Works, Leicester.
Scottish Branch: 200, St. Vincent Street, Glasgow, C.2.

YOU'LL WANT A CAMCO CABINET



when you build the Q.P.P. "Super 60."

The Camco "Waverley" has been specially chosen by the designers for this circuit. It is a handsome oak cabinet and has ample space provided for batteries and eliminators with room for an electric or clockwork gramophone motor.

Baseboard supplied, size 19 by 15 inches, and a removable baffleboard having a 7½ inch hole.

Supplied with polished wooden panel 4/- extra. If any difficulty is experienced in obtaining Camco Cabinets from your dealer, please write direct. Price: Oak £5 10 0. Mahogany £6 15 0



Carrington Manufacturing Co., Ltd.
Showrooms: 24 Hattton Garden, London, E.C.1.
Phone: Holborn 8202.
Works: South Croydon.

Post in 3d. envelope

FREE Send the coupon for your free copy of the 24-page Camco Cabinet Catalogue, and see the complete range in our showrooms. Open 9.15 to 5.45 (Sat. 12.30).

NAME

ADDRESS

10 W.M.

Advertisers like to know you "saw it in the 'Wireless Magazine'"



SCREENED CHOKE
The Goltone screened high-frequency choke is well made

GOLTONE SCREENED CHOKE

APPARATUS: Screened high-frequency choke.
PRICE: 4s.
MAKERS: Ward & Goldstone, Ltd.

WE have tested this month a Goltone screened high-frequency choke. This choke is wound on a slotted-ebonite former having nine slots, the centre slot containing approximately double as much wire as any of the others.

The choke is mounted on a small moulded-bakelite base, hexagonal-headed screws being provided for the connections. It is completely screened by means of a small can, an earthing tag being provided on the latter.

The choke was tested in accordance with our usual practice, by comparing the impedance of the choke with that of a small condenser over the whole range of 200 to 2,000 metres.

The results were plotted on a chart and it was found that over the greater majority of the range the performance is very good.

A small absorption occurs at about 1,000 metres, but since this is just out of the normal working range it should not cause any trouble. The inductance was 120,000 microhenries.

GRAMPIAN NIPPER LOUD-SPEAKER

APPARATUS: Permanent-magnet moving-coil loud-speaker.
TYPE: Nipper PC2.
PRICE: £1 7s. 6d.
MAKERS: Grampian Reproducers, Ltd.

THE Grampian Nipper loud-speaker is a strongly-made instrument capable of giving very good overall results. A massive and somewhat unusually shaped per-

manent magnet is employed, this being copper-plated to prevent rusting.

The magnet is bolted to the back of a rigid metal chassis, which carries the one-piece type diaphragm from its outer edge. The moving coil is of the low-resistance type, the necessary input transformer being included with the loud-speaker.



MASSIVE MAGNET SYSTEM
With its large Magnet, the Grampian Nipper gives remarkably good results

This transformer is of the multi-ratio type and allows a very good degree of matching to be obtained with the output valve of the receiver. The centring device employed is of the normal web type, being held by a bolt from the centre polepiece.

On test the loud-speaker gave very good overall results, being exceptionally good towards the bottom end of the audio range. The loud-speaker was quite sensitive and appeared to handle inputs up to 3 or 4 watts with no sign of distress.



FOR THE SHORT-WAVE FAN.
The new Ealex multi-range short-wave coil will interest every short-wave fan

EALEX SHORT-WAVE COIL

APPARATUS: Short-wave plug-in coil.
TYPE: Duplex.
PRICE: 5s., without holder.
MAKERS: J. J. Eastick and Sons.

WE have tested the Ealex Duplex short-wave coil, which has been designed to cover the complete band from approximately 15 to 100 metres.

This large range is not obtained on one winding but is covered in two steps, the change from one range to the other being accomplished by removing the coil from its holder, turning it 180 degrees and re-inserting.

The special base required is supplied with the coil.

In practice the coil functioned quite satisfactorily, a smooth reaction control being obtainable over the whole range. The actual wave range covered was from approximately 16 to 42.5 metres and 41 to 93.5 metres respectively on the two ranges.

LISSEN Q.P.P. TRANSFORMERS

APPARATUS: Q.P.P. low-frequency transformer.
TYPE: Hypernik, LN5306.
PRICE: 12s. 6d.
MAKERS: Lissen, Ltd.

A NEW addition to the very comprehensive range of Lissen components is the 8 : 1 quiescent push-pull input transformer which we have received for test this month.

This transformer is housed in a



FOR Q.P.P. SETS
A photograph of the Lissen Q.P.P. input transformer. It has a ratio of 1 to 8

neatly-made moulded bakelite case, dark brown in colour, provided with a flange at the base to facilitate mounting. The necessary terminals are arranged on the side of the casing, a soldering tag being provided with each.

The moderately high ratio of 8 : 1
Continued on page 437

PERTRIX

NON SAL-AMMONIAC

H.T. BATTERIES for Q.P.P. RECEIVERS

THESE NEW PERTRIX BATTERIES ARE AVAILABLE
IN THE FOLLOWING SIZES

120 volts Pertrix Battery, Cat. No. 320, price 16/3. Tapped at every 1½ volts from 110 to 120 volts. A 15 volt G.B. section is included in the same carton. Dimensions: 10½" L. by 5½" W. by 3" deep.

130 volts Pertrix Battery, Cat. No. 321, price 17/9. Tapped at every 1½ volts from 120 to 130 volts. An 18 volt G.B. section is included in the same carton. Dimensions: 11½" L. by 5½" W. by 3" deep.

150 volts Pertrix Battery, Cat. No. 322, price 21/9. Tapped at every 1½ volts from 135 to 150 volts. A 24 volt G.B. section is included in the same carton. Dimensions: 14½" L. by 5½" W. by 3" deep.

159 volts Pertrix Battery, Cat. No. 323, price 20/9. Tapped at every 3 volts from 120 to 159 volts. A 9 volt G.B. section is included in the same carton. Dimensions: 7" L. by 6½" W. by 5½" deep. This battery is specially suitable for Pye "G.B." Receivers.

FOR BEST Q.P.P. RESULTS FIT PERTRIX

BRITANNIA BATTERIES, LTD.

233 Shaftesbury Avenue,
LONDON, W.C.2.
Works: Redditch (Worcs.)

MAKE SURE OF SUCCESS

If you are aiming at the most advanced radio reception the most brilliant means of achieving success is to construct the "W.M. Super-Het" with the specified Lewcos Units, as list below.

2 A.T.G/R Coils 8/6 each
2 I.F.T./P Coils 10/6 each
1 T.O.S./G Coils 8/6 each
100,000 ohm. Potentiometer 4/6 each

Lewcos components are made by master-craftsmen using only the finest materials.

BUILD
The W.M. D.C.
SUPER-HET
WITH
THE
SPECIFIED

Lewcos
REGD.

Radio Components

The London Electric Wire Company and Smiths, Limited
Church Road . . . Leyton . . . London, E.10

ROLA

the World's Finest Reproducers

ROLA MODEL F5-PM - 32/6

is SOLELY Used and Specified for the
"WELCOME PORTABLE"

Described in this issue

● CLASS B AMPLIFICATION

Special Rola Speakers are now ready for Class B Output Valves :-

COSSOR 240B VALVE
Rola F5-PM-14-Class B . . . 32/6 or Rola F6-PM-01-Class B . . . 49/6
MULLARD PM2B VALVE
Rola F5-PM-12-Class B . . . 32/6 or Rola F6-PM-08-Class B . . . 49/6
MAZDA B220
Rola F5-PM-12-Class B . . . 32/6 or Rola F6-PM-08-Class B . . . 49/6

● EXTENSION SPEAKERS

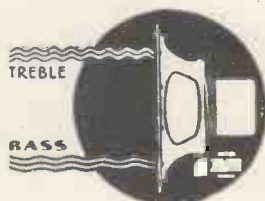
There is a correct Rola Extension Speaker for practically all British Radio Receivers. Write for list.

Write to-day for the Rola Folder
THE BRITISH ROLA CO., LTD.

Brondesbury Works,
179 High Road,
Kilburn, N.W.6
Telephone: Maida Vale
5017-8-9

ROLA SPEAKERS

for better
Radio Reception



Mention of the "Wireless Magazine" will ensure prompt attention

COLVERN FERROCART COILS

open a new era in Radio Reception

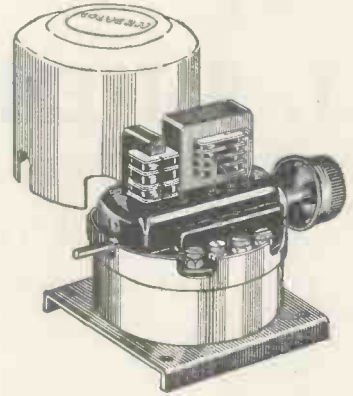
Tuning Coils of maximum efficiency are essential in the attainment of selectivity and sensitivity.

Colvern Ferrocart coils, though of considerably smaller dimensions than the relatively inefficient screened air-cored coils to which we have become accustomed, are actually more efficient than the unscreened Litz wound large-diameter coils which have always been regarded as the last word in efficiency, but which could never be put to practical use owing to their bulk and the impossibility of screening without very serious loss of efficiency.

One set F1, F2, F3 Coils ganged on sub base plate with wave-change switch Set **50/-**

TYPE F1—F2.
Input bandpass filter. Constant selectivity, ganging unaffected by variations in aerial reactance, symmetrical resonance curve.

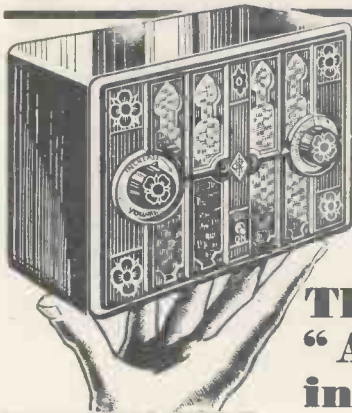
TYPE F3
Autotransformer intervalve coupling with reaction, ganging perfectly maintained on both wave ranges by transfer of tapping point in correct turns ratio, practically constant reaction.



Made under licence from the patentee, Hans Vogt.

COLVERN LTD., ROMFORD, ESSEX.

HERE IT IS!



The smallest
"All Mains"
in the World

Aptly described as the "Midget with a mighty reach," the KADETTE will get stations from all parts of the world at full volume and with a beauty of tone that will surprise you. Works off both A.C. or D.C. mains without any adjustment or by batteries. Keen selectivity. No outside aerial needed. Built-in speaker and the following valves: H.F. Variable Mu, Pentode, Screen Grid, Pentode, and Rectifier. Smart cabinet of genuine, unscratchable brown bakelite, with recessed ornamental panel, giving strength and light weight. Enjoy good radio whilst motoring—the KADETTE is easily adaptable for use in your car. Weight only 6 pounds. Measurements: 8½ by 6½ by 3½ ins. Spare components always available.

PRICE 10 GNS. COMPLETE. DEFERRED TERMS, 19/3 MONTHLY. NO DEPOSIT. OBTAINABLE FROM ALL GOOD DEALERS, OR DIRECT.

Kadette

THE MIDGET WITH A MIGHTY REACH

SEND A POSTCARD TODAY FOR DESCRIPTIVE FOLDER

THE HOMEAIDS RADIO CO.
(Dept. W.M.) 56 VICTORIA ST., S.W.1

WRITE FOR CATALOGUE

OSBORN SUPER ACOUSTIC BAFFLE BOARD
SEND for FREE SAMPLE

DEPT. W.M., REGENT WORKS, ARLINGTON STREET, NEW NORTH ROAD, LONDON, N.1.
Showrooms: 21 Essex Road, Islington, N.1. Telephone: Clerkenwell 5083.

70% OSBORN RADIO-GRAM CABINET

Model No. 234. Beautiful Queen Anne Style Radio-Gram Cabinet, 3 ft. 3 in. high by 2 ft. 6 in. wide by 1 ft. 6 in. deep. Takes panel 19 in. by 12 in. or smaller. Ample room for any type of gramophone motor, including Garrard automatic record changer and largest H.T. and L.T. batteries made. Accommodation for 35 records each side of set. Cabinet takes panel 27 in. long by omitting records storage. Height between motor board and baseboard, 12½ in.

PRICES: Machined Ready to Assemble, Kit of Parts, Oak, £3 10s.; Mahogany, £3 15s.; Walnut, £4 15s. Assembled Ready to Polish: Oak, £4 10s.; Mahogany, £4 15s.; Walnut, £5 10s. Assembled and Polished, Oak, £5 10s.; Mahogany, £6 5s.; Walnut, £7 5s.

All Models Carriage Paid.

BURNE-JONES & CO., LTD.
Tel. Hop 0257 & 0258. Scottish Agent: Mr. ROSS WALLACE, 54 Gordon St., Glasgow, C.1.

Enjoy SHORT-WAVE Reception—

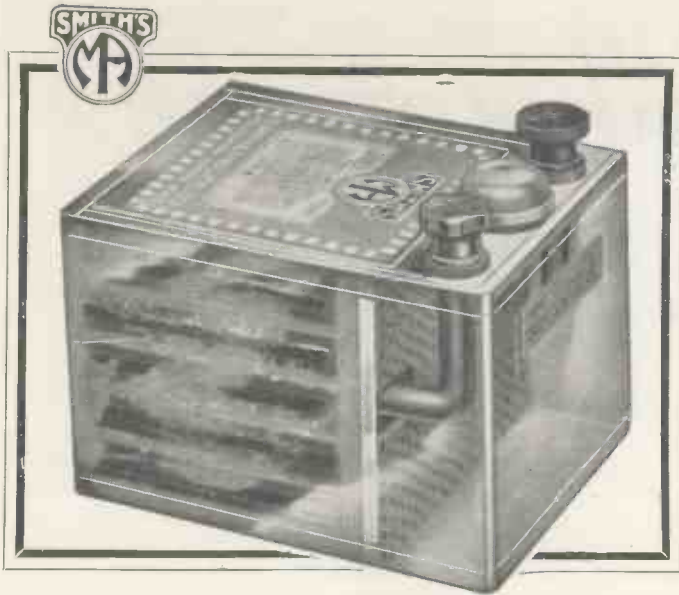
WITH THE MAGNUM SHORT-WAVE ADAPTOR

Models are now available for A.C. Mains and Battery Sets using British valves, American valves, British S.G. detector valves, and American S.G. detector valves. Price, complete with 40/80-m. coil, 39/6. 18/40-m. coil, 3/- extra.

SUPER-HET. ADAPTOR
(Model T.S.H.), for all British and American A.C. Mains and Battery Sets employing a tuned high-frequency stage. Price, with 2 coils, 45/-. Complete with Valve and Batteries, 63/-. Full particulars, with a list of short-wave stations and free trial offer, on request.

"MAGNUM" HOUSE,
298 BOROUGH HIGH STREET,
LONDON, S.E.1

Better service results from mentioning "Wireless Magazine" when writing to advertisers



A Reminder

Smith's Jelly Acid Cell is exclusively specified for the

"Welcome Portable"

Constructors cannot do better than follow this recommendation. A Smith Accumulator not only ensures the best possible results but is absolutely unspillable and guaranteed to give its full rated capacity.

Order yours to-day.

Type 2.PJ11. Price 14/-.

SMITH'S Jelly Acid ACCUMULATOR

Look for the SMITH Trade-Mark—your guarantee of satisfaction.

Agents throughout the country.

S. SMITH & SONS (Motor Accessories) LTD., CRICKLEWOOD WORKS, LONDON, N.W.2.

Give Your Battery Set an All-Electric Performance

with

R.I. QUIESCENT COMPONENTS

Specified for Q.P.P. SUPER-SIXTY



R.I.

Q.P.P. TRANSFORMER

List No. D.Y. 34. Primary inductance 30 henries without D.C., 20 henries with 1 m.a., 16 henries with 2 m.a. Royalty 15/- 1/6 extra.



R.I.

Q.P.P. OUTPUT CHOKE

List No. 35. This choke acts as a highly efficient auto-transformer coupling. It is more efficient in use than any ordinary push-pull output transformer. 12/6

The **Cossor Empire Melody Maker**
FULL SIZE BLUE PRINT OF CIRCUIT MODIFIED TO
R.I. QUIESCENT PUSH PULL

The **MULLARD MASTER THREE**
FULL SIZE BLUE PRINT OF CIRCUIT MODIFIED TO
R.I. QUIESCENT PUSH PULL

The **OSRAM MUSIC MAGNET**
FULL SIZE BLUE PRINT OF CIRCUIT MODIFIED TO
R.I. QUIESCENT PUSH PULL

The **R.I.** Full-Size **BLUE PRINTS** show you how to do so easily, efficiently & at minimum expense. Full-size Blue-prints of many of the most popular circuits of recent years have been issued by R.I. at 2d. each post free. The **R.I. "Quiescent" Brochure** includes full details of the Blue-prints available, and contains instructions and diagrams relative to the conversion of existing sets, and construction of new sets on "Quiescent" lines. Post the coupon below.

COUPON for R.I. QUIESCENT BROCHURE and Particulars of Full-Size Blue Prints.

Post in unsealed 1/2d. stamped envelope.

Name.....

Address.....

.....W.M.

Radio Instruments, Ltd., Croydon, Surrey.

There is news in the "Wireless Magazine" advertisements

Notes and Tiddings

A NEW range of accumulators that are claimed to hold their charge for a longer period than usual have been marketed by the Edison Swan



A NEW LOUD-SPEAKER
One of the latest Blue Spot productions, the type 29PM loud-speaker, with a permanent magnet. As a chassis the price is £1 12s. 6d.

Electric Co., Ltd., of 123 Queen Victoria Street, E.C.4.

A well-illustrated chart describing the construction of an A.C. three-valve receiver has been received from Lissen, Ltd., of Worples Road, Isleworth, Middlesex. The set is built up on a metal chassis and incorporates an enclosed mains unit with a valve rectifier. The price, complete with valves, for the A.C. Skyscraper, as the set is called, is £7 19s. 6d.

McMichael Radio, Ltd., were responsible for the radio equipment installed in an Imperial Airways liner that viewed the inter-Varsity boat race on April 1. Use was made of the pilot's standard 200-ft. aerial

for the receiver, which was supplied with power by a 12-volt accumulator coupled to an M.L. rotary converter. Six Celestion moving-coil loud-speakers were installed in the forward cabin and six in the after cabin.

Further orders for crystal, one-, two-, and three-valve sets have been placed with Burne-Jones & Co., Ltd., by the Wireless for the Blind Fund.

Some of the sets will be fitted with loud-speakers, others with headphones. The number of radio sets for blind people made and delivered by Magnum now runs into many thousands.

From Wright & Weaire, Ltd., we have received a leaflet giving details of their range of mains transformers. There are models suitable for almost every purpose.

Copies of this leaflet can be obtained from the makers at 740 High Road, Tottenham, N.17.

Radio Aid, the Scientific Solution to the Problem of Deafness is the title of an interesting booklet received from Radio Aid, Ltd., of 4 Idlesleigh House, Caxton Street, S.W.1. Copies of this booklet will be sent to those listeners who are interested in deaf-aid appliances.

From Sound Sales, Ltd., we have received a unit, incorporating a class B low-frequency transformer with associated decoupling components and valve holder, for adding direct to existing battery sets. The price is £1 15s., not including the class B valve. Full details can be obtained from the makers at Tremlett Grove Works, Junction Grove, Highgate, N.19.

Technical information concerning Eric resistances is given in a booklet we have received from the Eric Resistor Co., of 1 Golden Square, London, W.1. Copies can be obtained from the manufacturers, post paid.



COMPLETE RADIO-GRAMOPHONE FITTING
This new Garrard arrangement incorporates an induction motor, a pick-up and volume control, as well as two needle cups, mounted on one plate for fitting in the top of a radio-gramophone cabinet

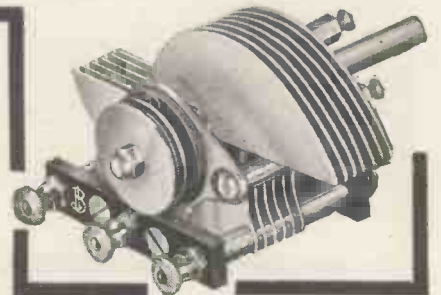
Full details are now available from Britannia Batteries, Ltd., of 233 Shaftesbury Avenue, W.C.2, of four new Pertrix batteries designed for use with receivers having a Q.P.P. output stage. A grid-bias battery—not electrically connected to the main high-tension battery—is included in the one carton.



"J.B." SHORT WAVE "SPECIAL"

Designed in every detail for Short Wave work. Bearings carry no current. Special screened "pigtail" to rotor. Very small minimum capacity. Insulating material is carefully placed and proportioned so as to reduce H.F. losses. Design of frame minimises closed loop effects. Capacities .00005, .0001, .00015, .0002, .00025. Price 5/9 each

Advertisement of Jackson Bros. (London), Ltd., 72 St. Thomas' St., London, S.E.1. Telephone, Hop. 1837.



FOR THE SHORT WAVES

TESTS OF NEW APPARATUS

Continued from p. 432

appears to be wisely chosen as transformers having higher ratios than this must be used with extreme care if anything like a uniform amplification is to be expected.

Even with a ratio of 8 : 1 it is necessary that the transformer should be preceded by a relatively low-impedance valve, and any damping across the following circuit must be minimised.

These difficulties, of course, are common to any high-ratio transformer, and we consider that the makers are well advised to limit the ratio to 8 : 1.



GENERAL-PURPOSE VALVE
The new Eta BY1815 valve,
which sells at 5s. 6d.

ETA VALVE

APPARATUS: General-purpose 2-volt valve.
TYPE: BY1815.
PRICE: 5s. 6d.
MAKERS: Electrical Trading Association, Ltd.

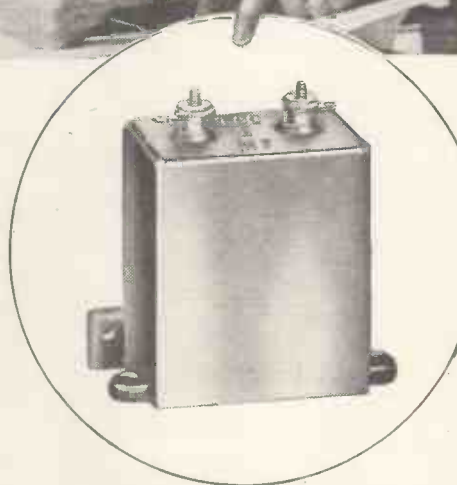
A NEW Eta valve we have just tested is the type BY1815. This valve is a 2-volt battery valve of the general-purpose type. The construction of the valve is quite normal.

A moulded bakelite base is used and the pins are of the split variety, thus ensuring a good connection with the valve holder.

The valve was tested in accordance with our usual practice, the normal anode current/grid voltage curves being taken. From these the constants of the valve have been worked out and are as follows: Mutual conductance, 1.2 milliamperes per volt; impedance, 13,000 ohms; and amplification factor, 16.5.

This valve is quite satisfactory in practice and appears to be most useful as a grid detector or first low-frequency valve.

● THE DESIGNER SAID . . .



A highly efficient receiver such as the 'D.C. Super Het.' calls for fixed condensers of unquestioned reliability. Without hesitation the designer says "T.C.C. of course." He knows that every "condenser in the green case" is the outcome of specialised work—that 100% effort in condenser research is behind them. He knows too, that every worth-while condenser development has emanated from the T.C.C. Factory. That is why he insists that you use T.C.C. Be sure of your results with your 'D.C. Super Het.'—follow the designer.

for the
"D.C.
SUPERHET"

T.C.C.
ALL-BRITISH
CONDENSERS

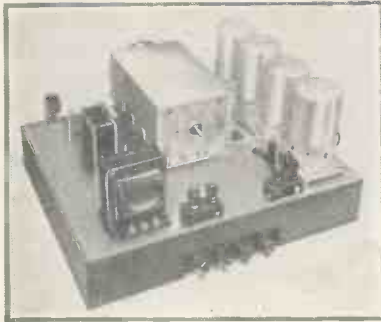
THE SPECIFIED CONDENSERS

1—4-mfd.	type 80	7s. 0d.
4—2-mfd.	" 50	3s. 6d. each
8—1-mfd.	" 50	2s. 6d. each
1—.0001-mfd.	" S.P.	2s. 0d. each
1—.00005-mfd.	" 34	1s. 3d.
2—.0001-mfd.	" 34	1s. 3d. each
1—.0005-mfd.	" 34	1s. 3d.
1—.001-mfd.	" 34	1s. 6d.
1—.01-mfd.	" 34	3s. 0d.

The TELEGRAPH CONDENSER Co. Ltd., Wales Farm Rd., ACTON, W.3

YOU CANNOT GO WRONG IF YOU USE A

FULL-SIZE BLUEPRINT



FINE A.C. SET
The A.C. Quadradyne (W.M. 279), which was recently described in "W.M.", incorporates all modern refinements in A.C. receiver design

CRYSTAL SET

- 6d. post free
1931 Crystal Set AW308

ONE-VALVE SETS

- 1s. each, post free
Short-wave One-valver (6d.) AW327
Easy-to-Build One-valver AW304
"B.B.C." One AW344
Portable Short-wave One AW354

TWO-VALVE SETS

- All these 1s. each, post free
Ever-tuned Regional Two (D, Trans) .. WM241
Station-finder Two (D, Trans) WM243
Music-lover's Two (D, Trans) WM260
New Economy Two (D, Trans) WM265
Family Two (D, Trans) WM278
Economy A.C. Two (D, Trans) WM286
Screen-grid Two (SG, Trans) WM289
Two for Seven Metres (D, Trans) WM295
New Style Radiogram (D, Trans) WM299
A.C. Quality Gem (D, Trans) WM312
Ether Music Two (D, Trans) AW364
Clarion Voice Two (D, Trans) AW371
Home-station A.C. Two (D, Pen) AW374
B.B.C. National Two (D, Trans) AW377

THREE-VALVE SETS

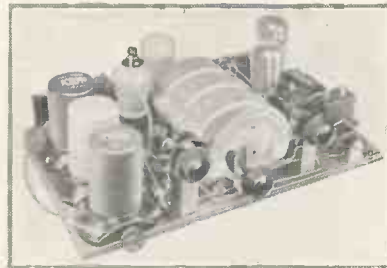
- All these 1s. each, post free
Everybody's Radiogram (with Automatic Grid Bias) WM262
New Economy Three (SG, D, Trans) .. WM263
New Plug-in-Coil Three (D, 2 Trans) WM270
Transportable Three (SG, D, Trans) .. WM271
Multi-Mag Three (D, 2 Trans) WM288

A blueprint of any one set described in the current issue of the "Wireless Magazine" can be obtained for half-price up to the date indicated on the coupon (which is always to be found on the last page) if this is sent when application is made. These blueprints are marked with an asterisk (*) in the above list and are printed in bold type. An extension of time will be made in the case of overseas readers.

- Percy Harris A.C. Radiogram (D, RC, Trans) WM294
1933 Economy S.G. Three (SG, D Trans) WM305
Harris Ethergram (SG, D, Trans) .. WM308
A.C. Calibrator (SG, D, Trans) WM309
Narrow-pass Three (SG, D, Trans) .. WM314
£6 6s. Radiogram (D, RC, Trans) .. WM318
Home-lovers A.C. Three (SG, D, Trans) AW383
Up-to-the-minute Three (SG, Westector, LF, Trans) AW384

FOUR-VALVE SETS

- All these 1s. 6d. each, post free
Economy Radio Gramophone (SG, D, RC, Trans) WM276
A.C. Quadradyne (2 SG, D, P) WM279
Ideal A.C. Home Super (Super-het) .. WM290
Gold Coaster (AC Short-wave) WM292
Triple-tune Four (2SG, D, Trans) WM293
Calibrator (SG, D, RC, Trans) WM300
Table Quad (SG, D, R.C. Trans) WM303
Words and Music Radiogram (2 SG, D, Trans) WM307



COMPACT FOUR-VALVER

A fine battery four, the Table Quad, was described in the November, 1932 issue of "Wireless Magazine." Over forty stations were received during a test

- Home Short-Waver (SG, D, RC, Trans) WM311
Empire Short-waver (SG, D, RC, Trans) WM313
Words and Music Radiogram De Luxe (2 SG, D, QPP) WM307A
Calibrator de Luxe (SG, D, RC, Trans) WM316
65/- Four-valver (SG, D, RC, Trans) .. AW370
Melody Ranger (SG, D, RC, Trans) AW375
A.C. Melody Ranger (SG, D, RC, Trans) AW380

FIVE-VALVE SETS

- All these 1s. 6d. each, post free
Regional D.C.5 (SG, D, LF, Push-pull) WM252
Ideal Home Super (Super-het) WM280
Easytune 60 (Super-het) WM284
Easytune 60 on a Frame Aerial (Super-het) WM301
"W.M." Short-wave Super (Super-het) WM302
Easytune 60 for A.C. Mains (A.C. Super-het) WM317
★Super-quality A.C. Five (2 H.F., D, RC, Trans) WM320
Britain's Super (Super-het) AW311
A.C. Britain's Super (Super-het) AW322
Mains section (1/-) AW322A
James Short-wave Super-het AW328

SIX-VALVE SETS

- All these 1s. 6d. each, post free
Super 60 (with Wearite Base) WM247
Super 60 (with Lewcos Base) WM251
1932 Super 60 (Super-het) WM269
1932 A.C. Super 60 (Super-het) WM272
New Century Super (Super-het) with copy of A.W. 4d, post free AW363

SEVEN-VALVE SETS

- 1s. 6d., post free
Super Senior (Super-het) WM254
Seventy-seven Super (A.C. Super het) WM305
Q.P.P. Super 60 (Super-het with Q.P.P. output) WM319
★"W.M." D.C. Super-het (D.C. Super-het) WM321

PORTABLE SETS

- Super 60 Portable (Super-het) .. WM238 1/6
Town and Country Four (SG, D, RC, Trans) WM282 1/6
Everybody's Portable (Super-het) .. WM291 1/6
★Welcome Portable (Super-het) WM322 1/6
General-purpose Portable (SGD, RC, Trans) AW351 1/6

AMPLIFIERS

- All these 1s. each, post free
D.C. Fader WM242
Quality Amplifier (D.C.) 1s. 6d. .. WM264
A-P-A (Public Address) WM275
A-P-A Radio Unit (SG, D) WM281
Economy Gramophone Amplifier WM277
Dual-speaker Amplifier (A.C.) WM304

MISCELLANEOUS

- Super-het Adaptor WM268 1/-
A Simple Mains Unit WM283 1/-
Short-wave Director (wavemeter) .. WM285 6d.
Voltage Regulator WM287 1/-
A.C. Mains Unit WM310 1/-
Q.P.P. Output Circuits WM315 1/-
Short-wave Adaptor for New Century Super AW367 1/-
D.C. H.T. Unit AW369 1/-
Band-pass H.F. Unit AW373 1/-
"A.W." Super-het Adaptor AW385 1/-



NEW SUPER-HET

The New Century Super, recently described in "Amateur Wireless," represents the latest technique in modern super-het design

Each blueprint shows the position of each component and every wire and makes construction a simple matter. Copies of "Wireless Magazine" and of "Amateur Wireless" containing descriptions of most of these sets can be obtained at 1s. 3d. and 4d., respectively, post paid. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

Send, preferably, a postal order (stamps over sixpence in value unacceptable) to

Wireless Magazine

BLUEPRINT DEPT.,
58/61 FETTER LANE,
LONDON, E.C.4

**Listen
to the
World**



Fit an Eelex Short-Wave Converter

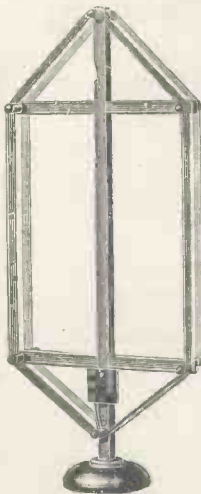
Why not increase the range and selectivity of your present set by fitting an Eelex Short-Wave Converter? Over 70 extra stations on the short-wave bands can be tuned in with one of these wonderful instruments fitted to your set—no alterations necessary—just connect to the aerial and earth terminals, you will be amazed at the results. **DUPLEX MODEL**, complete with coil, valve extra **52/6**

**Eelex
Frame Aerial**

A wonderful frame aerial at an amazingly low price. This aerial was especially designed for use with super-het receivers, but can also be employed in any circuit with or without centre tap.

The Eelex Frame Aerial has a definite minimum silent point.

PRICE 20/-



Write for List K.18

J. J. EASTICK & SONS

Eelex House,
118 Bunhill Row, London, E.C.1
Phone: Metropolitan 0314 (6 lines)



**Recommended
for the 'A.C. Easytune 60'**

Specially recommended by the designer, the Heayberd MW.1 Mains Unit is ideally suitable for the A.C. Easytune 60. Offering a maximum output of 200 v. 50 ma., and L.T. supply 4 v. 5 amps., it is adaptable to the majority of sets available—either battery or A.C. models. Incorporating Heayberd Transformer, Double Chokes, 16-mfd. Condensers, Westinghouse Rectifier, etc. complete in neat metal case—ready to plug in and guaranteed 3 years.

Alternative Outputs: 30 ma. at 150 v. or 50 ma. at 200 v.
Tappings: 40/120 v. var. S.G., 175 v., and 209 v. fixed.

Price 127/6 Complete

Send NOW, enclosing 3d. stamps, for 36-page Handbook, "Mains Power for Radio" packed with hints and diagrams.

F. C. HEAYBERD & CO.,
10, FINSBURY STREET, LONDON, E.C.2

There should be no difficulty in obtaining Heayberd products locally. If your dealer cannot supply—write to us direct.



Famous Makers' Offer! **PIANO-TONE! CABINET!**

IMPROVES PERFORMANCE 50%



Patent 8123. Users obtain 50% to 100% greater volume. The rich, mellow tone brings a fine thrill. (B.B.C. and 3,000 clients.)

FREE TRIAL OR 10/- MONTHLY.

MAKERS PRICES FROM 35/- to £15.
PHOTOGRAPHS AND LISTS FREE.

PICKETTS Piano Tone Cabinets (M.G.), Albion Rd., Bexleyheath, Kent.
"WORDS & MUSIC" RADIO-GRAM DE LUXE
PICKETTS CABINETS,
Recommended for Best Results

—Specified by the Experts—

**SOUND SALES for the
SUPER QUALITY FIVE**

One L.F. CHOKE 14/-
(Type 30 v.) Price

**SOUND SALES—
FIRST with a CLASS 'B' UNIT**

which will convert practically any battery set to Class 'B' Amplification. Ask for the

SOUND UNIT
(Complete in bakelite case) **35/-**
Full details on request (less valve)

Sound Sales Ltd., Tremlett Grove, London, N.19

TAYLEX WET H.T. BATTERIES

Give long service, improved volume and tone. Very economical. Replacements for Taylex or Standard batteries at low prices; details post free. Also Bargain List, Radio Kits and parts at lowest prices.
B. TAYLOR, 67 Studley Road, STOCKWELL, LONDON

**FOR EVERY SET—there's a
PILOT
AUTHOR KIT**

CASH—C.O.D.—or H.P.

WELCOME PORTABLE

Described this month

KIT "A" Author's Kit of first specified components, less panel, baseboard, valves, cabinet, speaker and batteries. **£6:4:0**
Cash or C.O.D. Carriage Paid.
Or 12 monthly payments of 11/5.

KIT "B" As Kit "A," but with valves only. Cash or C.O.D. Carriage Paid. **£10:5:0**
Or 12 monthly payments of 18/0.

KIT "C" As Kit "B," but with cabinet, panel, and baseboard, less speaker and batteries. Cash or C.O.D. Carriage Paid. **£12:2:6**
Or 12 monthly payments of 22/8.

KIT-BITS Selected C.O.D. items. You pay the postman. We pay post charges on orders value over 10/-

- 4 Wearite coils; (2) type OT2, (1) type OT1, (1) O3 £1 16 0
 - 2 Utility .0005-mfd. var. cond. with disc dial, W318 13 0
 - 6 Valves, as specified .. 4 1 0
 - 1 Camco transportable cabinet with panel and baseboard .. 1 17 6
 - 1 Rola permanent-magnet M.C. speaker, type PSPM 1 12 6
- If specified Rola speaker required, add 32/8 to Kit cash prices, or 3/- to each deposit and monthly payment.

Q.P.P. SUPER 60

KIT "A" Author's Kit of first specified parts, with baseboard, but less valves, panel, and cabinet. **£9:19:9**
Cash or C.O.D. Carriage Paid.
Or 12 monthly payments of 18/3.

KIT-BITS Selected C.O.D. items. You pay the postman. We pay post charges on orders over 10/-

- Set of Specified Valves .. £4 18 6
 - Peto-Scott Adaptagram, Model "B," with Garrard motor B.T.H. pick-up, and volume control .. 6 6 0
 - 2 Ferranti Transformers, as specified .. 1 10 0
 - J.B. Uniltune 2-gang Condenser .. 18 6
 - Set of 5 Wearite Super Het Coils as specified .. 3 7 6
- If specified speaker required, add £2 2 0 to Kit cash prices or 3/12 to deposit and each monthly payment.

"W.M." D.C. SUPER-HET
Described this month

KIT "A" Author's Kit of first specified components, less valves, cabinet and grammo. equipment and speaker. **£10:7:0**
Cash or C.O.D. Carriage Paid.
Or 12 monthly payments of 18/-.

- 1 Peto-Scott Adaptagram Model "A" cabinet only in mahogany .. £3 3 0
- 6 Valves, as specified .. 5 4 0

SUPER QUALITY FIVE
Described this month

KIT "A" Author's Kit of first specified components, less valves, cabinet, speaker and grammo. equipment. **£11:7:6**
Cash or C.O.D. Carriage Paid.
Or 12 monthly payments of 21/-.

- 5 Valves, as specified .. £4 2 0
- 1 Camco Gresham radiogram cabinet in walnut .. 6 0 0

**CONVERT YOUR OLD SUPER
60 TO Q.P.P. WITH THE PILOT
Q.P.P. CONVERSION KIT**

Mains Results on any Battery Set

Contains 1 Q.P.P. Transformer, 1 Q.P.P. Output Choke, 4 Non-Inductive Resistances, 1 Potentiometer, 2 Mansbridge Condensers, 2 Valve Holders, 1 Tone-Compensating Condenser, 1 H.F. Choke, G.B. Plugs, Wires, Screws, Flex, etc. With Full-size Diagrams and constructional notes. **£2:2:6**
Cash or C.O.D. Carriage Paid.
Or 8 monthly payments of 6/-.

KIT "B" As above with 2 Pentode 220A valves. **£3:17:6**
Cash or C.O.D. Carriage Paid.
Or 12 monthly payments of 7/-.

PETO-SCOTT Co. Ltd.

77, CITY ROAD, LONDON, E.C.1
West End Showroom: 62 High Holborn, LONDON, W.C.1

Better service results from mentioning "Wireless Magazine" when writing to advertisers

BLUEPRINT COUPON

Valid only until May 31, 1933 (or until June 30, 1933, for overseas readers)

FOR ONE BLUEPRINT ONLY

If you want a full-size blueprint of any ONE of the sets constructionally described in this issue for half price, cut out the above coupon and send it, together with a postal order, to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

This coupon is valid for a blueprint of any ONE only of the following sets at the prices indicated:—

SUPER-QUALITY FIVE (page 374), No. WM320, price 9d., post paid.

"W.M." D.C. SUPER-HET (page 416), No. WM321, price 9d., post paid.

WELCOME PORTABLE (page 360), No. WM322, price 9d., post paid.

INFORMATION COUPON

Valid only until May 31, 1933 (or until June 30, 1933, for overseas readers)

If you want to ask any questions, cut out the above coupon and send it, together with a postal order for 1s. and stamped-addressed envelope, to the Information Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

Note that not more than two questions may be asked at a time and that queries should be written on one side of the paper only.

Under no circumstances can questions be answered personally or by telephone. All inquiries must be made by letter so that every reader gets exactly the same treatment.

Alterations to blueprints or special designs cannot be undertaken: nor can readers' sets or components be tested.

If you want advice on buying a set, a stamped-addressed envelope only (without coupon or fee) should be sent to the Set Selection Bureau, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

Q.P.P. AND THE SUPER 60

IN response to inquiries from many prospective constructors of the Q.P.P. Super 60, which was fully described in the April issue of "Wireless Magazine," we wish to point out that Multitone and R.I. transformers can be used if desired.

The necessary wiring will be clear from the layout guides of the units incorporating these parts that were published in the march issue (see pages 138 and 139).

Very great interest is being taken in this new design. Whether you intend to build the set or not, you should read the special test report from Capt. E. H. Robinson that appears on page 424 of this issue.

It is no mean achievement to obtain loud-speaker reception from eighty foreign stations at full volume and with really good quality. Moreover, the Q.P.P. Super 60 is quite suitable for the electrical reproduction of gramophone records.

The cost of converting the original Super 60 to the new Q.P.P. is not excessive. Many of the parts used in the original can be retained in the new set.

A LITTLE EXPERT HELP WILL MAKE YOUR SET WORLDS BETTER

Whether you are building one of the latest sets published in the technical wireless magazines, or whether your present set needs overhauling, modernising or repairing, you will find the "Scott Sessions" service all you require. It is better and cheaper to secure the expert guidance of our skilled engineers—which costs you comparatively little—rather than be content with mediocrity for months on end. Whether your requirements be for a short- or long-wave set, our help and assistance will prove invaluable to you, as it has done to many other discriminating listeners who have sent us their unsolicited testimonials.

Write, Phone or Call—

our Technical Experts are always in attendance

SCOTT SESSIONS

RADIO ENGINEERS & CO.
MUSWELL HILL
LONDON, N.10. Phone: Tudor 5328

INDEX TO ADVERTISERS

	Page
B	
Belling & Lee, Ltd.	341
Block Batteries, Ltd.	351
British Blue Spot Co.	Cover iii
British Radiophone, Ltd.	347
British Rola Co.	433
Bulgin, A. F., & Co.	341
Burne-Jones & Co., Ltd.	434
C	
Carrington Mfg. Co., Ltd.	431
City Accumulator Co.	338
Clifford A. Pressland (Sales), Ltd.	352
Columbia Graphophone Co., Ltd.	Cover iv
Colvern, Ltd.	434
D	
Dubilier Condenser Co., Ltd.	354
E	
Eastick, J. J. & Sons	439
Ever Ready Co. (G.B.), Ltd.	349
F	
Ferranti, Ltd.	339
Fluxite, Ltd.	352
G	
Garrard, Eng. Co., Ltd.	345
H	
Heyberd, F. C., & Co.	439
High Vacuum Valve Co.	341
Homeaids	434
J	
Jackson Bros.	436
L	
London Electric Wire Co., and Smiths, Ltd.	433
Lyons, Claude	353
M	
McMichael Radio	431
O	
Osborn, Chas.	434
P	
Partridge & Mee, Ltd.	429
Partridge Wilson & Co.	431
Pertrix, Ltd.	433
Peto-Scott, Ltd.	439
Pifco	351
Pickett Bros.	439
Preh. Mfg. Co.	351
R	
Radio Resistors	341
Radio Instruments	435
Regent Fittings	341
Reproducers & Amplifiers, Ltd.	338
S	
Scott Sessions	440
Siemens Bros.	353
S. Smith & Sons	435
Sound Sales	439
Stenibac, Ltd.	339
T	
Taylor, A.	341, 439
Telegraph Condenser Co., Ltd.	437
Telsen Electric Co.	427
U	
Univolt Electric, Ltd.	339
W	
Westinghouse Brake & Saxby Signal Co., Ltd.	Cover ii
Wingrove & Rogers	352
Wright & Weaire, Ltd.	343

NEW BLUE SPOT MOVING COIL SPEAKERS

The new Blue Spot Moving Coil Speakers have been produced after the most exacting and painstaking research, for it is realised that the public are more than ever very critical of the standard of reproduction which they expect from their Loudspeaker. These new Blue Spot models represent the very latest achievement in Speaker technique, both from the point of view of design and reproduction. The known and dependable quality of all Blue Spot products has never been better exemplified than in these new Moving Coil models. Write for Catalogue No. W.M. 27S.

N.B. Standard Models 99 P.M. and 45 P.M. are suitable for Class B output, 29 P.M. on request.



99 PM

Blue Spot 99 P.M. represents the highest achievement in moving coil loudspeaker technique to-day. Its reproduction is sheer delight. Its response throughout the whole musical range of frequencies is extraordinarily even, true bass, true middle, true top. An exclusively designed magnet, ensures powerful and permanent energy. Moulded side-plates exclude dust and magnetic particles from entering the air gap. De Luxe Transformer is fitted with plugs and sockets. New process Cone and Speech Coil prevent trouble from moisture, warping or fouling in the gap. To own a Blue Spot 99 P.M. is to have at your disposal the most perfect rendering of broadcast programmes the world has known. Luxurious cabinet model in beautiful walnut 59/6
32 P.M. 87/6



45 PM

This Blue Spot Moving Coil Speaker will be hailed with delight, for two reasons. It embodies the latest engineering and technical refinements, while its reproduction sets a new standard, a new ideal. Having an even response throughout, no excessive bass and no shrill top, 45 P.M. will meet the most exacting requirements. Dust proof plates have been fitted to the special magnet, specially designed Cone and Speech coil. The Matching Transformer which is included is complete with plugs and sockets for easy and trouble-free valve matching.

Exceptionally attractive cabinet models made in mahogany or walnut with the new Blue Spot grille 62 P.M. 67/6

45/6



29 PM

This is another splendid Blue Spot achievement. The performance of the new 29 P.M. will enhance the already enviable Blue Spot reputation. The price will enable those whose means have not previously allowed them to consider the possibility of owning a Moving Coil Loudspeaker, to secure the added enjoyment of Radio which it brings. The performance and reliability of this Model are really astonishing. Complete with Matching Transformer and other special features, price

Attractive Cabinet model in Oak 22 P.M. 45/-
BRITISH MADE

32/6

SPECIAL FEATURES OF ALL MODELS

Scientifically designed and well made Output Transformers with each Chassis ● Plugs and sockets in lieu of solder tags for easy valve matching ● Suitable for Power, Super-Power, Pentode and Q.P.P. (Triode) Output, Special Q.P.P. Pentode models 2/6d. each extra ● New process Cones and Speech Coils—no trouble from moisture, warping or fouling in the gap ● Cadmium plated pole pieces, copper plated chassis with felt surrounds ● Every model stands firmly on its own base ● Cabinet models have special acoustic features, the Chassis being mounted to an independent baffle specially fitted to cabinet ● Unrivalled finish, construction, performance.



THE BRITISH BLUE SPOT COMPANY LTD

BLUE SPOT HOUSE • 94/96 ROSOMAN STREET • ROSEBERY AVENUE • LONDON • E.C.1
Telephone: Clerkenwell 3570. Telegrams: "Bluospot, Isling, London."
Distributors for Northern England, Scotland and Wales: H. C. RAWSON (Sheffield and London) Ltd., 100 London Road, Sheffield; 22 St. Mary's Parsonage, Manchester; 177 Westgate Road Newcastle-upon-Tyne; 37, 38, 39 Clyde Place, Glasgow.

Get Original Tone



Immediately you hear the performance of this four valve mains model, you'll realise the amazing difference "tone" can make in radio entertainment. You will be listening to Columbia's latest development—ORIGINAL Tone—the perfect result of 30 years' continuous research in sound reproduction. Presented in fine walnut this set brings you the finest possible standards of efficiency in every detail. Test its superiority in *the actual reception conditions of your own home*. The coupon will bring you complete particulars.

USE THE COLUMBIA DEALER SERVICE

Expert advice on local radio conditions and service after sales

All-Electric Four

16 gns. cash (A.C. or D.C.)

or delivered on first payment of £1 . 13s



Columbia

ALL-ELECTRIC FOUR

CUT OUT AND POST TO-DAY !

Please send me fullest particulars of Columbia Model 355 and other Columbia instruments from £4 . 7 . 6 to 90 gns. (*write in block capitals*)

NAME.....

ADDRESS.....



.....W.M. MAY, 1933

Cut this out and post in an unsealed envelope bearing a ½d. stamp to:—
Columbia Graphophone Co. Ltd., 98, Clerkenwell Road, London, E.C.1.